PARTICIPATING COUNTRIES (9)

Azerbaijan, Turkey, Portugal, Pakistan, Egypt,
Indonesia, Uzbekstan, Spain, Poland

SOLIDARITY FOR A GREEN WORLD: CLIMATE CHANGE AND ENVIROMENTAL PROTECTION CONGRESS PROCEEDINGS BOOK

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EDITORS

ASSOC. PROF. DR. FİKRET DOĞRU
PROF. DR. IR. SOFYAN HUSEIN SIREGAR

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13. Dr. Professor Vladimir Androkhanov - Soil Science and Agrochemistry Research Institute, Siberian Branch, RAS, Russia
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15. Dr. Professor Natallia Kukharchuk - Institute for Fruit Growing of the NAS, Belarus
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SOLIDARITY FOR A GREEN WORLD: CLIMATE CHANGE AND ENVIROMENTAL PROTECTION

CONFERENCE PROGRAM

International Conference

Online

Baku, Azerbaijan

NOVEMBER 5, 2024

https://swg.tai.az

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+994 (50) 683 94 51

INTERNATIONAL SCIENTIFIC CONFERENCE

Solidarity for a Green World:
Climate Change and Environmental Protection

PLENARY SESSION (10:00 am - 12:30 pm, GMT+4)

November 5, 2024
Azerbaijan, Baku

CONFERENCE PROGRAM
Online (with Video Conference) Presentation

Participating countries (9)

Azerbaijan, Turkey, Portugal, Pakistan, Egypt, Indonesia,
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Meeting ID: 869 5738 0909
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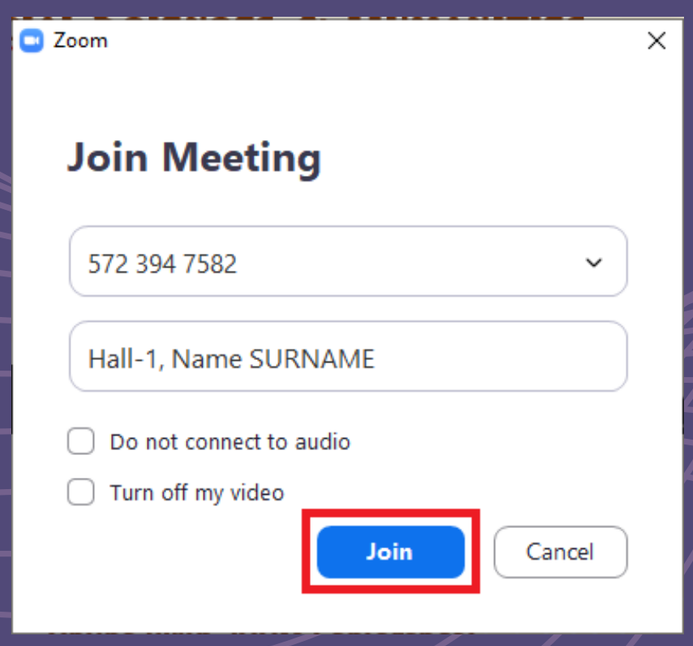
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Dr. Associate Professor Ulviyya Mammadova MES, Institute of Soil Science and Agrochemistry, Baku MA, Research Institute of Fruit and Tea Growing, Guba, Azerbaijan

Dr. Baha Ahmet Yilmaz
CEO of BZT Turan Academy, Türkiye



SOLIDARITY FOR A GREEN WORLD: CLIMATE CHANGE AND ENVIROMENTAL PROTECTION

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KEYNOTE SPEAKERS



Dr. Baha Yilmaz
Türkiye



Dr. Associate Professor Ulviyya Mammadova
Azerbaijan



Dr. Professor Nazlı Dide Kutluk Yilmaz
Türkiye



Dr. Professor Mohamed Nageeb Rashed
Egypt



Dr. Professor Raul D.S.G
Portugal



Dr. Professor Muhammed Saftar Bhatti
Pakistan



Dr. Joko Samiaji, M. Sc.
İndonesia

HONORARY SPEAKERS



Dr. Professor Fikret Doğru
Atatürk University,
Erzurum, Türkiye



Dr. Professor İzzet Akça
Ondokuz Mayıs University,
Samsung, Türkiye



Dr. Associate Professor
Ilham Garagurbanli
Director of the Research Institute of Fruit and Tea Growing, Guba



Prof. Dr. Hj. Sri Indarti, S.E., M.Si.,
Rector of RIAU University, Indonesia



Dr. Ir. Sofyan Husein Siregar, M.Phil., Prorector of RIAU University, Indonesia



Dr. Ass. Professor
Farahila Shukurova
General Coordinator on Transcaucasis of TURAN Academy, Baku, Azerbaijan



Dr. Professor Dost Muhammad Khan,
Faculty Dean of the Islamia University of Bahawalpur, Pakistan



Dr. Associate Professor
Abduvokhid Urazkeldiyev
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Dr. Professor
Vladimir Androkhanov
Director of Soil Science and Agrochemistry Research Institute, Siberian Branch, RAS

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COORDINATOR
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Research Institute of Fruit and Tea Growing,
Guba, Azerbaijan

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PLENARY SESSION

Meeting ID: 869 5738 0909
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OPENING SPEACH			
	05.11.2024	Time: 10:00 am - 12:30 pm (Azerbaijan, Baku, GMT+4)	*GENERAL CHAIRMAN & SESSION HEAD:* Dr. Ass. Professor Ulviyya Mammadova *GENERAL COORDINATOR:* Elmar Esgerov
Time	**Authors**	**Affiliation**	***Topic title***
10:00 - 10:05	Dr. Professor Alovsat Guliyev	Institute of Soil Science and Agro Chemistry, SEM AR	Welcome
10:05 - 10:10	Dr. Ass. Professor Sultan Huseynova	Institute of Soil Science and Agro Chemistry, SEM AR	Welcome
10:10 - 10:15	Dr. Ass. Professor Ilham Garagurbanli	Research Institute of Fruit and Tea Growing	Welcome
10:15 - 10:20	Dr. Ir. Sofyan Husein Siregar, M.Phil.	RIAU University, Indonesia	Welcome
10:20 - 10:25	Dr. Ass. Professor Farahila Shukurova	TURAN Academy Baku, Azerbaijan	Welcome
10:25 - 10:30	Dr. Professor Dost Muhammad Khan	The Islamia University of Bahawalpur, Pakistan	Welcome
10:30 - 10:35	Dr. Associate Professor Abduvokhid Urazkeldiyev	Research Institute of Irrigation and Water Problems, Uzbekistan	Welcome
10:35 - 10:40	Dr. Professor Vladimir Androkhanov	Soil Science and Agrochemistry Research Institute, Siberian Branch, RAS	Welcome
KEYNOTE SPEAKERS			
Time	**Authors**	**Affiliation**	***Topic title***
10:40 - 10:55	Dr. Baha Ahmet Yilmaz	CEO of BZT Turan Academy	Support for Azerbaijani Scientists and Organization of Scientific Events in International Collaboration
10:55 - 11:10	Dr. Professor Nazli Dide Kutluk Yilmaz	Ondokuz Mayis University, Faculty of Agriculture, Department of Plant Protection, Samsun, Türkiye	The Current Status of Rhizomania Disease in Sugar Beet in Turkey

PLENARY SESSION

Meeting ID: 869 5738 0909
Password: 748213

KEYNOTE SPEAKERS			
Time	**Authors**	**Affiliation**	***Topic title***
11:10 - 11:25	Dr. Professor Raul D. S. G. Campilho	Institute of Science and Innovation in Mechanical and Industrial Engineering, Portugal	Sustainable Optimization of Packaging Solutions for Heavy Mechanical Equipment: A Comparative Analysis of Material Performance and Environmental Impact.
11:25 - 11:40	Dr. Professor Muhammad Safdar Bhatti	The Islamia University of Bahawalpur, Pakistan	Crafting Solidarity for a Green World: A Review
11:40 - 11:55	Dr. Joko Samiaji	Marine Science Department Faculty of Fishery and Marine Science Universitas Riau, Pekanbaru, Indonesia	Carbon stock estimation in mangrove ecosystem.
11:55 - 12:10	Dr. Professor Mohamed Nageeb Rashed	Professor of environmental chemistry, Faculty of Science. Aswan University, Egypt	Natural and artificial organic materials responsible of the world climatic change.
12:10 - 12:25	Dr. Ass. Professor Ulviyya Mammadova	MES, Institute of Soil Science and Agrochemistry, Baku MA, Research Institute of Fruit and Tea Growing, Guba, Azerbaijan	Exploring the Ecological and Medical Benefits of Dill (Anethum graveolens) as an Alternative to Spirulina (Arthrospira platensis): A Comparative Study

CONFERENCE PROGRAM NOVEMBER 5, 2024

PROGRAM FLOW

VIRTUAL OPENING SPEECHES



Dr. Baha Ahmet Yilmaz

CEO of BZT Turan Academy, Türkiye

Topic: Support for Azerbaijani Scientists and Organization of Scientific Events: Strengthening Innovation and International Collaboration

CONFERENCE PROGRAM NOVEMBER 5, 2024

PROGRAM FLOW

VIRTUAL OPENING SPEECHES



Dr. Professor Nazlı Dide Kutluk Yilmaz

Ondokuz Mayis University, Faculty of Agriculture, Department of Plant Protection, Samsun, Türkiye

Topic: The Current Status of Rhizomania Disease in Sugar Beet in Türkiye

CONFERENCE PROGRAM NOVEMBER 5, 2024

PROGRAM FLOW

VIRTUAL OPENING SPEECHES



Dr. Professor Mohamed Nageeb Rashed

Professor of environmental chemistry,
Faculty of Science.
Aswan University, Egypt

Topic: Natural and artificial organic materials responsible of the world climatic change.

CONFERENCE PROGRAM NOVEMBER 5, 2024

PROGRAM FLOW

VIRTUAL OPENING SPEECHES



Dr. Professor Raul D. S. G. CAMPILHO

Institute of Science and Innovation in Mechanical and Industrial Engineering, Portugal

Topic: Sustainable Optimization of Packaging Solutions for Heavy Mechanical Equipment: A Comparative Analysis of Material Performance and Environmental Impact.

CONFERENCE PROGRAM NOVEMBER 5, 2024

PROGRAM FLOW

VIRTUAL OPENING SPEECHES



Dr. Professor Muhammad Safdar Bhatti

The Islamia University of Bahawalpur, Pakistan

Topic: Crafting Solidarity for a Green World: A Review

CONFERENCE PROGRAM NOVEMBER 5, 2024

PROGRAM FLOW

VIRTUAL OPENING SPEECHES



Dr. Joko Samiaji

Marine Science Department Faculty of Fishery and Marine Science Universitas Riau, Pekanbaru, Indonesia

Topic: Carbon stock estimation in mangrove ecosystem.

CONFERENCE PROGRAM NOVEMBER 5, 2024

PROGRAM FLOW

VIRTUAL OPENING SPEECHES



Dr. Ass. Professor Ulviyya Mammadova

MES, Institute of Soil Science and Agrochemistry, Baku
MA, Research Institute of Fruit and Tea Growing,
Guba, Azerbaijan

Topic: Exploring the Ecological and Medical Benefits of Dill (Anethum graveolens) as an Alternative to Spirulina (Arthrospira platensis): A Comparative Study

HALL 1 / SESSION 1

Meeting ID: 869 5738 0909
Password: 748213

HALL 1 / SESSION 1			
	05.11.2024	Time: 12:30 pm - 13:15 pm (Azerbaijan, Baku, GMT+4)	*MODERATOR & HEAD OF SESSION:* *Dr. Professor Irwan Effendi* *COODINATOR:* *MS. Nigar Emecen* *MS. Elmar Esgerov*
Time	**Authors**	**Affiliation**	***Topic title***
13:00 - 13:10	Elnur Abdullayev	Research Institute of Fruit and Tea Growing, Guba	DETERMINATION OF VIRAL DISEASES IN STONE FRUIT PLANTS CULTIVATED IN AZERBAIJAN BY DAS-ELISA-TEST METHOD
13:10 - 13:20	Tunzala İskenderova	Ganja State University, Ganja	EFFECTS OF CLIMATE CHANGES ON FRUIT GROWING AND WAYS TO FIGHT
13:20 - 13:30	Lala Dadashova	Republican Children and Youth Development Center	IMPACT OF CLIMATE CHANGE ON POPULATIONS OF RARE GEOPHYTES
13:30 - 13:40	Gulchohra Huseynova	Institute of Soil Science and Agrochemistry	PROTECTION AND EFFICIENT USE OF THE LANDS OF THE OGUZ REGION OF THE SOUTHERN SLOPE OF THE GREATER CAUCASUS
13:40 - 13:50	Ashura Abdullayeva Nargiz Abdullayeva	Zakatala Zonal Experimental Station, Research Institute of Fruit and Tea Growing	THE IMPACT OF SOIL FERTILITY ON CORN CULTIVATION
13:50 - 14:00	Rumiyya Mammadrzayeva	Research Institute of Plant Protection and Technical Plants, Ganja	STUDY OF MUTATION AND CREATION OF MUTANT FORMS BY INFLUENCE OF GAMMA RAY ON COTTON SEEDS
14:00 - 14:10	Samira Bagırova Leyla Atayeva Lala Nasirli Saria Ahmadova Jamala Aghayeva Mirhuseyin Safarov	“Dendrology Garden” Public Legal Entity	USE OF ORGANIC FERTILIZERS IN GREEN AGRICULTURE

HALL 1 / SESSION 1

Meeting ID: 869 5738 0909
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HALL 1 / SESSION 1			
	05.11.2024	Time: 12:30 pm - 13:15 pm (Azerbaijan, Baku, GMT+4)	*MODERATOR & HEAD OF SESSION:* *Dr. Professor Irwan Effendi* *COODINATOR:* *MS. Nigar Emecen* *MS. Elmar Esgerov*
Time	**Authors**	**Affiliation**	***Topic title***
14:10 - 14:20	Yavar Pashayev	Azerbaijan State Agricultural University, Ganja SGGW, University of Life Sciences, Poland, Warsaw UCO, Universidad De Cordoba, Spain	EFFECTS OF AFFORESTATION ON MICROCLIMATIC CONDITIONS AND ECOLOGICAL BENEFITS IN AZERBAIJAN
14:20 - 14:30	Gafar Mammadov	AR MA, Research Institute of Animal Husbandary Azerbaijan State Agricultural University, Ganja	CREATION AND TESTING OF HEAT-RESISTANT HYBRIDS
14:30 - 14:40	Suyanto Suyanto Anuar Rasyid Belli Nasution Angela Sesdia	Universitas Riau, Indonesia	CSR COMMUNICATION TO EMPOWER COMMUNITIES AGAINST FOREST FIRES
14:40 - 14:50	Jahrizal Jahrizal Achmad Tavip Junaedi Nicholas Renaldo Muhammad Rayen	Universitas Riau, Indonesia	FINANCIAL FEASIBILITY ANALISYS OF SUSTAINABLE WATERMELON FARMING AND GREEN SUPPLY CHAIN MANAGEMENT IN SAKO VILLAGE, PANGEAN DISTRICT, KUANTAN SINGINGI REGENCY
14:50 - 15:00	Vilayet Hasanov	MES, Institute of Soil Science and Agrochemistry	THE INFLUENCE OF ENVIRONMENTAL CONDITIONS ON THE DIAGNOSTIC PARAMETERS OF ALLUVIAL-MEADOW-FOREST SOILS IN THE GANIKH-AGRICHAY VALLEY OF AZERBAIJAN
15:00 - 15:10	Rana Hasanova Baba-zada Matanat Aliyeva	MES, Institute of Soil Science and Agrochemistry	SOIL BIODIVERSITY DETERMINATION IN UJAR USING RS METHODS
15:10 - 15:20	Elmar Askerov	Research Institute of Fruit and Tea Growing, Guba	DEVELOPMENT OF CLIMATE CHANGE MITIGATION MEASURES IN PEAR CROP

HALL 2 / SESSION 1

Meeting ID: 869 5738 0909
Password: 748213

HALL 2 / SESSION 1			
	05.11.2024	Time: 12:30 pm - 13:15 pm (Azerbaijan, Baku, GMT+4)	*MODERATOR & HEAD OF SESSION:* *Dr. Ass. Prof. Fikret Doğru* *COODINATOR:* *MS. Ufuk Ezgin* *MS. Deyanet Osmanov*
Time	**Authors**	**Affiliation**	***Topic title***
13:00 - 13:10	Agil Mustafayev	Hekimoglu Veterinary Services Azerbaijan, Ganja	ZOONOTIC DISEASES: RISKS OF ANIMAL TO HUMAN TRANSMISSION AND METHODS OF PREVENTION
13:10 - 13:20	Firoza Ramazanova Rena Mirzazada	MES, Institute of Soil Science and Agrochemistry	RESTORATION OF DEGRADED IRRIGATED SOILS OF THE KURA-ARAKS ZONE
13:20 - 13:30	Huseinaga Asadov Kamala Sadigova Idris Hojjatov Jahani Nusratzade	MES, Institute of Dendrology, Lankaran Regional Scientific Center of ANAS Ministry of Agriculture of Azerbaijan	CLIMATE CHANGE AND PROSPECTS OF DEVELOPMENT OF TEA FARMING
13:30 - 13:40	Samandar Kocherli Chingiz Gulaliyev Ali Jafarov Zeynab Valiyeva Fatma Aliyeva Sabina Taghiyeva	MES, Institute of Soil Science and Agrochemistry, MES, Institute of Geography	IN BROWN MOUNTAIN-FOREST LANDS OF GREATER CAUCASUS DYNAMICS OF THE HYDROTHERMAL REGIME
13:40 - 13:50	Mammadhuseyn Huseynov Farman Abdullayev	MES, Lankaran State University Lankaran Tea Branch of Research Institute of Fruit and Tea Cultivation	ASSESSMENT OF GENETIC DIVERSITY OF TEA PLANT
13:50 - 14:00	Nazli Babayeva	MES, Institute of Genetic Resources, Baku	COMPARATIVE ANALYSIS OF RESISTANCE MARKERS AGAINST SELECTED VENTURIA PYRINA PATHOGEN IN PEAR GENOTYPES CULTIVATED IN AZERBAIJAN
14:00 - 14:10	Ulkar Yusubova	Azerbaijan State Agricultural University	IMPACT OF CLIMATE CHANGE ON THE ECOLOGICAL CONDITION OF WATER RESOURCES OF THE REPUBLIC OF AZERBAIJAN

HALL 2 / SESSION 1

Meeting ID: 869 5738 0909
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HALL 2 / SESSION 1			
	05.11.2024	Time: 12:30 pm - 13:15 pm (Azerbaijan, Baku, GMT+4)	*MODERATOR & HEAD OF SESSION:* *Dr. Ass. Prof. Fikret Doğru* *COODINATOR:* *MS. Ufuk Ezgin* *MS. Deyanet Osmanov*
Time	**Authors**	**Affiliation**	***Topic title***
14:10 - 14:20	Rana Ibayeva	Scientific Research Institute of Plant Protection and Technical Plants	DEVELOPMENT OF MEASURES TO COMBAT CLIMATE CHANGE
14:20 - 14:30	Mammad Mammadov Vugar Jafarov Bahruyya Bagirova Hasil Bagirov Najiba Mirmovsumova Arzu Hashimova Svetlana Rasulova	MES, Institute of Soil Science and Agrochemistry	EFFECT OF FERTILIZERS AND ORGANIC-MINERAL COMPLEXES ON THE QUALITY INDICATORS OF AGRICULTURAL PLANTS
14:30 - 14:40	Nazrin Mammadova Sabina Aghammadova Lamiya Gurbanova	Water and Amelioration Scientific Research Institute	SOIL FERTILITY: ESSENTIAL PRACTICES FOR LONG-TERM PRODUCTIVITY
14:40 - 14:50	Bahadir Ismayilov	MES, Institute of Soil Science and Agrochemistry, Baku	INFLUENCE OF SEMI-DESERT CLIMATIC CONDITIONS AND IRRIGATION ON MORPHOGENETIC DIAGNOSTICS OF IRRIGATION ALLUVIAL-MEADOW-FOREST SOILS IN THE FLOODPLAND OF THE KUR RIVER
14:50 - 15:00	Ali Jafarov Turan Ismailli	MES, Institute of Soil Science and Agrochemistry, Baku Lankaran State University	MORPHOLOGICAL AND PHYSICO-CHEMICAL PROPERTIES OF GRAY-MEADOW SOILS OF THE SALYAN PLAIN
15:00 - 15:10	Sakti Hutabarat	Universitas Riau, Indonesia	FROM PALM OIL CERTIFICATION TO ENVIRONMENTAL PROTECTION
15:10 - 15:20	Shalala Salimova Tarlan Yelmarli	MES, Institute of Soil Science and Agrochemistry, Baku	STUDY OF THE MICROELEMENT IODINE (I) IN SOILS FORMED UNDER CITRUS AND SUBTROPICAL PLANTS

HALL 3 / SESSION 1

Meeting ID: 869 5738 0909
Password: 748213

HALL 3 / SESSION 1			
	05.11.2024	Time: 12:30 pm - 13:15 pm (Azerbaijan, Baku, GMT+4)	*MODERATOR & HEAD OF SESSION:* *Dr. Riska Fatmawati, M.Si* *COODINATOR:* *MS. Kağan Sargin* *MS. Khalaya Yunusova*
Time	**Authors**	**Affiliation**	***Topic title***
13:00 - 13:10	Sultan Huseynova Maharram Babayev Amin Ismayilov	MES, Institute of Soil Science and Agrochemistry, Baku	SOILS OF LANKARAN-ASTARA ECONOMIC REGION OF AZERBAIJAN
13:10 - 13:20	Elnara Khankishiyeva	Research Institute of Fruit and Tea Growing, Absheron Station	ANALYSIS OF THE INDICATORS OF SELECTED RESISTANCE MARKERS AGAINST VENTURIA INAEQUALIS OF APPLE GENOTYPES CULTIVATED IN AZERBAIJAN
13:20 - 13:30	Nargiz Abdullayeva	Zakatala Support Point of the Research Institute of Fruit and Tea Growing	AGROCHEMICAL COMPOSITION OF SOILS IN THE SHEKI-ZAKATALA REGION AND WAYS TO OBTAIN AN ECOLOGICALLY CLEAN HAZELNUT CROP
13:30 - 13:40	Sabina Jafarzadeh	MES, Institute of Microbiology, Baku	THE ROOTS AND RISKS OF ECO-TERRORISM
13:40 - 13:50	Tarana Aliyeva	MES, Baku State University	ECO-CHEMICAL STUDY OF ABSHERON LAKES, WHOSE NATURAL STATE HAS BEEN DISTURBED BY TECHNOGENESIS
13:50 - 14:00	Nigar Mehdiyeva Leyla Jalilova	MES, Institute of Soil Science and Agrochemistry, Baku	EFFECT OF CLIMATE CHANGES ON IRRIGATED SOILS
14:00 - 14:10	Nurana Yuzbashova	MES, Institute of Soil Science and Agrochemistry, Baku	INFLUENCE OF SLOPE EXPOSITION ON THE PROPERTIES OF HAPLIC KASTANOZEMS IN THE LESSER CAUCASUS

HALL 3 / SESSION 1

Meeting ID: 869 5738 0909
Password: 748213

HALL 3 / SESSION 1			
	05.11.2024	Time: 12:30 pm - 13:15 pm (Azerbaijan, Baku, GMT+4)	*MODERATOR & HEAD OF SESSION:* *Dr. Riska Fatmawati, M.Si* *COODINATOR:* *MS. Kağan Sargin* *MS. Khalaya Yunusova*
Time	**Authors**	**Affiliation**	***Topic title***
14:10 - 14:20	Leyla Jalilova Farid Mustafayev	MES, Institute of Soil Science and Agrochemistry, Baku	AMELIORATIVE SITUATION OF IRRIGATED SOILS IN SOUTH MUGHAN(IN THE EXPERIMENTAL AREA)
14:20 - 14:30	Elnur Jabrayilov Elnur Abdulmanafov	The Academy of the Ministry of Emergency Situations, Baku	THE ROLE OF THE MINISTRY OF EMERGENCY SITUATIONS IN THE PROTECTION OF WATER RESOURCES
14:30 - 14:40	Gulzar Asgarli	MES, Baku State University	CLIMATE ADAPTATION MEASURES FOR SUSTAINABLE AGRICULTURAL DEVELOPMENT IN THE ABSHERON PENINSULA
14:40 - 14:50	Aladdin Sadigov	Research Institute of Fruit and Tea Growing, Guba	THE ROLE OF FOLK BREEDING VARIETIES IN OBTAINING BREEDING APPLE VARIETIES ADAPTED TO CLIMATE VARIABILITY
14:50 - 15:00	Khayala Yunusova	Research Institute of Fruit and Tea Growing, Guba	WAYS OF DEVELOPMENT OF FRUIT GROWING IN AZERBAIJAN
15:00 - 15:10	Riska Fatmawati Tri Laela Wulandari Romie Jhonnerie Nofrizal Muhammad Arif	Universitas Riau, Indonesia	EVALUATING FISHING GEAR SELECTIVITY FOR ENVIRONMENTAL SUSTAINABILITY AND BLUE ECONOMY: A CASE STUDY AT CAROCOK TARUSAN PORT, WEST SUMATRA

HALL 4 / SESSION 1

Meeting ID: 869 5738 0909
Password: 748213

HALL 4 / SESSION 1			
	05.11.2024	Time: 12:30 pm - 13:15 pm (Azerbaijan, Baku, GMT+4)	*MODERATOR & HEAD OF SESSION:* *Dr. Muhammad Saftar Bhatti* *General Chairman: Baha Ahmet Yilmaz* *COODINATOR: MS. Emil Arabov*
Time	**Authors**	**Affiliation**	***Topic title***
13:00 - 13:10	Elba Rustamova Aynura Ahmadova	Institute of Soil Science and Agrochemistry of the Ministry of Science and Education	EFFECTIVENESS OF ORGANİC AND MİNERAL FERTİLİZERS UNDER ONİON PLANT İN SHİRVAN GRAY-MEADOW SOIL CONDITIONS
13:10 - 13:20	Fatma Isayeva Aynura Ahmadova	Institute of Soil Science and Agrochemistry of the Ministry of Science and Education	RESEARCH THE EFFECTİVENESS OF ORGANİC AND MİNERAL FERTİLİZERS UNDER CİTRUS PLANTS İN THE YELLOW-CLAY SOIL CONDITIONS OF LANKARAN ASTARA ZONE
13:20 - 13:30	Leyla Gasimova	Republican Children and Youth Development Center, Head of the Department of Science, Innovation and Technology	AN ANALYSIS OF TEMPERATURE, PRECIPITATION, AND SUNSHINE IN BAKU
13:30 - 13:40	Kamala Damirova Aynura Ahmadova	Institute of Soil Science and Agrochemistry of the Ministry of Science and Education	STUDYING THE EFFECT OF ORGANIC FERTILIZERS ON THE TRANSFORMATION OF ORGANIC MATTER IN THE SOIL UNDER VEGETABLE CROPS IN THE GRASSLAND-FOREST SOILS OF THE GUBA-KHACHMAZ ZONE
13:40 - 13:50	Aygun Alieva Aynura Ahmadova	MES, Institute of Soil Science and Agrochemistry	THE EFFECT OF ORGANİC FERTİLİZERS MADE FROM WASTE ON THE PRODUCTİVİTY AND QUALİTY İNDİCATORS OF PEPPER PLANTS İN THE CONDİTİONS OF GRASS-GRAY SOİLS OF SHİRVAN ZONE
13:50 - 14:00	İzzet Akça Ali Kaan Aşkın	Ondokuz Mayis University, Turkey, Samsun	THE EFFECT OF CLIMATE CHANGE ON INSECTS

HALL 4 / SESSION 1

Meeting ID: 869 5738 0909
Password: 748213

HALL 4 / SESSION 1			
	05.11.2024	Time: 12:30 pm - 13:15 pm (Azerbaijan, Baku, GMT+4)	*MODERATOR & HEAD OF SESSION:* *Dr. Muhammad Saftar Bhatti* *General Chairman: Baha Ahmet Yilmaz* *COODINATOR: MS. Emil Arabov*
Time	**Authors**	**Affiliation**	***Topic title***
14:00 - 14:10	Aynura Ahmadova	MES, Institute of Soil Science and Agrochemistry	COMPARATİVE RESEARCH OF ORGANİC FERTİLİZERS İN GRAY-MEADOW SOILS OF SHIRVAN ZONE
14:10 - 14:20	Rena Heydarova Aynura Ahmadova	MES, Institute of Soil Science and Agrochemistry	THE EFFECT OF DIFFERENT TYPES OF ORGANIC FERTILIZERS ON THE DEVELOPMENT OF CORN PLANT ADAINS THE BACKGROUND OF MINERAL FERTILIZERS IN THE IRRIGATED GRAY-MEADOW SOILS OF SHIRVAN
14:20 - 14:30	Ilaha Mirzadjanzade	Baku State University	THE DEVELOPMENT OF CITRUS FRUIT AND TEA GROWING IN THE LANKARAN NATURAL REGION
14:30 - 14:40	Sevda Talibova Aynura Ahmadova	MES, Institute of Soil Science and Agrochemistry	COMPARATIVE RESEARCH OF ORGANIC FERTILIZERS UNDER SUGAR BEET
14:40 - 14:50	Turkan Hasanova Gunel Asgarova	MES, Institute of Soil Science and Agrochemistry	OIL BIODIVERSITY OF THE FOREST BIOGEOCENOSES IN GREATER CAUCASUS
15:00 - 15:10	Amirulla Kazımlı	The Academy of Ministry of Emergency Situations	PROTECTION OF WATER RESOURCES AND THEİR EFFİCİENT USE
15:10 - 15:20	Fidan Manafova Guluzar Hasanova	MES, Institute of Soil Science and AgroChemistry	THE INFLUENCE OF CLIMATE AND ENVIRONMENTAL CONDITIONS ON THE FORMATION OF THE SOIL COVER STRUCTURE OF THE GOBUSTAN MASSIF

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MORPHOLOGICAL AND PHYSICOCHEMICAL PROPERTIES OF GRAY-MEADOW SOILS OF THE SALYAN PLAIN

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ABSTRACT

Gray-meadow soils are widespread in the Salyan plain. In this article, we have studied the morphological and some physico-chemical properties of soil types in the territory.

These soils of alluvial origin had different properties depending on the meso and microrelief. Since it is carbonated, all the genetic layers of the soil boil. Most of the salts are CaSO4 and NaSO4. They had a ball-like and nut-like structure. The amount of humus in a layer of 10-15 cm is 2-2.5%. The granulometric composition of the crop layer is mainly clayey and heavy loamy, sometimes light and medium loamy soils are also found. The amount of physical clay varies between 20-90%. Among the absorbed bases, calcium is 38-85%, the largest amount of which falls on the share of the planting layer. The second place is occupied by magnesium - 30-55%, the next place is occupied by sodium - 10-17%. The soils are medium to high fertility. The amount of dry residue in the crop layer is 0.135-3.732%. Most of them are found in the lower layer. They belong to sulfate-chlorine and chlorine-sulfate type. The reason for salinization is that groundwater is close to the surface. The structure is smooth and lumpy. The alluvial layer is relatively hard. The amount of carbonates in the upper layer is between 6.6-17.4%, and in the second meter layer it is above 15.2%. The morphological characteristics of these soils are characterized by the color of gray, stubble-gray and gray-brown, the thickness of the cultivated layer, the structure of the clay, and the solidity of the sub-plough layer.

The increase of absorbed bases in the lower layers of gray-meadow soils is closely related to the presence of clay and heavy gravelly layers in those layers.

Keywords: microrelief, granulometric composition, carbonation, absorbed bases, physical clay.

INTRODUCTION

The Salyan Plain is located in the Kur-Araz lowland and covers an area of 149 thousand hectares, of which 46 thousand hectares are currently intensively used for agricultural crops. Recent studies show that part of the used lands has been subjected to salinization.

The relief of the Salyan Plain is mainly plains. The general slope of the plains is in the southeast direction and is very weak. The relief of the area quickly takes the form of a plain from the foothills towards the Caspian Sea, and in the central part of the area there are areas with a negative slope of 15-23 m, where ponds have formed. Despite the fact that the area is flat, small hollows are found in some places. Negative relief forms were formed as a result of the Kura River carrying away and opening a new bed for itself over the centuries.

The Salyan Plain was formed on the alluvial deposits of the Kura River. Due to the materials brought by the Kura River, silty sediments periodically filled its channel, and as a result, the level of running waters rose, flooding the surrounding areas and covering them with floodplain silty sediments.

Most of the soils spread in the area are of alluvial nature. This can only be explained by the characteristics of the soil-forming rocks. The fact that the soil profile is completely clayey in some areas indicates that these soils developed on the deluvial-prolluvial deposits in the Kura and other small rivers. Since most of the soil-forming rocks are rich in salts and carbonates, the soils developed here are carbonated and saline to varying degrees.

RESEARCH OBJECT AND MATERIALS

The Salyan Plain is located in the Kur-Araz lowland and covers an area of 149 thousand hectares, of which 46 thousand hectares are currently intensively used for agricultural crops. Recent studies show that part of the used lands has been subjected to salinization.

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SOME PHYSICAL AND CHEMICAL INDICATORS OF THE MAIN SOIL TYPES OF THE SALYAN PLAIN

Depth, cm	Hygroscopic moisture, %	Humus, in %	$CaCO_3$ in % based on CO_2	Volume weight, g/ cm_3	Porosity, by number	Absorbed bases in mg.eq.		Dry residue, %	Mechanical composition, %	
						Ca	Mg		0,001	0,01
Gray-grass lands										
0-17	4.4	2,13	6,6	1,13	50,26	13,15	5,51	2,024	13,60	47,70
17-46	4,5	1,65	10,1	1,29	43,22	10,07	5,76	1,643	10,88	46,00
46-79	5,7	0,86	6,0	1,16	48,94	15,80	5,43	2,232	9,68	38,24
79-120	3,7	0,92	9,0	1,17	46,52	14,39	6,28	1,571	8,80	34,00
Grassy-gray soils										
0-22	4,0	1,54	10,7	1,30	42,78	8,29	6,17	0,580	11,92	51,04
22-41	3,4	0,81	9,1	1,17	48,50	12,90	7,10	1,032	11,04	30,54
41-63	3,2	0,74	12,6	1,19	47,62	18,39	7,20	0,840	4,24	38,54
63-96	4,2	0,60	16,1	1,16	46,54	16,40	6,30	0,840	4,24	38,54
Gray soils										
0-26	4,5	1,65	10,23	1,09	52,02	16,14	5,86	0,808	15,60	49,14
26-51	4,0	1,13	14,89	1,26	44,54	21,79	9,76	0,976	12,40	46,24
51-90	4,2	0,17	12,34	1,23	45,86	20,97	9,37	1,584	7,70	40,00
90-125	3,9	0,53	15,32	1,16	43,79	18,87	9,61	1,584	9,05	36,54
Meadow-marsh lands										
0-35	9,7	4,82	7,34	1,19	47,62	17,40	12,10	1,937	19,23	39,56
35-50	8,4	2,15	13,90	1,31	42,34	17,33	9,25	2,345	26,54	55,76
50-95	7,2	1,90	5,34	1,35	40,58	21,29	5,35	1,557	17,05	37,27
Saline soils										
0-23	8,9	2,65	10,7	1,25	44,98	15,24	9,36	4,260	10,42	44,08
23-62	7,5	1,80	11,6	1,19	47,62	18,33	9,25	2,930	6,43	41,46
62-87	7,9	0,70	6,4	1,23	45,86	17,91	8,27	3,755	2,89	40,08
87-141	8,2	0,65	12,5	1,24	46,74	17,00	8,34	4,005	-	-

The amount of dry matter in the topsoil is 0.135-3.732%. Most of them are found in the lower layer. They belong to the sulfate-chlorine and chloride-sulfate type. The reason for salinization is that groundwater is close to the surface. The structure is loamy and clayey. The alluvial layer is relatively hard. The amount of carbonates in the upper layer is between 6.6-17.4%, and in the second meter layer it is above 15.2%. The morphological characteristics of these soils are characterized by their gray, gray-brown color, thick sown layer, loamy structure, and solid subsoil layer.

Results and Dicussions

The characteristic morphological features of these soils include the presence of salt spots in the pro le and a calcareous structure. In gray-grass soils, the thickness of the humus layer in the upper layer (0-17 cm) is 2.13%. The amount of humus decreases along the pro le towards the lower layers. These soils are carbonate, and the amount of CaCO3 along the pro le is 6.6-9.0%. The amount of absorbed bases varied between 13.15-14.39 m.eq (in 100 g of soil). Among the absorbed bases, calcium cation occupies the rst place, magnesium cation occupies the second place, and sodium cation occupies the third place. The granulometric composition of these soils is mainly heavy clay, and the amount of physical clay varies between 40.08-44.08% along the pro le.

Most soil types are relatively low in humus and organic matter, especially in the deeper layers. Therefore, enriching the soil with organic matter through methods such as organic fertilization and green manure is important to increase productivity. Marshland and saline soils require drainage and irrigation systems. In soils with high salinity, a well-managed irrigation system is essential to leach salts. Balancing calcium and magnesium levels is important for the long-term productivity of soils. In soils with very low levels, the use of fertilizers rich in these minerals is necessary.

Conclusion

Land reform and reclamation measures are required to make marshy and saline lands suitable for agriculture. These areas can be used to grow certain types of crops while maintaining water balance. High salinity in saline soils signi cantly reduces productivity. Managing soil salinity using appropriate technologies can make these lands more suitable for agriculture.

This analysis provides a detailed understanding of the physical and chemical characteristics of the soil types of the Salyan Plain. Using this information, it is possible to take appropriate steps for land reform and agricultural planning.

Acknowledgment

The research was conducted with the aim of preserving and maintaining Azerbaijan s arable soils.

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REFERENCE

A.M. Jafarov. Spectrometric properties of Salyan plain soils. Azerbaijan Agricultural Science, Baku-2005.

A.M. Jafarov., Kocharli S.A., Gerayzade A.P. Spectrophotometric parameters of Azerbaijan Arid zone soils. Energy Ecology Econo-my international congress, Baku- 2007.

Kocharli S.A., Jafarov A.M., Hajiyeva G.A. Physical and hydrophysical indicators of the soils of the Shirvan plain. Collection of works of the Institute of Geography of ANAS Baku- 2017.

Jafarov A.M., Kocharli S.A. Dependence between agrophysical properties and optical properties of the main soil types of the Mughan plain. ANAS, Soil Science and Agrochemistry Journal, vol. 24, Baku, 2019.

Gulaliyev Ch.G., K rli S. ., Khasayeva S.G. Changes in the chemical properties of sierozem-meadow soils in crop rotation elds. Chem-istry, ecology and rational nature management. Magas, October 21-23, 2021.

Gulaliyev Ch.G., Kozlova A.A., K rli S. . Dynamics of some soil properties under cotton-alfalfa crop rotation. Soils and Environment, ISSN 2618-6802 (On-Line) Volume 5, Issue 1, 2022

A.M. Jafarov, E.M. Mamedova, Z.M. Velieva. Physicochemical properties of soils of the Khizi region of Azerbaijan and their in uence on agrophysical properties. Ministry of Agriculture of the Republic of Belarus. Current Scienti c, Technical and Environmental Tests of Land Reclamation. Gorki, BGSH, 2023.

S.M.H seynova., A. . smay lov., M.P.Babayev., A.M.C f rov. Taxonomic attribution of the haplic gleysols of the Azerbaijan Republic in world reference base for soil resources. nternational Journal of Advances in Applied Sciences, March 2024.

A.M. Jafarov., S.A. Kocharli. et al. Comparative analysis of water absorption capacity of the Shirvan and Mughan plains of the Kur-Araz lowland depending on their use. Institute of Soil Science and Agrochemistry of the Ministry of Science and Education, Volume 1, 2024.

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ZOONOTIC DISEASES: RISKS OF TRANSMISSION FROM ANIMALS TO HUMANS AND PREVENTIVE MEASURES

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Abstract

Zoonotic pathogens pose signi cant public health risks through their ability to be transmitted from animals to humans, impacting global health systems. This paper discusses three major zoonotic diseases with high epidemiological signi cance salmonellosis, leishmaniasis, and prion diseases and the complications they cause. While salmonellosis and prion diseases are primarily transmitted through contaminated food, leishmaniasis is spread by blood-feeding insects. This study aims to highlight the impact of zoonotic diseases on human populations, the burden they place on global health systems, and critical measures for prevention and control. The paper emphasizes strategies for reducing the incidence of zoonotic diseases through public health initiatives. Transmission primarily occurs through direct contact with infected animals, consumption of animal-derived food products, or vectors like insects. The COVID-19 pandemic has underscored the vast potential for zoonotic diseases to spread globally, with signi cant repercussions for public health, global economies, and social stability. Factors such as climate change, ecosystem destruction, urbanization, and intensive livestock farming are key drivers that increase the likelihood of zoonotic disease outbreaks. As animals natural habitats and food sources shrink, they are more likely to encroach on human-inhabited areas, weakening the boundaries between human and wildlife environments and facilitating disease spread. Individuals living in urban areas with high populations of rats, mice, and stray dogs are at greater risk.

To prevent these diseases, early warning systems, robust monitoring, effective diagnostic and vaccination programs, and hygiene and sanitation measures are essential. The One Health approach, which recognizes the interconnectedness of human, animal, and environmental health, offers integrated and sustainable solutions to prevent zoonotic disease transmission. This approach is critical to ensuring global health and the sustainability of ecosystems.

Keywords: vectors, epidemiology, rehabilitation, genetic mutations, wildlife, laboratory safety, latent period

Introduction:

Zoonotic diseases are infections transmitted from animals to humans and represent a critical threat to global public health. Pathogens such as Salmonella (bacteria), prions (misfolded proteins causing neurodegenerative diseases), and Leishmania [1,2] (parasites) are widespread and can result in high morbidity and mortality rates. This study provides a comprehensive overview of diagnostic methods, treatment strategies, and preventive measures for these zoonotic pathogens.

Research Object and Materials

Salmonella Infections: Epidemiology and Clinical Manifestations

Salmonella is a major cause of foodborne illnesses, presenting clinically as gastroenteritis or enteric fever [1,2,3].

Diagnosis and Treatment:

Diagnosis is typically established through stool or blood cultures. Treatment depends on the severity of the infection:

1. Mild Cases: Supportive therapy with rehydration uids and oral electrolyte solutions.
2. Severe Cases: Antibiotic therapy is required:

Cipro oxacin: 500 mg twice daily for 7 14 days [4,5,6].
Azithromycin: 1 g on the rst day, followed by 500 mg daily.
Ceftriaxone: 1 2 g/day intravenously.

Prevention:

Key preventive measures include adherence to hygiene standards, food safety practices, and avoidance of raw or undercooked food.

Prion Diseases

Epidemiology and Clinical Manifestations

Prions are misfolded proteins that cause neurodegenerative disorders in humans, such as Creutzfeldt-Jakob disease (CJD).

Diagnosis and Treatment:

There is no de nitive cure for prion diseases. Diagnosis relies on magnetic resonance imaging (MRI) and postmortem biopsy. Treatment focuses on symptom management:

1. Polyanionic Compounds (Pentosan Polysulfate): May inhibit prion accumulation but with limited success in clinical trials.
2. Doxycycline: Shown to reduce prion toxicity in cell cultures and used in supportive clinical therapy.
3. Amphotericin B and Suramin: Investigated for their potential to inhibit prion protein misfolding.

Prevention:

Effective sterilization [1,2,6] protocols and avoidance of consumption of infected animal products are critical preventive measures.

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Prion Diseases:
Epidemiology and Clinical Manifestations
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Prevention:
Effective sterilization [1,2,6] protocols and avoidance of consumption of infected animal products are critical preventive measures.

Leishmaniasis
Epidemiology and Clinical Manifestations
Leishmaniasis is a parasitic disease caused by Leishmania species, presenting in cutaneous, mucocutaneous, and visceral forms.

Treatment
Cutaneous Leishmaniasis:
Meglumine Antimonate: 20 mg/kg/day intramuscularly or intravenously for 20 days.
Miltefosine: 2.5 mg/kg/day orally for 28 days.

Visceral Leishmaniasis:
Liposomal Amphotericin B: 3 mg/kg in a total of 5 7 doses.
Pentavalent Antimonials: 20 mg/kg/day intravenously or intramuscularly for 28 days.

Mucocutaneous Leishmaniasis:
Amphotericin B Deoxycholate: 0.7 1 mg/kg/day intravenously for 20 30 days.

Adverse Effects and Management

1. Amphotericin B: Risk of nephrotoxicity; regular monitoring of renal function is necessary.
2. Pentavalent Antimonials: Risk of cardiotoxicity and pancreatitis.
3. Miltefosine: Gastrointestinal side effects, including nausea and vomiting.

Prevention
Preventive measures include the use of insect repellents, protective clothing to avoid sand y bites, and control of infected animal reservoirs.

Conclusion and Discussion
The treatment of zoonotic diseases varies depending on the type and etiology of the infection. Effective management of Salmonella, prion diseases, and Leishmania infections requires a multidisciplinary approach and strengthened public health policies. Awareness and prevention are pivotal in reducing the burden of zoonotic infections.

Acknowledgment
The investigations were realized on the wild and domestic animals and birds in real situations.

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REFERENCE

Wikel, Stephen K. Zoonoses: Changing, Challenging, and Increasing Global Disease Threats. Zoonotic Dis. 2024, Volume 4, Issue 1, Pages 8 10. DOI: 10.3390/zoonoticdis4010002.

Jones, K. E., Patel, N. G., Levy, M. A., et al. Global Trends in Emerging Infectious Diseases. Nature, 2008, Volume 451, Issue 7181, Pages 990 993. DOI: 10.1038/nature06536.

Palmer, M. A., Deem, L. S., & Peiris, A. Zoonotic Diseases and One Health: Current Perspectives. Springer Nature, 2020. ISBN: 978-3030237358.

Anderson, R. M., & May, R. M. Infectious Diseases of Humans: Dynamics and Control. Oxford University Press, 1992. ISBN: 978-0198545999.

Kahn , S., & Monath, T. Zoonoses and Climate Impact: Challenges and Solutions. Elsevier, 2018. ISBN: 978-0128053477.

Smith, K., & Bradley, C. Emerging Infectious Zoonotic Diseases: Drivers and Dynamics in a Globalized World. The Lancet Infectious Diseases, 2022, Volume 23, Issue 5, Pages 350 358. DOI: 10.1016/S1473-3099(21)00675-9.

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THE EFFECT OF ORGANIC FERTILIZERS MADE FROM WASTE ON THE PRODUCTIVITY AND QUALITY INDICATORS OF PEPPER PLANTS IN THE CONDITIONS OF GRASS-GRAY SOILS OF SHIRVAN ZONE

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In the reporting period of 2020-2024, a eld experiment was carried out in 3 replications and 5 variants with the variety "Zumrud" of the pepper plant in the conditions of the grass-gray soils of the Ujar support station. Variants were taken as control without fertilizer, manure 20 t/ha, manure 40 t/ha, compost 20 t/ha, compost 40 t/ha. Along with organic fertilizers, biohumus was added to the soil. Biohumus contains organic matter-41%, nitrogen N-3.2%, phosphorus F-2.6%, potassium K-2.0, pH-7.0, humus 16% at a moisture content of 55%. During vegetation, 20 tons of manure, 150-180 kg of nitrogen, 120-180 kg of phosphorus, and 120-150 kg of potassium were applied per hectare. 70-80% of the manure was given under the main plow, and 20-30% when planting seedlings. The best results were obtained when plants were given 5 tons of biohumus. Thus, the average yield here over 3 years was 120.0 s/h, and 48.0 s/h or 66.7%. When the correct norm is selected in the scien- ti c research work with waste, the soil is enriched with organic matter and the fertility of the soil increases due to the new organic fertilizer applied to the soil in time.

What has been said once again proves that organic fertilizers are cheap and effective and shows the necessity of using them for vegetable crops in Shirvan's grass-gray soil-climate conditions.

Keywords: pepper, Shirvan zone, fertilizer, organic, biohumus

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COMPARATIVE RESEARCH OF ORGANIC FERTILIZERS IN GRAY-MEADOW SOILS OF SHIRVAN ZONE

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This research investigates the effectiveness of organic fertilizers on sugar beet cultivation in gray-meadow soils of the Shirvan zone. Environmentally friendly fertilizers such as biohumus, manure, compost were used in our research work. These fertilizers obtained as a result of the processing of plant, animal and household waste are environmentally friendly fertilizers because they are a part of nature. At the same time, mineral fertilizers equivalent to manure were also used for the purpose of comparison. The Dayag district of the Institute of Soil Science and Agrochemistry, located in the territory of Garab rk village, Ujar region, was chosen as the research area. 20 tons of Shirvan compost per hectare, 20 tons of manure, 10 tons of biohumus and mineral fertilizer equivalent to 20 tons of manure were given the best indicators in the variant with 10 tons of biohumus per hectare. 20 tons of Shirvan compost per hectare, 20 tons of manure, 10 tons of biohumus and mineral fertilizer equivalent to 20 tons of manure were given the best indicators in the variant with 10 tons of biohumus per hectare. In the version with 10 tons of biohumus per hectare, the quality indicators of the sugar beet plant improved and the productivity increased. At the same time, an increase in the amount of nutrients in the soil was observed.

Keywords: soil, fertilizer, organic, biohumus, sugar beet.

INTRODUCTION

With an increase in the humus content in the soil, accumulated with intensive use of organic fertilizers, the supply of plant roots with water, air and nutrition improves. The reaction of the soil solution becomes more favorable for the life of cultivated plants. As a result of such a diverse and positive effect of organic fertilizers on the soil, the effectiveness of the applied mineral fertilizers also increases. In this regard, the content of soil nutrients increases, which indicates that organic matter is a very important and useful component of manure. Usually, manure contains an average of 0.5% nitrogen, 0.25% phosphoric acid and 0.6% potassium oxide. The importance of manure and other organic fertilizers in increasing soil fertility is determined not only by the fact that they add essential nutrients to the soil, accelerating the growth and development of plants. They are a means of improving the biological, physical and chemical properties of soils (Talibova S.T 2015).

In our research work, environmentally friendly fertilizers such as biohumus, manure, compost are used. These fertilizers obtained from the processing of plant and animal household waste are environmentally friendly fertilizers due to a feature of nature. At the same time, mineral fertilizers equivalent to manure are also used for ghting.

As a research area, the experiment was budgeted for 2020-2024 in the territory of Garab rk village of Ujar region of the Institute of Soil Science and Agrochemistry.

RESEARCH OBJECT AND MATERIALS

In order to study the ef ciency of organic fertilizers on saline and non-saline gray meadow soils under sugar beet in the Ujar region of Azerbaijan, an experiment was conducted. The experiment was conducted according to the following option: 1. control (used); 2. Shirvan compost 20t/ha; 3. manure 20t/ha; 4. biohumus 10t/ha.

Shirvan compost was prepared from the following waste: 60% - manure, cannery waste - 10%, tops of agricultural plants - 10%, bird droppings - 10%, forest litter - 5%, superphosphate - 2%, ammonium sulfate - 1%, ash - 2%. Chemical composition of Shirvan compost: organic matter - 41%, total nitrogen - 1.3%, total phosphorus - 0.82%, total potassium - 1.02%. Chemical composition of vermicompost: organic matter - 55%, total nitrogen - 3.2%, total phosphorus - 2.6%, total potassium - 2.0%. Chemical composition of manure: organic matter - 27%, total nitrogen - 0.65%, total phosphorus - 0.31%, total potassium - 0.88% [3, 4]. To conduct laboratory analyses to determine the amount of assimilable forms of nitrogen, phosphorus and potassium, soil samples were collected at two times - in the phase of formation of two main leaves of sugar beet and in the middle of vegetation from depths of 0-20 and 20-40 cm. The amount of absorbed ammonia was determined using Nessler s reagent, mobile phosphorus - according to Machigin, exchangeable potassium - according to Maslova on the Palintest-7500 apparatus (Arinushkina E.V., 1970)

RESULT AND DISCUSSION

The introduction of all the studied wastes into the soil had a positive effect on the results of soil analyses and the yield of soybeans. The best results of the analyses of soil samples taken in Nakhichevan were obtained in the variant with the use of 20 t/ha of Nakhichevan compost + 10 t/ha of manure + 5 t/ha of sludge + N45P60K30 on ancient irrigated sierozem under soybeans. Thus, in this variant, the amount of absorbed ammonium was 25 mg/kg of soil, mobile phosphorus - 22 mg/kg of soil, exchangeable potassium - 390 mg/kg of soil, which exceeded the control variant by 17.8; 9.7; 15.9 and 125 mg/kg of soil, respectively. The yield in this variant was 36 c/ha, which is 30% more than in the variant without fertilizers. The amount of protein in soybean grain was 37%, oil - 25%, while in the control variant these gures were 22% and 18%, respectively. Analysis of soil samples taken from the Imishli experimental plot showed that in the N50P25K60 + manure 10 t/ha + waste from a sugar beet processing plant 20 t/ha variant, the amount of absorbed ammonium in the arable soil layer was 15.9 mg/kg of soil (in the control without fertilizer application 9.2 mg/kg of soil), mobile phosphorus 21.2 mg/kg of soil (in the control -13.1 mg/kg of soil), exchangeable potassium -30.2 mg/kg of soil (in the control 262.6 mg/kg of soil).

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Conclusion

It was determined that the total humus in the 0-20 cm planting layer in the soil is 1.96%; total nitrogen 0.18%; total phosphorus 0.15%; while total potassium is 3.5%, these indicators are 0.93% at a depth of 80-100 cm; 0.05%; 0.06%; It decreased accordingly to 2.4%. In order to study the dynamics of nutrients in the soil under the sugar beet plant of organic and mineral fertilizers, soil samples were taken and analyzed by agrochemical methods in 3 periods, the formation of the main two leaves, the middle of the vegetation and the end of the vegetation. The highest indicator of N/NH4 absorbed ammonia in weakly salinized soils was 31.9 mg/kg; activated phosphorus P2O5 was 37.0 mg/kg, exchangeable potassium was 353.0 mg/kg, 20.4 of this control option; 16.9; 105 mg/kg was more. In the middle of the vegetation, the nutrients decreased due to intensive absorption by the plant, but in the variants given organic fertilizer, the amount of nutrients in the soil at the end of the vegetation was found to be relatively higher than the initial 2-leaf stage. This is due to the later mineralization of organic fertilizers in contrast to mineral fertilizers.

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The study shown in the scienti c paper has been done in the land eld and laboratory medium for a year.

Reference

Arinushkina E.V. Guide to chemical analysis of soils. Moscow: Moscow State University Publishing House, 1970, 487 p.

Talibova S.T. et al. Composts and their role in increasing soil fertility. / International Scienti c and Practical Conf. Economic Aspects of Intensi cation of Agricultural Production , / vol. II, Penza 2015

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EXPLORING THE ECOLOGICAL AND MEDICAL BENEFITS OF DILL (ANETHUM GRAVEOLENS) AS AN ALTERNATIVE TO SPIRULINA (ARTHROSPIRA PLATENSIS): A COMPARATIVE STUDY

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Abstract

Dill (Anethum graveolens) is a plant species traditionally used for culinary and medicinal purposes. This study aims to explore the ecological and medicinal bene ts of dill compared to Spirulina (Arthrospira platensis). By examining the ecological effects of dill in natural habitats, the plant's impact on habitat diversity and ecosystem health In addition, focusing on the medical potential of dill, its pharmacological effects such as antioxidant and anti-in ammatory properties were investigated. The possible bene ts and therapeutic potential of these effects on human health were evaluated. Compared with Spirulina, the nutritional content and biological properties of dill were analyzed. The use of dill as a potential alternative for human health has been examined, with particular emphasis on its effects on digestive health and metabolic balance. This comprehensive comparative study makes an important contribution to understanding dill's potential for both ecological balance and human health. However, it should be noted that the medicinal use of dill needs further research and clinical studies. In conclusion, this study investigating the potential advantages of Anethum graveolens as an alternative source is an important step to promote and evaluate the versatile use of the plant. Dill presents numerous advantages over spirulina. Primarily, dill is widely accessible and can be easily grown in diverse climates, rendering it more sustainable and attainable for widespread utilization. Additionally, dill boasts abundant essential oils such as carvone and limonene, renowned for their antimicrobial attributes and supportive role in digestive wellness. Moreover, dill is a notable source of vitamin C, pivotal for immune function and collagen synthesis, an attribute absent in spirulina. Furthermore, dill's culinary adaptability facilitates its integration into an extensive array of dishes, enriching both taste and aroma, unlike spirulina, which may be limited in culinary applications due to its pronounced taste and scent. Lastly, dill holds a longstanding tradition as a medicinal herb in various cultures, offering potential therapeutic advantages that extend beyond its nutritional composition. In the comparison between dill and spirulina, it is seen that dill is economically more suitable. In addition, the ecological effects of dill have been determined to be more sustainable and less harmful to nature. Medically, dill's traditional uses and health bene ts are similar to spirulina.

Keywords: Dill (Anethum graveolens), spirulina (Arthrospira platensis), ecological bene ts, medical advantages

Introduction:

Dill (Anethum graveolens) and Spirulina (Arthrospira platensis) [1,2,3,4,5,6] are two important plant species obtained from different sources in nature. While Spirulina is known for its high protein, vitamin, and mineral content, dill stands out as a plant that has been used in traditional medicine for a long time. In recent years, the search for more sustainable and environmentally friendly alternatives to spirulina has highlighted the potential of dill. This comparative study aims to investigate the ecological and medicinal bene ts of dill as a substitute for spirulina. From an ecological perspective, the effects of dill in natural habitats and the environmental effects of spirulina production will be examined and compared. Growing dill more widely and using sustainable agricultural methods suggests that it has less potential to harm the ecological balance. From a medical perspective, the health effects of the bioactive compounds contained in dill and how these effects differ from spirulina will be investigated.

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To understand the potential medicinal bene ts of dill [7,8,9,10,11], its antioxidant, antimicrobial and anti-in ammatory properties will be taken into account. Additionally, dill s potential effects such as supporting the digestive system, strengthening the immune system, and supporting cardiovascular health will also be examined. In this way, it will be better understood what advantages dill has medically compared to spirulina. Finally, it is also important to compare the culinary use of dill with spirulina. While dill can be used in a variety of dishes and recipes [12,13,14,15,16], spirulina s distinct taste and smell may be a drawback for some consumers. Therefore, comparing dill with spirulina will take into account not only its medicinal and ecological bene ts but also its ease of use. This comparative study aims to reveal the ecological and medical bene ts of using dill instead of spirulina. Understanding the potential of dill can make a valuable contribution to sustainable nutrition and health. Dill has various application areas in Azerbaijan. First, dill is an important spice frequently used in Azerbaijani cuisine and is one of the main ingredients in many traditional dishes. It is especially widely used in pilaf [17,18,19,20], stuffed vegetables, and salads. Additionally, dill is frequently used in making pickles and pickles. Dill is also used for health and medicinal purposes in Azerbaijan. It is widely used in traditional medicine to relieve digestive problems and strengthen the immune system. Dill oil is used externally to relieve pain and support skin health. Additionally, dill farming is an important economic activity in Azerbaijan. In particular, dill cultivation is an important source of income for farmers who want to generate income in rural areas. Dill farming [21,22] increases employment by contributing to the country s economy. In Azerbaijan, dill is also used in cosmetics and personal care products. In particular, dill extracts and oils are frequently included in the formulation of natural products used for hair and skin care. Dill also plays an important role in traditional Azerbaijani culture and festivals. For example, during important events such as Novruz Feast, dill is an indispensable part of some traditional rituals and dishes. Finally, dill also takes part in local folk culture and folklore in Azerbaijan. Dill and motifs associated with it appear frequently in folk songs, folk dances, and other traditional art forms. Figure 1. The General View of Dill (Anethum graveolens)



Figure 1. The General View of Dill (Anethum graveolens)

Dill has different vegetation stages throughout its plant life. First, there is a germination phase that begins with planting seeds. Seeds receive moisture and germinate under suitable conditions. This is followed by a growth phase in which the seedlings grow and develop. During this phase, seedlings develop their root systems by taking nutrients from the soil and grow their leaves [23,24,25]. Next comes the owering phase. During this stage, the dill plant forms ower buds and blooms. Flowers provide fertilization of the plant and lead to seed production. After seed production is completed, the plant moves into the maturation and ripening phase of the seeds. Finally, come the harvesting and replanting phases. After the dill plant matures, it is harvested and its seeds are collected. These seeds can be saved or replanted for use in future growing seasons. Thus, the life cycle of the dill plant is completed and a new cycle begins. The purpose of this comparative study is to investigate the ecological and medicinal bene ts of dill (Anethum graveolens) as a substitute for spirulina (Arthrospira platensis). In this context, we aim to examine the health and environmental effects of dill with a comparative approach.

By examining the ecological effects of dill, we aim to evaluate its potential effects on soil health;

By comparing the medicinal properties of dill with spirulina, we aim to determine its antioxidant and antimicrobial activities;

We plan to evaluate in terms of ecological sustainability by comparing the use of resources required for the cultivation and production of both plants;

We aim to investigate the potential medical applications of dill and spirulina extracts by testing their effects on human cells;

By taking a comparative approach, we aim to determine whether dill has similar or different health bene ts to spirulina;

Finally, we plan to evaluate consumer habits and acceptability by examining traditional and modern uses of dill.

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Research Object and Materials

The research object is the dill plant which is widely used in daily life, modern medicine, and the kitchen, too. The investigation was realized to prove the pro tability of the plant in traditional medicine, the environment, and the kitchen. The biochemical properties of the plat is the main factor in the investigation. While studying it was revealed that dill planted in different soil types and climate conditions gives us various results. Among abiotic factors, solar radiation takes the rst place. In the generation of ascorbic acid in the dill biochemical reactions happening demand more direct solar radiation as in other vegetables. The aim of the research is to examine the ecological and medicinal bene ts of dill (Anethum graveolens) by comparing it with spirulina (Arthrospira platensis). In line with this purpose, the materials and methods of the research were determined. To evaluate the ecological impacts of dill and spirulina, data on the cultivation and production of both plants will be collected and analyzed. Seeds, cultivation materials and soil samples of dill and spirulina plants will be used as research materials. Various materials needed to grow dill and spirulina will also be taken into account, such as the use of water and fertilizer. The procurement and use of these materials was determined as one of the methods of the research. To study the medicinal bene ts, extracts and extracts from dill and spirulina samples will be obtained and subjected to laboratory testing. These tests will be performed to determine the antioxidant, antimicrobial and anti-in ammatory properties of the herbs. Additionally, the effects of dill and spirulina extracts on human cells will be examined. The materials to be used throughout the research were carefully selected to obtain reliable and accurate results. Standard methods will be used for growing and processing dill and spirulina plants. Analysis of the data obtained will provide the information necessary to achieve the purpose of the research.

Botanical description of Dill (Anethum graveolens):



It is an annual plant species from the Apiaceae family. Its thin and hairy body is generally 40 to 60 cm long and has a branched structure. Its leaves are long and thin, bright green in color and have a hairy texture. The plant has small, white or yellow owers in umbrella-shaped in orescences. These owers mature into seed fruits and are lled with long, cylindrical seeds that have a characteristic odor. Dill seeds are the most valuable part of the plant and are generally used in the kitchen, but also for medicinal and aromatic purposes. The scent of dill is fresh and aromatic, often with a refreshing effect like mint and anise. Its scent contains slightly spicy and lemony notes, making it familiar and attractive. When it is broken or crushed, it becomes more noticeable and a pleasant smell spreads to the environment. Whether cooked or consumed directly, the aroma of dill is used to add a unique taste and smell to dishes and beverages. Its scent is known as an indispensable part of various cuisines and recipes, and it has a sweetening and aromatic property.

Botanical description of Spirulina (Arthrospira platensis):



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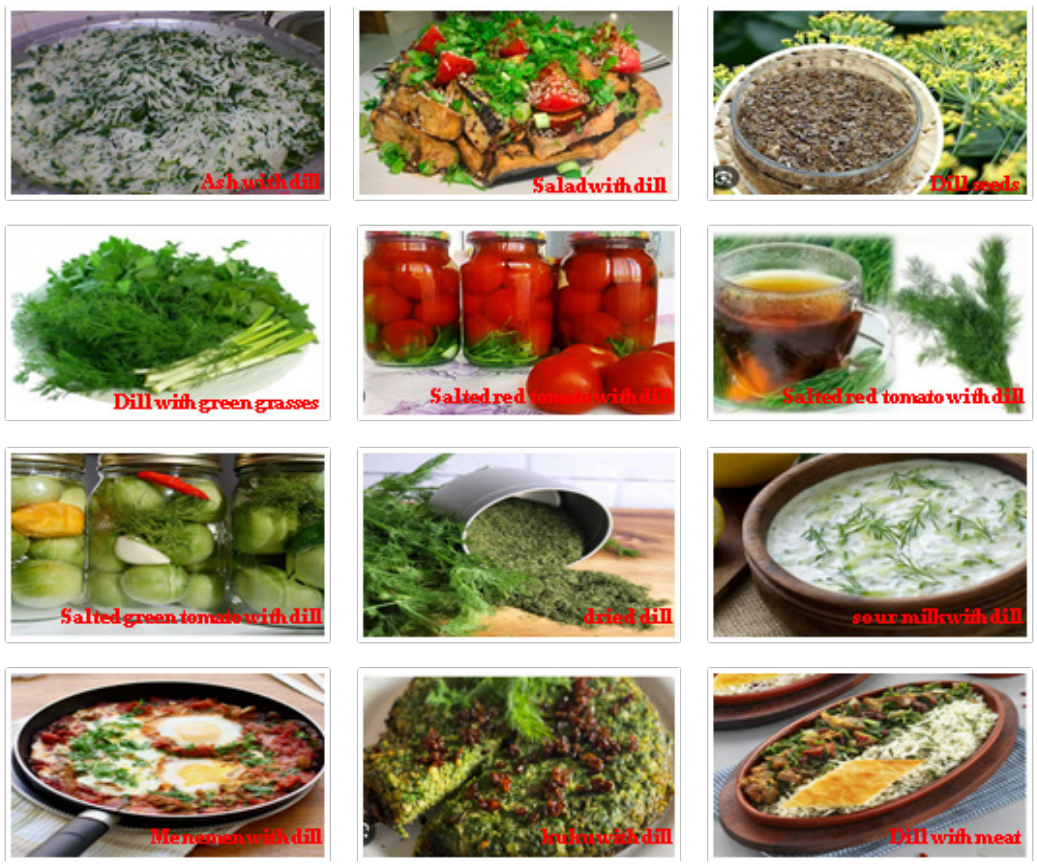


Figure 4. Dill in the Kitchen with Various Application

Dill has got low calories and possesses a high ber content that supports the digestive health of human beings. Also, dill is rich in minerals [24,26,29] including iron, calcium, potassium and magnesium, which strengthens bone health, heart muscular, brain and lungs. The special vitamins in the plant are vitamins A and C. Vitamin C strengthens the Human s immune system, while vitamin A helps keep the skin healthy, brain, eyes, hairs and intestines. Besides, dill contains essential fatty acids [24,29], such as; omega-3 and omega-6 fatty acids, which support heart health and ght in ammation, sight, intestine diseases. Dill provides many health bene ts in traditional and modern medicine, the plant supplies the necessary nutrients for human ecology.

Results and Discussion

The results obtained in the study titled "Study of dill (Anethum graveolens) as an alternative to Spirulina (Arthrospira platensis)" revealed important ndings. From an ecological point of view, the more widespread cultivation of dill [28,29] and the use of sustainable agricultural practices can reduce its negative effects on natural habitats. Also, the health effects of dill have been compared with Spirulina, focusing especially on its antimicrobial and digestive system supporting properties.

Ecological advantages of the dill plant are:

Grown in Various Climates and resistibility to the dried climate;

Less Consumption of Natural Water Resources and resistibly to waterless medium;

Maintaining Soil Quality and recultivation feature;

Reducing the use of chemical fertilizer and pesticides in soil and human-beings;

Protection of local ecosystem and human ecology.

At the result of the investigation the most advantages of dill plant have been revealed and collected. Some of the most important advantages of dill compared to Spirulina are follow:
Easier Cultivation and Wider Growing Areas: Dill can be grown more easily in different climate and soil conditions and can spread over a wider geographical area, making it more accessible around the world;

More Economically and Commercially Viable: Dill is a more economically and commercially accessible herb compared to Spirulina, encouraging its more widespread use in various cultural cuisines;

Wider Areas of Use and Cultural Value: Dill is a plant widely used in various cuisines and traditional medicine practices, which is an important part of our cultural heritage;

Less Intense Taste and Odor: The taste and smell of dill can be milder and more pleasant compared to the distinct taste and smell of Spirulina, offering a wider variety of uses;

More Diverse Nutritional Value: While Dill comes with a pro le rich in vitamins, minerals, and antioxidants, Spirulina focuses on more speci c nutrients, resulting in a more balanced diet.

Due to the investigations, I can say that different impacts of the dill which are more progressive than spirulina have to be investigated by ecologists, doctors, culinarians and biologist

Acknowledgment

The study aimed to provide essential information about the dill plant (Anethum graveolens) to a wide scienti c audience, highlighting its pro tability in supplying essential nutrients to the human body and enhancing soil and nature. Additionally, it explores the plant s culinary applications, such as preparing delicious meals, salads, and pickled vegetables in our cuisine.

REFERENCE

Aghili Khorasani Shirazi MH., (2008)1. Makhzan al-Advyeh. Tehran: Tehran University of Medical Sciences; pp. 490 491. [Google Scholar]

Aghili Khorasani Shirazi MH. Qrabadin-e Kabir., (1999)2. Tehran: Mahmoudi Bookstore Publication; 261 pp. [Google Scholar]

Ansari Shirazi AIH. Ekhtiarat e Badiee., (1992). Tehran: Pakhshe Razi Companies; p. 246. [Google Scholar]

Avicenna H., (2005). Canon in Medicine. Vol. 2. Alaalami Library: 148 pp. [Google Scholar]

Hosseinzadeh H, Ramezani M, Salmani G., (2000) Antinociceptive, anti-in ammatory and acute toxicity effects of Zataria multi ora Boiss. extracts in mice and rats. J. Ethnopharmacol. 73:379 85. [PubMed] [Google Scholar]

Ibn Bitar Z., (2001). The Whole Vocabulary of Medicine and Food. Vol.1. Beirut: Scienti c Book House; p. 382. [Google Scholar]

Moemen Tonekaboni MM. Tohfat ol-Moemenin., (2007). Tehran: Shahid Beheshti University of Medical Sciences; 69 pp. [Google Scholar]

Murray MD, Brater DC., (1993). Renal toxicity of nonsteroidal anti-in ammatory drugs. Ann. Rev. Pharmacol. Toxicol. 32:435 65. [PubMed] [Google Scholar]

Razi M. Alhavy., (2005). Vol. 21. Tehran: Iranian Academy of Medical Sciences; p. 56. [Google Scholar]

Zargari A., (1996). Medicinal Plants., 6th ed. Vol. II. Tehran: Tehran University Press; pp. 531 528. [Google Scholar]

F.F.Mammadov & et all. Solar Energy Terms Dictionary. Baki, Elm 2009. 364 p. ISBN 978-9952-453-05-8: https://ebooks.az/en/book/8QtBzgv5

U.F.Mammadova. Remote Sensing Study of Wind Energy Potential In Agsu District. ICEFSSS 2023, vol 1, no. 1. pp. 425-431

http://www.fesss.org/upload_pic/2d7f039f022fd4d1920edfce0370cc66.pdf#page=42

Yulianto S. Nugroho Ari Sandhyavitri,* , Bambang Sujatmoko , Mitra Adhimukti , Ulviyya Mammadova, F. Heru Widodo , Rizki Ramadhan Husaini. Reduction of Carbon Emissions from Tropical Peat Land Fire Disasters Using Weather Modi cation Technology. Ecology and Environment Journal. vol 11, no. 5, 2023, pp. 834 848:

https://www.hrpub.org/journals/article_info.php?aid=13687

U.F.Mammadova. Effect of humic substances on yield and nutrient contents of Eggplant Santana (Solanum melongena) plants in gray-brown soil. Eurasian Journal of Soil Science. vol 11, no. 4, 2023, pp. 98-103

https://dergipark.org.tr/en/pub/ejss/issue/72635/1197785

U.F.Mammadova. Ecological monitoring of Chukhuryurd Lake Ecotourism potential. Aswan University Journal of Environmental Studies (AUJES), Egypt. vol 1, no. 1. pp. 38-47. DOI: 10.21608/aujes.2022.159495.1093

https://aujes.journals.ekb.eg/article_273908.html

ISBN: 978-9952-8545-1-0 https://doi.org/10.30546/19023.978-9952-8545-1-0.2025.0756

U.F.Mammadova. Garanohur Lake Ecotourism Potential Study (Ismayilli District). Journal of Baku Engineering University. Chemistry and Biology. vol. 25, no. 1, 2023, pp. 3-10

https://beu.edu.az/root_panel/upload/ les/beu_edu_az/journals/2023_1/chemistry_1.pdf#page=5

U.F.Mammadova. Wind Damages Monitoring on Vine Yard to Select The Right Location in Gobustan District. The International Symposium on Soil Science and Plant Nutrition (EURASIAN SOIL Symposium 2022). vol. 7 no. 1. pp.175-179

le:///C:/Users/admin/Downloads/State_of_1671012304%20(1).pdf

U.F.Mammadova. Woodland Soils Alternative Protection Ways. Journal of Baku Engineering University Chemistry And Biology, ISSN 25. vol. 6 no. 1. pp.31-41

https://www.academia.edu/92415698/woodland_soils_alternative_protection_ways

U.F.Mammadova. Remote Sensing Based Study on Wind Energy s Ecological Effectiveness in Shamakhi District (Azerbaijan). Aswan University Journal of Environmental Studies. vol. 3 no. 1, 2022. pp.1-8. DOI: 10.21608/aujes.2022.109968.1052:https://journals.ekb.eg/article_222729.html

U.F.Mammadova. Wind Energy Potential Estimation in Agsu District. Mathematics and Natural Sciences Series of the Periodical Scienti c Journal News of the Pedagogical University .vol. 70, no.46, 2022, pp. 39-46
https://adpu.edu.az/images/adpu_ les/elm/elmi-jurnallar/01rtes/rtes-4-2022.pdf

U.F.Mammadova. The effect of bio-humus on Cardinal grape yield (Vitis vinifera L.) and nutrient contents of dark brown soil using drip irrigation systems under the open eld conditions. Eurasian Journal of Soil Science. Vol. 11, no. 4, pp. 345-352

https://dergipark.org.tr/en/pub/ejss/issue/69285/1172178

U.F.Mammadova.Wind Energy Potential s Remote Sensing Study to Save Bioenergy Resources in Highest Mountainous Regions. II International Scienti c-Practical Conference Reconstruction and Restoration in Post-Con ict Situations . 2022/2 Azerbaijan, Baku, vol. 24, no. 2. pp. 100-105.

U.F.Mammadova. Crude Oil Contaminated Soils actual Ecological Recultivation Ways. Processes of Petrochemistry and Oil Re ning (PPOR). vol. 22, no. 2, 2021. pp. 278-287: ISSN: print - 1726-4685; online - 2519-2876: https://ppor.az/jpdf/10-Mammadova-Ulviyya-2-2021.pdf

U.F.Mammadova. Remote sensing climate monitoring for wind potential to reduce deforested areas of Mountainous Shirvan. Proceedings of The Virtual International Conference Current Problems of Modern Agricultural And Biological Sciences: Global Challenges and Innovations 2022. vol.1 no. 1, pp. 360-366 https://ppor.az/jpdf/10-Mammadova-Ulviyya-2-2021.pdf
U.F.Mammadova. Remote sensing climate monitoring for wind potential to reduce deforested areas of Mountainous Shirvan. Proceedings of The Virtual International Conference Current Problems of Modern Agricultural And Biological Sciences: Global Challenges and Innovations 2022. vol.1 no. 1, pp. 360-366

U.F.Mammadova. Ef ciency of solar energy application for stopping deforestation. THERMAM International Conference Rostock, Germany, 2021/9. vol. 10, no. 1. pp.46. https://www.ltt.uni-rostock.de/storages/uni-rostock/Alle_MSF/LTT/Thermam/Abstract_Book_THERMAM_2021.pdf

U.F.Mammadova. Renewable Energy Sources Application for Forest Soils Safety. Scienti c & Academic Publishing, USA 2012. ISBN: 978-0-9838996-4-8. 158 p.

http://www.sapub.org/book/978-0-9838996-4-8.html

Mammadova U.F. Wildlife in Pirgulu State Nature Preserve. Germany: Lambert Academic Publishing , 2012.114 p.

https://biblio.es/libro/wildlife-pirgulu-state-nature-preserve-ulviyya/1537292710

Mammadova U.F. Ecological Aspects of the Use of Renewable Energy Sources in Forest Protection. Bak , MSV Publication house , 2022, 220 p. ISBN 978-9952-37-890-0

Mammadova U.F. Estimation of the renewable energetic potentials: Case study in Azerbaijan. Advances in Energy Research: Energy and Power Engineering, Nova Publishing, USA, 2012, pp. 557 582:https://novapublishers.com/shop/advances-in-energy-research-energy-and-power-engineering/

https://cyberleninka.ru/article/n/issledovanie-riska-vetrovoy-erozii-distantsionnym-zondirovaniem-na-kashtanovyh-pochvah

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THE ROLE OF FOLK BREEDING VARIETIES IN OBTAINING BREEDING APPLE VARIETIES ADAPTED TO CLIMATE VARIABILITY

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ABSTRACT

Due to the diversity of its natural-historical and physical-geographical conditions, the gene pool of fruit plants in Azerbaijan is extremely rich. Varieties selected by the people using the gene pool of local populations of the wild ancestors of cultivated fruit plants are an irreplaceable source in the selection of fruit plants. Those varieties are historically adapted to the soil and climate conditions of Azerbaijan, especially to climate variability. Taking into account the high genetic characteristics of those varieties, we involved in the selection program of the apple plant, using the father and mother parent lines: Zirva, Ziya, Lala, Nigar, Marfa, Sulh, Payizlig Guba, Qi lig Guba, Gobustan, Zumrud, Qizil Taj, Makhmari, Sevinj, Nuran, Chiraggala, Elvin, Sadaf, Emil, etc. varieties were created. The new apple varieties created through selection are about 10-12% ahead of the introduced varieties due to their compatibility with the soil and climate conditions of our country, as well as their high ef ciency and service life. Those varieties are being tested at the Adiyati stations of the Agrarian Services Agency under the Ministry of Agriculture of the Republic of Azerbaijan. Sevinj, Elvin, and Zumrud varieties have been regionalized and started to be applied.

Keywords: Apple, genepool, selection, variety, application.

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ANALYSIS OF THE INDICATORS OF SELECTED RESISTANCE MARKERS AGAINST VENTURIA INAEQUALIS OF APPLE GENOTYPES CULTIVATED IN AZERBAIJAN

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ABSTRACT

The main purpose of the research work is screening of molecular markers for resistance genes against the pathogen Venturia inaequalis in apple varieties and forms cultivated in the republic. QIAGEN kit and ABI 3500 X L fragment analysis methods were used to detect disease resistance genes in apple varieties. The creation and selection of apple varieties that are better adapted to the soil-climate conditions of our country, in addition to the reduction of chemical control measures against the disease, also contribute to the reduction of anthropogenic effects in nature, the preservation of bene cial entomophages, and the prevention of environmental pollution will make a great practical contribution. Large differences were observed in the comparative analysis of percentage indicators of selected molecular markers for genes resistant to the pathogen Venturia inaequalis in apple varieties and forms used in the study. Thus, from the SSR markers used for fragment analysis, the CH02f06 molecular marker selected for the Rvi15 gene was found in 80% of the total plants, the PI2_F/R marker selected for the PI2 gene was found in 66.6% of the total plants, for the Rvi1 gene the selected Vg12_SSR marker was found in 53.3% of the total plants and the selected CH02c02a marker for the Rvi4 gene was found in 30.0% of the total plants, which differed from other markers. However, among the SCAR markers, a higher index was observed in the OPL19 marker selected for the Rvi2 gene. Thus, the OPL19 marker was found in 70.0% of the total plants. Based on the obtained results, it is appropriate to use CH02f06, PI2_F/R, CH02f06 and OPL19 markers along with other molecular markers in future studies on detection of resistance genes against Venturia inaequalis in different apple varieties and forms cultivated in the country.

KEYWORDS: Markers, apple genotypes, resistance genes, Venturia inaequalis.

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A SCIENTIFIC STUDY ON THE IMPACT OF GLOBAL CLIMATE CHANGE ON EMERGENCIES

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ABSTRACT

The problem of climate change, which has been trending since the beginning of the last century, is having an ever-increasing impact on our planet. The article pointed out that global climate change has signi cantly affected the scale, diversity, intensity and frequency of natural disasters and other emergencies, as well as the concentration of greenhouse gases in the atmosphere has increased as a result of human activity and the annual average and maximum temperature of the planet. In order to prevent or at least minimize the effects of this problem in the world, it is necessary to strengthen the activities of international organizations and show the solidarity of humanity for this purpose, the growing interdependence between climate change and emergencies is clearly felt. It was emphasized that climate change has become a global priority due to the processes awaiting humanity and the unintended consequences it creates, including irreversible tragedies if urgent measures are not taken (impacts on people s life activities, weakening of the economic foundations of society and humanity as a whole, destruction of natural ecosystems, etc.). For the writing of the paper, research was conducted using a number of regularly updated sources of statistical information. These studies play an important role in informing people about how dangerous the problem is by investigating the impact of global climate change on emergencies.

KEYWORDS: climate change, emergencies, global warming, ecosystems, humanity

Introduction

Since the middle of the last century, global climate change has caused large-scale impacts on the natural ecosystems that have formed on the planet for millions of years and on humanity, as well as the emergence of emergency events that have even occupied the world agenda. The main problem that needs to be brought to the reader s attention is the lack of human attention to the most critical problem of the planet and the low level of awareness of the responsibility of each individual in solving it.

This article aims to emphasize the creation of legal and practical strategies within the framework of mutual cooperation of states around the world for the prevention of increasing emergencies against the background of climate change, in particular, to reduce material and human losses.

The study of the impact of climate change on emergencies plays an important role in the correct formulation of strategies to combat this problem.

RESEARCH OBJECT AND MATERIALS

As a result of the analysis of a large number of statistical data compiled by the UN in 2020, the study found that the temperature level on a global scale increased by 1.2 C compared to the pre-industrial revolution. increased the likelihood of emergencies occurring and recurring by 30%. In addition, this negative development will lead to a deterioration of the natural ecological balance of our planet, a narrowing of the habitat and diversity of ora and fauna, a decrease in the world economy by 1.5 - 5% of GDP. By 2050 (economic crises will lead to the emergence of various emergencies: food security, disruption of people s normal life activities, energy security, etc.), to a decrease in the level of health of the population, to hundreds of problems in society, such as the problem of drinking and irrigation water, deterioration of social stability, etc.

RESULTS AND DISCUSSION

Global climate change is creating the conditions for the emergence of atmospheric emergencies. Tropical cyclones and massive hurricanes are examples of this group of emergencies, which are caused by an increase in the surface temperature of the water in the oceans, the formation of hot air masses caused by unnatural causes and the death of thousands of people. People living in continents such as Europe, America, Asia; it can be shown that the living conditions of millions of people have been greatly worsened by drought. This problem also causes severe res, oods and inundations. Analysis of the data shows that oods and inundations in South Asia alone have caused $67 billion in damage to the economy. In addition, according to statistics from the World Health Organization, the number of deaths from heatstroke and sunburn increased by 30 percent in major cities of the world, such as London, Berlin, Paris and Moscow in the periods covering 2015-2020. Global warming has led to large-scale wild res in the Americas, Asia, Australia and Russia, destroying millions of hectares of forests. Wild res cause serious damage to the environment and biodiversity and take years to recover. According to the US National Oceanic and Atmospheric Administration, wild res increased by 25% every 10 years from 2000 to 2020.

CONCLUSION

This study on the impact of climate change on emergencies reveals once again that all countries must act with common strategies to solve global problems. Because this is a common problem of our planet that does not recognize state borders. The analysis of the statistical data in the study shows that as humanity, we are on the brink of disaster and that we have to take urgent action for the future.

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REFERENCES

1. Sarah Dimick. (2024). “Unseasonable: Climate Change in Global Literatures”. English Northwestern University. Cambridge University Press.
2. S.George Philander. (2008). “Encyclopedia of Global Warming and Climate Change”. SAGE Publication Press
3. NASA space research center. https://science.nasa.gov
4. World Health Organization. https://www.who.int
5. Intergovernmental platform on climate change. https://www.ipcc.ch

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THE ROLE OF THE MINISTRY OF EMERGENCY SITUATIONS IN THE PROTECTION OF WATER RESOURCES

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ABSTRACT

Environmental protection and ef cient resource management are vital issues for every country, including the Republic of Azerbaijan. Like many nations, Azerbaijan faces increasing pressures on its natural resources due to rapid economic growth, environmental impacts from human activity, and the direct consequences of regional con icts. These pressures highlight the critical need for Azerbaijan to strengthen environmental safeguards and utilize natural resources in a way that ensures sustainable growth and long-term ecological balance.

Among these natural resources, water is the most essential one. Water resources have a fundamental role in maintaining public health, supporting economic and social development, and preserving ecosystems that are essential to life. They are necessary not only for drinking and sanitation but also for agriculture, industry, and other economic activities. Ensuring access to fresh water is key for Azerbaijan s economic stability and future development.

Keywords: Ministry of Emergency Situations, water reservoirs, protective measures, war

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INTRODUCTION

Azerbaijan faces speci c challenges when it comes to water resource management. Rising global temperatures, climate change impacts on water sources, and population growth put immense pressure on water supplies. In response, the country must prioritize the sustainable management of its water resources. Addressing water scarcity and meeting increasing demand for clean water require suf cient usage and protective measures to safeguard water resources from both natural and human-induced threats.
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POLICY INITIATIVES AND GOVERNMENT DIRECTIVES

Recognizing the importance of water resource management, the President of Azerbaijan issued Decree No. 394 in April 19, 2006. This directive focuses on protecting critical water reservoirs, ensuring regular monitoring of their technical condition, and enhancing the ef - ciency of water management systems within the country. The decree assigned the Ministry of Emergency Situations (MES) the responsibility for organizing and managing these water resources. The MES s role includes overseeing key reservoirs such as Mingachevir, Shamkir, Yenikend, Varvara, and Jeyranbatan, which are crucial for Azerbaijan s water supply and infrastructure.
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4,5,6].

RESEARCH OBJECT AND MATERIALS

Importance of Security in Water Resource Management

Given Azerbaijan s geopolitical situation, ensuring the safety of water resources is a priority. The country s water infrastructure faces potential threats, especially in areas close to con ict zones. Reports of contaminated water owing from border areas underscore the risks to public health and environmental security. Polluted water sources can lead to widespread health issues, including skin diseases, cancer, and gastrointestinal infections. These issues not only threaten the health of Azerbaijani citizens but also pose risks to national security. Safeguarding the country s water resources is therefore essential.
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2,7,8].

THE ROLE OF THE SPECIAL RISKY RESCUE SERVICE (SRRS) OF THE MINISTRY OF EMERGENCY SITUATIONS

To address these security concerns, the Ministry s Special Risky Rescue Service (SRRS) is tasked with maintaining the physical security of reservoirs and safeguarding engineering systems at these facilities. One example of these efforts can be seen at the Jeyranbatan reservoir, where comprehensive security measures are in place to ensure uninterrupted operation. These measures include monitoring unauthorized access, controlling entry and exit points, and detecting any external sabotage-related activities.

Results and Dicussions

Components of The Security and Engineering Systems

The physical security and engineering systems employed by the MES for water resource protection include a range of advanced technologies designed to prevent unauthorized access and detect potential threats. These components include:

1. Biometric Face Recognition This system ensures secure identi cation of individuals entering the protected areas.

2. Engineering Structures for Physical Security Physical barriers and reinforced structures help secure critical access points.

3. Perimeter Protection Television System (PTS) Surveillance cameras monitor and record activity around the reservoir perimeters.

4. Fire Safety Systems Fire ghting equipment and alarms are installed to respond to re hazards.

5. Reliable Communication Systems High-quality and exible communication channels enable rapid response and coordination.

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6. Vehicle License Plate Recognition Monitors vehicles entering and exiting the premises.

7. Perimeter Security Signaling System (PSS) Detects movement around the reservoir boundaries.

8. Main and Backup Power Systems Ensures power availability in emergencies.

9. Access Control and Management System (ACMS) Controls and monitors access to restricted areas.

10. Duty and Security Lighting Provides illumination for security personnel and cameras.

11. Radar Systems Detects and tracks movements within the monitored area.

These security systems represent a coordinated effort to protect Azerbaijan s critical water resources from threats, both natural and arti- cial.

Implementation of Access Control and Management System (ACMS)

On April 4, 2016, the Cabinet of Ministers of Azerbaijan approved Decision No. 143, establishing construction norms for physical security and engineering systems in protected facilities. Following this decision, the ACMS was implemented at reservoirs managed by the MES. The ACMS plays a signi cant role in security management, controlling entry to sensitive areas and tracking personnel movements within these zones.

I Purpose of the Access Control and Management System (ACMS)

Facilities must be equipped with an Access Control and Management System (ACMS) designed for the following purposes:

Restricting the access of employees and visitors to buildings, rooms, and special zones protected by the ACMS;

Tracking the entry and exit times of each employee;

Obtaining information about the opening of internal rooms (when and by whom);

Providing information about unauthorized access attempts to facilities equipped with the ACMS.

II Software for ACMS

The software for ACMS ensures the execution of the following tasks:

Organizing a database for all employees (card number, surname, and rst name of the authorized employee, entry and exit times);

Programming control panels and reading the data stored on them;

Providing information about speci c incidents (reports);

Allowing the system operator to open and close any door equipped with ACMS from the workstation.

Television Surveillance System

The television surveillance system is designed to provide visual information in the security service room about the condition of protected zones, rooms, the perimeter, and the area of the facility. The scope of use and the tasks performed by television surveillance systems are extensive.

Components of Television Surveillance Systems

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- Television cameras;

- Monitors;

- Equipment for image processing;

- Equipment for storing video data;

- Power supply sources;

-Cables used for networking can simultaneously handle data transmission and power delivery.

Among all existing technical security tools, only television cameras can visually display what is happening at the protected facility.

Key Tasks Solved by Television Cameras

- General surveillance;

- Detecting people, vehicles, animals, objects, etc., within the surveillance area of the security cameras;

- Matching detected objects with control objects.

Types of Cameras Installed at the Reservoir

Three types of cameras are installed at the reservoir:

1. Stationary;

2. Rotating;

3. Thermal.

Stationary cameras: Installed on 5-meter poles, these cameras monitor fences and detect intruders within a 50-meter range.

Rotating and thermal cameras: Installed on 7-meter poles, these cameras cover an 800-meter range and are positioned at central locations. [9]

Water Quality Monitoring and Treatment

In addition to security management, water quality is continuously monitored to ensure the safety and health of Azerbaijani citizens. The Azersu OJSC Jeyranbatan Ultra- ltration Water Treatment Plants Complex is responsible for testing and maintaining water quality in the Jeyranbatan reservoir. The facility s central laboratory uses state-of-the-art equipment from internationally recognized suppliers to conduct accurate analyses of drinking and wastewater. This equipment enables the lab to measure physical, chemical, and bacteriological indicators, ensuring that the water meets high standards.

The Jeyranbatan treatment complex has a capacity of 6.6 cubic meters per second, or 570,000 cubic meters per day, making it an essential resource for providing clean, safe drinking water to residents of Baku and the Absheron Peninsula. Through ef cient water treatment and careful monitoring, the facility helps maintain a stable supply of high-quality drinking water for Azerbaijan s urban areas. 10].

Conclusion

Azerbaijan s commitment to sustainable water resource management re ects its dedication to environmental protection and public health. Through security enhancements, advanced monitoring systems, and ongoing policy initiatives, the country is working to safeguard its valuable water resources against both environmental and human threats. This coordinated approach is critical to ensuring the availability of clean water, supporting socio-economic development, and protecting the health and well-being of the Azerbaijani population.

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REFERENCE

1. F.Ə.İmanov, A.B.Ələkbərov “Azərbaycan su ehtiyyatlarının müasir dəyişmələri və inteqrasiyalı idarə edilməsi”. Bakı-2017

2. N.S.Əhmədov, R.S.Səfərov “Kütləvi Qırğın Silahlarından müdafiə vasitələri və üsulları”. Dərs vəsaiti. Bakı. BAHDM-nin nəşriyyatı., 1999.- 216 səh., şəkilli.

3.https://e-qanun.az/framework/45487

4.https://e-qanun.az/framework/3483

5.https://fhn.gov.az/storage/pages/51623/1706114086.pdf

6.https://fhn.gov.az/uploads/legislation/aze/cabinet/109_21.08.03.doc

7.https://azvision.az/news/240312/news.html

8.https://azertag.az/xeber/ermenistan_terefinden_hava_ve_suyun_chirklendirilmesi_neticesinde_milyonlarla_insanin_heyati_ve_etraf_muhit_tehlukeded-ir-2698297

9.https://e-qanun.az/framework/32648

10. https://azersu.az/az/static/7/link/18

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THE IMPACT OF CLIMATE AND ENVIRONMENTAL CONDITIONS ON THE FORMATION OF SOIL COVER STRUCTURES IN THE GOBUSTAN

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Abstract

Gobustan is located in the southeastern foothills of the Greater Caucasus, in the eastern part of the Republic of Azerbaijan. According to modern physical-geographical zoning, Gobustan is a distinct physical-geographical area. The length of Gobustan from east to west is 80 km, and from north to south, it is 100 km. The Gobustan region lies to the east of Shamakhi, 101 km from Baku. It borders the Mishovdag ridge and the Pirsagat River to the south and west, respectively.

Keywords: Gobustan, structure of soil cover, soils, climate, environment

Introduction

One of the ve physical-geographical regions of Azerbaijan is the Greater Caucasus region, which rises above sea level to a height of 4,466 meters. The Gobustan-Absheron area belongs to the Greater Caucasus region. This area includes the Absheron Peninsula, foothills, and narrow coastal plains of the southeastern slope of the Greater Caucasus, as well as the entire Gobustan region and the arid-denudational foothills of the Sumgaitchay River basin and its tributaries. To the south, the area borders the Shirvan Plain.

The absolute heights in this area range from 28 to 800 1000 meters and above. The maximum width is 80 km from north to south, with a length exceeding 120 km. One of the signi cant features of the geological structure of this region is the widespread occurrence of mud volcanism. Azerbaijan ranks rst in the world in the number of active mud volcanoes.

Object and Research Methodology

The geological structure, lithology, composition of soil-forming rocks, climate, hydrology, and intermountain plains play signi cant roles in shaping the relief of Gobustan. Gobustan features valleys, ravines, and cliffs. Winds, precipitation, and mud volcanoes signi cantly in uence the relief forms. Geologically, Gobustan is rich in oil and gas, with mud volcanoes being natural indicators. Jayirli, Shorsulu, Kolany, and other mud volcanoes are located in the region.

The climate is predominantly arid, hot, and dry. Vegetation is characterised by semi-desert, ephemeral plants adapted to arid climates, with dry-steppe, semi-desert, and desert vegetation types. Typical dry-steppe vegetation includes wormwood-ephemeral formations. Xerophytic plants are widespread. Drought-resistant shrubs such as pomegranate, wormwood, g, blackberry, rosehip, and raisins are adapted to grow on rocky terrains.

Groundwater is observed only in the eastern plain. Due to the rise of the Caspian Sea and the in uence of oil wastewaters, groundwater levels have risen to a depth of 0.5 1.5 m from the soil surface.

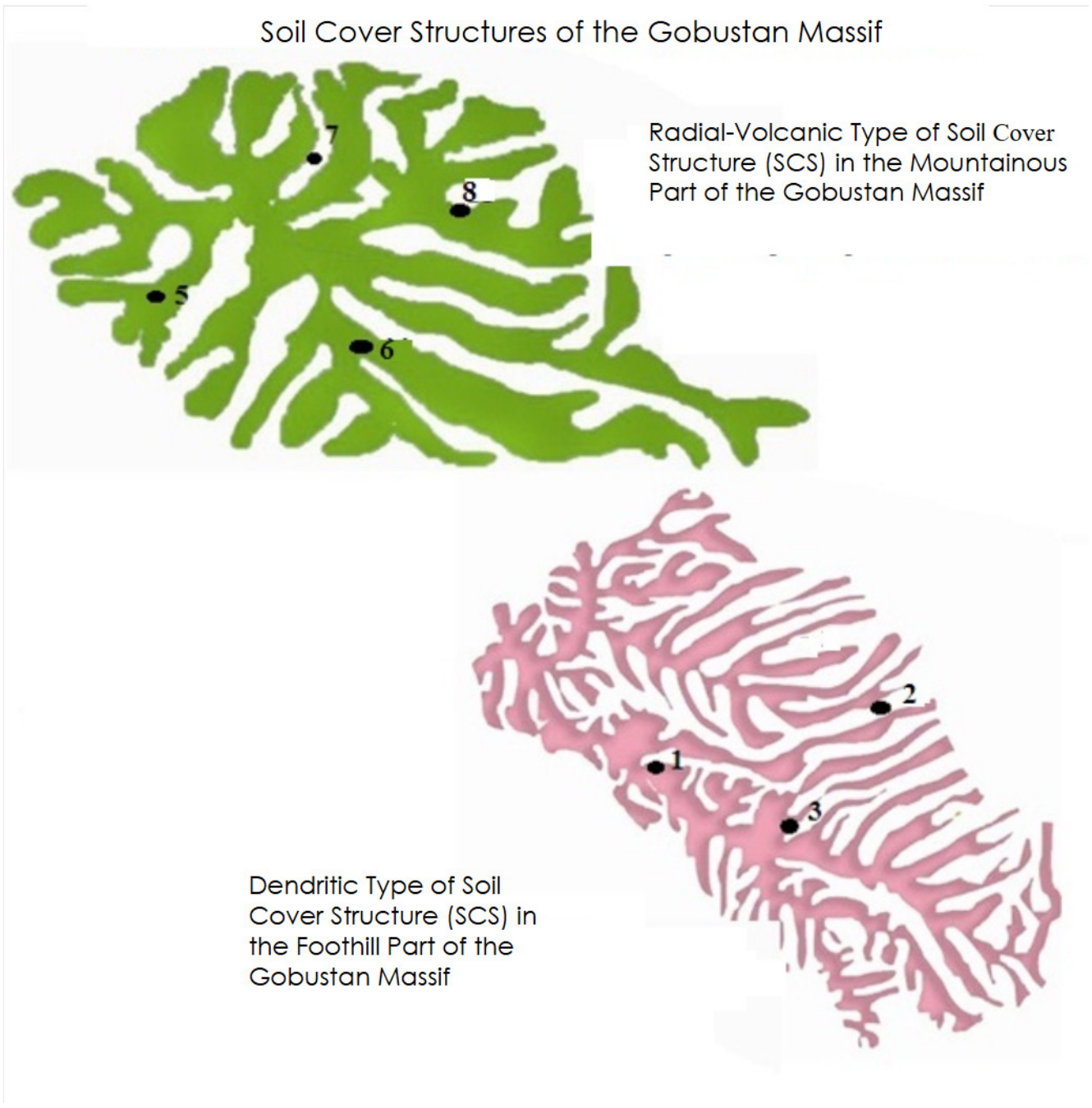
The soil cover in Gobustan is diverse, with saline grey-brown soils in the eastern parts and variations of grey-brown soils in the northwest.

Field and laboratory studies were conducted. Samples of grey-brown and mountain grey-brown soils were taken from the northwestern shaded exposure and the southeastern sunny exposure.

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The Impact of Climate and Environmental Conditions on the Formation of Soil Cover Structures in the Gobustan Massif

Genetic Horizons, cm	Humus Content, %	Nitrogen, %	$CaCO_3$ %	pH of Aqueous Suspension	Particle Size Distribution, %	Total Absorbed Bases, mmol-equiv	
						<0,001 mm	<0,01 mm
Northwest (Shaded) Exposure							
AYv 0-20	2,10	0,113	8,5	8,3	25,7	31,28	61,36
A/Bs-sc 20-36	1,36	0,093	9,4	8,5	23,8	39,48	68,52
Bs-sc 36-72	0,98	t.olm	12,4	8,6	26,5	40,08	72,80
B/Cs-sc 72-98	0,47	---	10,6	8,7	19,8	36,52	74,68
Cs 98-125	0,33	---	6,7	8,6	18,2	31,44	85,04
Southeast (Sunny) Exposure							
AYs 0-15	1,24	0,109	10,8	8,5	22,4	20,80	47,66
A/Ss-sc 15-32	0,92	0,098	13,5	8,7	21,7	19,96	49,72
Ss-sc 32-56	0,56	t.olm	16,7	8,7	15,6	22,68	63,94
Cs 56-90	0,47	---	9,8	8,5	14,7	23,58	66,12
Micro-Depressions in the Relief							
AYs 0-25	1,36	0,114	13,5	8,6	26,8	38,20	67,74
A/s-sc 25-44	1,04	0,103	15,2	8,7	24,5	33,92	69,68
Bs-sc 44-85	0,86	0,061	18,0	8,8	22,6	38,72	80,34
B/Cs-sc 85-124	0,68	t.olm	13,7	8,7	20,4	39,44	81,68
Cs 124-160	0,54	---	11,0	8,5	20,7	34,12	72,14



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It was found that the formation of soil cover structures and soil properties is in uenced by the northwestern shaded and southeastern sunny parts of slope exposures. Based on laboratory studies, it was determined that the soils of the sunny southeastern exposure, compared to the shaded northwestern exposure, have undergone changes for the worse. Diagnostic indicators of mountain grey-brown and grey-brown soils in the sunny southeastern exposure, compared to soils in the shaded northwestern exposure, showed the following changes: a decrease in the accumulative-humus horizon (AY = 15 20 cm), humus content (1.0 1.5%), absorbed bases (15 18 mmol-eq); an increase in salinity (1.35 2.67%) and pH (8.5 9.0); a weakening of the granulometric composition (<0.01 mm = 38 45%; <0.001 mm = 35 41%); and accelerated erosion processes. In microdepressions, the humus content in the upper horizon increases to 1.8%, the absorbed bases rise to 24 27 mmol-eq, and the physical clay content increases to 67 70%.

Figure 1. View of Soil Cover Structures in Gobustan Massif

Conclusion

Based on the plastic relief method, the soil cover structures of the Gobustan massif were determined and mapped (scale 1:100,000). The method visually represents an organized, genetically grounded system of Earth s surface and real soil cover structure, including geochemical ows, their formation, transit areas, and soluble component accumulation zones.

Acknowledgment

The paper was written on the base of fundamental soil study realized for many years.

References

1. Manafova F.A., Aslanova G.G. Study of Soil Cover Structure in the Southwestern Absheron Region, Science and Practice Bulletin, 2020, No. 6, Vol. 7, Russia, pp. 102 116.
2. Salaev M.M., Aliyeva R.A., Jafarova Ch.M. Explanatory Note on the Soil Map of Absheron, Baku, 1983, pp. 3 10.
3. Stepanov I.N. Space and Time in Soil Science, Moscow: Nauka, 2003, 176 p.
4. Engineering-Geological Map of Azerbaijan (scale 1:50,000), Institute of Cartography and Geodesy, 2004.
5. Shirinov N.Sh. Structural-Geomorphological Map of Absheron Peninsula (scale 1:100,000), 1959.
6. Manafova F.A., Aslanova G.G., Gurbanzade Sh.T. Ecological Studies of Gobustan Soil Cover Structures; ICEFSSS 2023, Baku, Azerbaijan, p. 436.

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RESTORATION OF DEGRADED IRRIGATED SOILS OF THE KURA-ARAKS ZONE

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Abstract

The purpose of the work is restoration the fertility of degraded Vermic Irragric Gleyic Calcisols (Calcic, Endosalic, Clayic/Loamic, Fluvic) (in WRB-2014) soils of the Kura-Araks lowland of Azerbaijan by applying the biopro le-genetic method. The following tasks were set in the research:

-to study the effect of long-term sowing of rye + vetch + rape [at the level of organic (19-22 t/ha) and mineral (N85P110K55 kg/ha active substance)] fertilizers on the physicochemical and biochemical properties of Vermic Irragric Gleyic Calcisols (Calcic, Endosalic, Clayic/ Loamic, Fluvic);

- to establish the in uence of the yield of green mass of rye + vetch + rapeseed on the biological properties and chemical composition of Vermic Irragric Gleyic Calcisols (Calcic, Endosalic, Clayic/Loamic, Fluvic);

- to determine the qualitative composition of the green mass and stubble root residuals of fodder crops and to estimate the biological state of all the genetic pro le of degraded Vermic Irragric Gleyic Calcisols (Calcic, Endosalic, Clayic/Loamic, Fluvic).

Research has shown that this method has allowed the accumulation of the following in Vermic Irragric Gleyic Calcisols (Calcic, Endosalic, Clayic/Loamic, Fluvic) under a grass mixture: carbon - 4013 in kg/ha, nitrogen 199 in kg/ha, phosphorus -99 in kg/ha, potassium -200 in kg/ ha, to increase the humus content in the 0-25 cm layer and 25-55 cm by 0.59-0.19%, reduce the C:N ratio to 6.9, restore the fertility of degraded soils by 69-75% in the 10-12 years, regulate the biological activity and fertility of Vermic Irragric Gleyic Calcisols (Calcic, Endosalic, Clayic/Loamic, Fluvic) in the future.

Keywords: soils, degraded, fertility, biological properties, humus

Introduction

Contextual information: Degradation of soils sometimes it is called the slow death of the planet [2, 9]. Many world regions have faced this process. Azerbaijan territories of dry subtropical climate deeply involved in agricultural industry - Absheron peninsula, Kura-Araksin lowland (Ganja-Kazakh and Shirvan zones) - are especially exposed to degradation [9, 12].

Statement of the problem: In connection with their cultivation and unsystematic use, the biological activity and fertility of these soils decreased by 30-40%. Therefore, under the existing system of agriculture, the soil will lose its fertility in 150-200 years. The protection of the soil as a whole by nature, in accordance with global human activities, should be considered in a good - bio-geo-cenological, i.e. ecosystem, aspect. Nowadays one of the most perspective ways to reproduce, increase, and maintain the biological activity and fertility of soils in Kura-Araksin lowland is fodder grass cultivation with a different root system. All plants have the same main organic compounds bu

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they differ in the ratio of lipids, proteins, and cellulose, the content of which depends on plant species and their nutritive conditions [1, 6, 8, 10,11].
Research Objectives: Restoration of fertility of irrigated degraded Vermic Irragric Gleyic Calcisols (Calcic, Endosalic, Clayic/Loamic, Fluvic) in the dry subtropics of Azerbaijan using the biological-pro le-genetic method.
Signi cance: These crops in irrigated agriculture in this zone are real factors in obtaining stable yields of green mass from 1 ha per year. This contributed to the increase in humus and biological activity of Vermic Irragric Gleyic Calcisols (Calcic, Endosalic, Clayic/Loamic, Fluvic) in relation to its original content. This is the scienti c interest and relevance of these studies.

Research Object and Materials

Research Objectives: The studies were conducted on degraded Vermic Irragric Gleyic Calcisols (Calcic, Endosalic, Clayic/Loamic, Fluvic) in the territory of Kurdamir in Azerbaijan Kura-Araksin lowland. The following forage crops were used for the studies: wild vegetation, lucerne, sainfoin, barley, rye + vetch + rape, autumn rye sowing + summer rape sowing.
The tasks of the research: The following tasks were set in the research:
-to study the effect of long-term sowing of rye + vetch + rape [at the level of organic (19-22 t/ha) and mineral (N85P110K55 kg/ha active substance)] fertilizers on the physicochemical and biochemical properties of Vermic Irragric Gleyic Calcisols (Calcic, Endosalic, Clayic/Loamic, Fluvic);to establish the in uence of the yield of green mass of rye + vetch + rapeseed on the biological properties and chemical composition of Vermic Irragric Gleyic Calcisols (Calcic, Endosalic, Clayic/Loamic, Fluvic);- to determine the qualitative composition of the green mass and stubble root residuals of fodder crops and to estimate the biological state of all the genetic pro le of degraded Vermic Irragric Gleyic Calcisols (Calcic, Endosalic, Clayic/Loamic, Fluvic).

Materials used: During the study period (12 years), the physicochemical data of degraded Vermic Irragric Gleyic Calcisols (Calcic, Endosalic, Clayic/Loamic, Fluvic) of the institute s background material were used for comparison. Meteorological data of the Kura-Araks lowland were also used. The soil and climatic conditions of the Kura-Araks lowland will allow the use of irrigated soils for intermediate crops and the restoration of the fertility of these soils. The establishment of eld experiments, eld and laboratory-analytical studies of soil and plant samples, statistical data processing were carried out using generally accepted methods [12-14].

Study Area: The research were conducted in 2011-2023 on on degraded Vermic Irragric Gleyic Calcisols (Calcic, Endosalic, Clayic/Loamic, Fluvic) in the territory of Kurdamir in Azerbaijan Kura-Araksin lowland. According to the data obtained from climatologists, agroecologists, physico-geographists, the climate in Kura-Araksin lowland has some features of the mediterranean one. The climate is warm; the average temperature in January is 0.2-2.2 C, in July is 27.7-28.9 C; the accumulated temperatures make >10 C 4349-4472 C; the annual precipitation is 263-300 mm.The Vermic Irragric Gleyic Calcisols (Calcic, Endosalic, Clayic/Loamic, Fluvic) (in WRB-2014) (meadow-sierozem, irrigated, carbonate, clayey, clayed loam) develops in the condition of the irrigation schedule of moistening. The ratio of C:N with regard to virgin lands is larger 8-10; total absorbed bases 26.7-28.0 mg/g of soil; water pH 8.0-8.2. According to generally accepted agricultural methods, the experiments were conducted four times on the plot of 72m2. Observable crops: wild vegetation, lucerne, sainfoin, barley, rye + vetch + rape, autumn rye sowing + summer rape sowing. Soil samples for the determination of physicochemical indices were selected in soil horizons before sowing and after harvesting crops for biochemical analysis from each variant inspring, summer, autumn, winter; vegetative samples - before harvesting. The setting up of eld experiments, eld and laboratory-analytical studies of soil and plant samples, statistical processing of data were carried out using generally accepted methods [1, 3, 14]

Results and Discussion

Field observations and laboratory soil analyses have established the optimal option for intermediate sowing of forage crops (2nd option), which ensures an annual supply of 124 c/ha, c/ha of dry mass of plant residues into the 0-50 cm soil layer. This sowing method allowed to accumulate in Vermic Irragric Gleyic Calcisols (Calcic, Endosalic, Clayic/Loamic, Fluvic) under the grass mixture (rye + vetch + rape): carbon - 4013 kg/ha, nitrogen - 199 kg/ha, phosphorus - 99 kg/ha, potassium -200 kg/ha, increase the humus content in the 0-25 cm and 25-55 cm layers by 0.59-0.19%, reduce the C:N ratio to 6.9, restore soil fertility by 69-75% in 10-12 years, and further regulate the biological activity and fertility of Vermic Irragric Gleyic Calcisols (Calcic, Endosalic, Clayic/Loamic, Fluvic).

It was established that after four-hay harvests of lucerne and sainfoin per annum, soil becomes enriched with 121-136 centner/ha of crop and root residues, after the mixed grass crop (rye + vetch + rape) harvesting 124 centner/ha, rye + summer rape sowing in sum 119 centner/ha. For all this, lucerne raised humus content by 0.56 and 0.30% in the layer of 0-25cm and 25-55cm, sainfoin- by 0.55-0.25%, rye + vetch + rape by 0.59-0.19%, reduce the C:N ratio to 6.9, restore the fertility of degraded soils by 69-75% in the 10-12 years, rye+ summer rape - by 0.44-0.14%. The results of the analyses on the content of carbon, nitrogen, phosphorus, potassium in crop and root residues showed that the soil becomes enriched with vegetative residuals containing nitrogen -1.0-2.16%, P2O5- 0.20-0.69%, K2O- 0.56-2.62%.

While cultivating autumn (rye) and summer (rape) sowings in the same eld, together with stubble and root residues soil becomes richer in C by 2813.5, N-by 109.5, P2O5- by 76.05, K2O by 197.38 kg/ha than after barley. However, after lucerne, sainfoin, and mixed grass crop harvesting, together with vegetative residuals soil is rich in food elements (N, P2O5, K2O) compared to the abovementioned variants (Table).

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RESTORATION OF DEGRADED IRRIGATED SOILS OF THE KURA-ARAKS ZONE

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Abstract
The purpose of the work is restoration the fertility of degraded Vermic Irragric Gleyic Calcisols (Calcic, Endosalic, Clayic/Loamic, Fluvic) (in WRB-2014) soils of the Kura-Araks lowland of Azerbaijan by applying the biopro le-genetic method. The following tasks were set in the research:
-to study the effect of long-term sowing of rye + vetch + rape [at the level of organic (19-22 t/ha) and mineral ($N_{85}P_{110}K_{55}$ kg/ha active substance)] fertilizers on the physicochemical and biochemical properties of Vermic Irragric Gleyic Calcisols (Calcic, Endosalic, Clayic/Loamic, Fluvic);
- to establish the in uence of the yield of green mass of rye + vetch + rapeseed on the biological properties and chemical composition of Vermic Irragric Gleyic Calcisols (Calcic, Endosalic, Clayic/Loamic, Fluvic);
- to determine the qualitative composition of the green mass and stubble root residuals of fodder crops and to estimate the biological state of all the genetic pro le of degraded Vermic Irragric Gleyic Calcisols (Calcic, Endosalic, Clayic/Loamic, Fluvic).
Research has shown that this method has allowed the accumulation of the following in Vermic Irragric Gleyic Calcisols (Calcic, Endosalic, Clayic/Loamic, Fluvic) under a grass mixture: carbon - 4013 in kg/ha, nitrogen 199 in kg/ha, phosphorus -99 in kg/ha, potassium -200 in kg/ha, to increase the humus content in the 0-25 cm layer and 25-55 cm by 0.59-0.19%, reduce the C:N ratio to 6.9, restore the fertility of degraded soils by 69-75% in the 10-12 years, regulate the biological activity and fertility of Vermic Irragric Gleyic Calcisols (Calcic, Endosalic, Clayic/Loamic, Fluvic) in the future.

Keywords: soils, degraded, fertility, biological properties, humus

Introduction
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Table 1. The in ow of carbon and nutrients together with vegetative residuals into soil (2011-2023, kg/ha)

Culture	C	N	P_2O_5	K_2O
1.Wild Vegetation	4503	115.29	30.05	96.77
2.Autumn Rye Sowing→	2457	71.30	18.38	69.93
Summer Sowing Rape	2197	86.25	68.87	155.12
3. Barley	1841	48.04	11.02	27.67
4.Sainfoin	4003	239.09	81.78	121.59
5.Lucerne	4070	252.46	97.78	121.75
6.Rye +Vetch + Rape	4083	269	99.00	224.00

Among the indicators re ecting soil biological activity, many scientists mark out micro ora, enzymatic activity, intensity of CO_2 producing.While researching it was learnt that the maximum of microorganisms is observed under lucerne and sainfoin in spring (4820; 4694 ths/g in absolutely dry soil), and the minimum - in winter (2121 and 2071 ths/g in absolutely dry soil), but in summer and autumn their quantity is intermediate. The number of fungi in the soil under all fodder crops differs subject to the seasons. Their quantity uctuates from 4.71; 4.65; 3.8 (in spring) 2.8; 1.90; 2.10 (in winter) under lucerne, sainfoin and rye + vetch + rape to 2.80 (in spring) 2.10 (in winter) ths/g in absolutely dry soil, under autumn rye sowing + summer rape sowing and barley. In soil under the mixed grass crop (rye + vetch + rape) and autumn rye sowing + summer rape sowing the total quantity of microorganisms is lower (4295 and 3494 ths/g in spring; 1670 and 1280 ths/g in winter) than in soil under lucerne and sainfoin, but the number of nonspore-forming bacteria and actinomycetes is higher. But under barley and wild vegetation their number is even lower. In summer, the number of bacteria and fungi in virgin soil under wild vegetation decreases, whereas that of actinomycetes increases. Enzymatic activity characterizes intensity and directivity of soil biochemical processes [2, 4-5, 7].

In spring the highest invertase activity is observed in the soil under lucerne- 18.40, then under sainfoin -15.80, mixed grass crop-13.60 mg of glucose in 1gm of the soil for 24 hours, urease 4.800-3.60 3.25 mg of NH_3 in 1gm of the soil for 24 h, phosphotase 1.26-2.03- 2.16 mg of P_2O_5 in 10 gm of the soil for 1h, catalase 18.90-16.90-15.98 cm^3 of O_2 in 1 gm of the soil, dehydrogenase 7.14-7.00-6.70 mg in 10 gm of the soil for 24h. Under barley and rye these indices are almost invariable, but under wild vegetation they are 2-2.5 times as less.

High phosphotase activity under the mixed grass crop (2.15mg of P_2O_5 in 10gm of the soil for 1h) owes to rape (in spring, rape roots going 1.3-1.5 m deep in soil raise nutrient substances to the upper soil layer and they are also able to secrete mustard-oils rich in sulfur decomposing dif cult for vegetation ferments). In summer, such variants as rye sowing+ summer rape sowing, then lucerne and sainfoin were notable for the intensity of invertase, urease, phosphotase, catalase, dehydrogenase. Like in spring, these indices were low under barley and wild vegetation. In autumn, fermentative activity in all variants decreases by 17-38%. Only under autumn rye sowing + summer rape sowing, the autumn index of invertase is higher than in summer by 1.49 mg of glucose. In winter, enzymatic activity decreases. The high activity of soil ferments under lucerne, sainfoin, and mixed grass crops can be explained by the presence of stubble and root residuals containing exposed nitrogen and phosphorus in soil that stimulate the intensity of microbiological processes the main source of soil enzymes. It also enriches the physicochemical properties of soils in Shirvan zone.

Results and Discussions

The initial content of water stable aggregates (1-0.25mm) in the degraded soils was 0.71-1.29%. While researching it was determined that lucerne, sainfoin, rye+vetch+rape increased their content 2-2.5 times as much. The fraction content (0.05-0.005mm) decreased, but that of clay fraction and physical clay increased.

The integral index of ecological and biological state of soils which can allow estimating the complex of biological indices, potential and actual biological activity of soil reveals that in the soil under barley compared to the soil under lucerne, sainfoin, mixed grass crop it is 21%, 15%, 7% low, but compared to the soil under wild vegetation it s 15% high.

Comparison with Previous Research: In contrast to similar studies conducted in the Ganja-Kazakh massif on Irragri Light Kastanozems soils, in the Kura-Araks lowland on Vermic Irragric Gleyic Calcisols (Calcic, Endosalic, Clayic/Loamic, Fluvic) soils, the yield of green mass of the grass mixture was 35 centners lower. This study showed that the soil type had the greatest impact on the yield. This suggests that both temperature and irrigation, as well as soil type, are dominant factors in the formation of green mass yield.

Implications: The obtained results indicate the need to use grass mixtures and soil and climatic conditions of the dry subtropical zone against the degradation of irrigated soils.

Conclusion

Summarize Key Findings: Research has shown that grass mixtures, temperature, soil type and irrigation are the main factors in uencing soil

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fertility.

Objectives: The obtained research results con rm that compliance with agricultural practices and the correct selection of forage crops make it possible to restore the fertility of irrigated soils and strengthen the forage base of the Kura-Araks Lowland.

Practical Implications: For farmers in dry subtropical zones, we recommend carrying out intermediate sowing of grass mixtures on degraded irrigated soils in order to restore soil fertility and strengthen the forage base for livestock.

Future Research: In the future, we will conduct morphological and diagnostic studies on other types of irrigated degraded soils of the Kura-Araks lowland.

Closing Statement: Grass mixtures of forage crops with different root systems and nutrients (N, P2O5, K2O) contribute to the entry of 4083 kg/ha of carbon and nutrients (N-269 kg/ha; P2O5-99.00 kg/ha; K2O-224.00 kg/ha) into the soil with crop and root residues annually, which leads to the restoration of the fertility of degraded irrigated soils.

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References

1.Aliyev, S.A. (1978) Ecology and energetics of biochemical processes of transformation of organic matter of soils. Baku Elm Press.

2.Khaziev F., Kh. (1990). Soil enzymic activity. Moscow Science Press.

3.Salayev M.E., Babayev M.P., Jafarova Ch., Hasanov V. (2004). Morphogenetic pro les of Azerbaijan soil. Baku Elm Press.

4. Besser, H., & Mokadem, N., & Redhouania, B. et al.(2017). GIS-based evaluation of groundwater quality and estimation of soil salinization and land degradation risks in an arid Mediterranean site (SW Tunisia). *Arab J Geosci*, 10, 350-370.

5. Gresta J., Olszowskij. (1999). The effect of fertilization on the biological activity of the soil of former open casts. *Ecol. Pol. J.* I-2 (22), 87-92.

6. Valkov V.F., Kazeev K.SH., Kolesnikov S.I. (1999): The methodology of the research of soil biological activity by the North Caucasus example. *The scienti c idea of the Caucasus*, 1, 32-37.

7. Rondon M.R., Goodman R.M., Handelsman J., (1999). The Earth s bounty: assessing and accessing soil microbial diversity. *Trend Biotechol. J.* , I(17), 403-409.

8. Agayev, U.B. (1975). The in uence of cultivation on morphological, physico-mechanical, and chemical properties of light-chestnut soils in Kirovbad massif/area. *Report. Conference on cultivation and recultivation of soils of Transcaucasia*, (p.46).

9. Babayev M.P., Ramazanova F.M. (2004): The soil protective role of fodder crops in the irrigated soils of Azerbaijan s dry subtropics. *Report. Forum Let s preserve the planet Earth* , (p.317).

10. Mirzezade, R.I, & Hasanova, T.A.(2023). Modern methods for application of soil standards on the basis of museum monoliths. *1st International Conference on innovative studies of contemporary sciences, April 1-3, Paris Press.,* (pp.316-320).

11. Orlov D. (1976): Possibility to employ some biochemical indices for soil diagnosis and indication. *Problems and methods of biological diagnosis of soils*, (pp. 4-15).

12. Ramazanova, F.M. (2009). The use of biodiversity for rehabilitation of the degraded soils in Azerbaijan s dry subtropics. *HSMBMP AASA Workshop on Environment and Resources* , (pp.96-101).

13. Ramazanova, F.M. (2023). Diagnostics of irrigated soils of the dry subtropical zone of Azerbaijan. *International Conference Scienti c research of the SCO countries: synergy and integration,* 3, (pp.161-165).

14. Ramazanova, F.M. (2023). Diagnostics of irrigated soils of the dry subtropical zone of Azerbaijan. *International Conference Scienti c research of the SCO countries: synergy and integration,* 3, (pp.161-165).

15. Shit, P.K. et al. (2020). Springer Nature Switzerland AG 2020. *Gully Erosion Studies from India and Surrounding Regions, Advances in Science, Technology & Innovation, https://doi.org/10.1007/978-3-030-23243-6_16.*

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EFFECTIVENESS OF ORGANIC AND MINERAL FERTILIZERS UNDER ONION PLANT IN SH RVAN GRAY-MEADOW SOIL CONDITIONS

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Abstract

With the purpose of studying the effectiveness of organic and mineral fertilizers under vegetable plants (onions) in the gray-grass soil conditions of Shirvan, an experiment was carried out with onion plants in the Ujar Dayag district. The eld experiment was set in 5 variants and 3 repetitions. In the experiment, ammonium salt, simple superphosphate, potassium sulfate, semi-rotted manure, biohumus and Shirvan compost were used as organic fertilizers. All organic fertilizers, 60% of mineral fertilizing phosphorus, 50% of potassium under the plow; 40% of nitrogen, 20% of phosphorus, 40% of potassium during planting; and the remaining amount of mineral fertilizer was given under the plant as feeding. Biohumus used in the experiment was provided by Absheron Bio-Technology LLC. The biohumus used during the experiment contains 55% moisture and 30% organic matter; humus-9.0%; total nitrogen-3.2%; phosphorus-2.6%; potassium is 2.0%. The chemical composition of Shirvan compost is 28% organic matter; 1.3% -nitrogen; 0.82%-phosphorus; Contains 1.2% potassium. Applying organic and mineral fertilizers under the onion plant has a positive effect on the dynamics of changing nutrients in the soil and the plant. During the use of organic and mineral fertilizers under the onion plant, the development of the onion plant improved, its quality indicators changed positively, and its productivity increased. Compared to other options, the option with 5 tons of biohumus per hectare had a relatively good result.

Keywords: Onion, fertilizer, organic, biohumus

Introduction:

Applying fertilizers to the soil is one of the important conditions for obtaining high and quality crops from agricultural plants. It is known that 40-50% of plant productivity is obtained due to fertilizers. Therefore, it is very important to use different fertilizers correctly and on different scienti c bases in agriculture (Simakin, 1983). The role of organic fertilizers in raising soil fertility is very large. Organic fertilizers are rich in all nutrients necessary for plant nutrition. In addition to improving the hydro-physical and agrochemical properties of the soil, it also enriches it with microorganisms and accelerates the entry of mineralized nutrients into the plant (Zamanov, 2004). In recent years, for this purpose, it is very important to apply new organic fertilizers prepared by the bioconversion method from local organic waste. For this purpose, research is being conducted in the conditions of the gray-grass soils of the Shirvan zone. The soils of the Shirvan zone vary in mechanical composition from light clay to heavy clay. Therefore, these lands are poor in terms of vegetation. Due to the cold winter and hot summer, plant remains that have perished are quickly mineralized as a result of long-lasting hot climate conditions. For this reason, the amount of humus in that area decreases (Isayeva, Rustamova, 2007). Therefore, it is an important condition to apply the necessary amount of organic fertilizer under the agricultural crops in the lands of the Shirvan Plain. Otherwise, fertility decreases

Research Object and Materials

In order to study the ef ciency of organic fertilizers made from local waste and also mineral fertilizers under the onion plant, an experiment was carried out on the gray-grass soil of Dayag station located in Ujar district of the Institute of Soil Science and Agrochemistry of ETN.

Onion belongs to the onion genus of the lily family. Up to 400 species are known. 4 species have been identi ed in Azerbaijan. Onions are more common and this species is of great importance.

Field experiment consists of 5 options and 3 repetitions according to the following scheme.

1. Control without fertilizer
2. N90P90K60-Fon
3. Fon + manure 20 t/ha
4. Fon + Shirvan compost 20 t/ha
5. Fon+Biohumus 5 t/ha

Results and Discussion

In the experiment, ammonium salt, simple superphosphate, potassium sulfate, semi-rotted manure, Biohumus and Shirvan compost were used as organic fertilizers. All organic fertilizers, 60% of mineral fertilizing phosphorus, 50% of potassium under the plow; 40% of nitrogen, 20% of phosphorus, 40% of potassium during planting; and the remaining amount of mineral fertilizer was given under the plant as feeding. Biohumus used in the experiment was provided by Absheron Bio-Technology LLC. The biohumus used during the experiment contains 55% moisture and 30% organic matter; humus-9.0%; total nitrogen-3.2%; phosphorus-2.6%; potassium is 2.0%. The chemical composition of Shirvan compost is 28% organic matter; 1.3% -nitrogen; 0.82%-phosphorus; Contains 1.2% potassium.

In order to determine the agrochemical characteristics of gray-meadow soils before the experiment, soil samples were taken from 5

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points of the eld using the envelope method and analyzed. As a result of the analysis, it was determined that in the planting layer of these soils, total humus is 1.92-1.70%, total nitrogen is 0.17-0.14%, easily hydrolyzable nitrogen is 8.70-7.24 mg/kg, total phosphorus is 0. ,15- 0.12%, the amount of total potassium was 3.3-3/0%. The obtained results show that the soil of the experimental area is generally poorly supplied with nutrients. As a result of the analysis, it was determined that the best result was in the option of providing 5 t/ha of biohumus per hectare. Thus, in the variant given Fon+Biohumus 5 t/ha, the total nitrogen in the plant in the phase of formation of the main leaves -

2.90%, total phosphorus - 0.78%, total potassium - 3.48%; nitrogen 2.65, phosphorus 0.68, calcium 3.30% in the onion formation phase; in the phase of fruit formation, total nitrogen was 2.32%, total phosphorus was 0.36%, and total potassium was 3.08%.

In the control variant, these numbers are nitrogen - 2.65%, phosphorus - 0.55%, and potassium - 3.12% in the phase of formation of the main leaves, in the phase of onion formation - 2.50%, phosphorus - 0.38%, potassium - 2.95, nitrogen - 2.20%, phosphorus - 0.25%, and potassium -2.78% in the phase of fruit formation.

The effect of organic and mineral fertilizers on onion productivity was studied. Organic and mineral fertilizers showed their effect on onion productivity in all options. The best indicator was in the option with 5 tons of biohumus per hectare. So, if the average yield was 180.0 centners per hectare in the control option, it was 255.5 centners in the option with 5 tons of biohumus per hectare, which means 75.5 centners more than the control option. The average weight of one onion was 10.6 grams more compared to the control in the variant with 5 tons of biohumus per hectare.

Conclusion

We came to the following conclusions from the conducted research:

1. Applying organic and mineral fertilizers under the onion plant has a positive effect on the dynamics of changing nutrients in the soil and plants

2. During the use of organic and mineral fertilizers under the onion plant, the development of the onion plant improved and its productivity increased.

3. Relatively good results compared to other options were obtained in the option with 5 tons of bio-humus per hectare.

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References

1. Isayeva F.H., Rustamova E.E., Ef ciency of the use of organic fertilizers obtained from local wastes that pollute the environment in horti-culture , Collection of works on soil science and agrochemistry, volume XVII, Science Baku 2007, p. 261-263

2. Zamanov P.B. et al., Effects of New Organic Fertilizers on Soil Fertility and Crop Productivity, Proceedings of Soil Science and Agro-chemistry, Volume XVI, p. 544

3. Simakin A.I. Krasnodar, 1983c. 3-10

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EFFECTIVENESS OF ORGANIC AND MINERAL FERTILIZERS UNDER LEMON PLANT IN YELLOW CLAY SOIL CONDITIONS

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Abstract

Research works were carried out in Lankaran district, which is located in the subtropical climate zone of the country. Due to its natural climate, the climate of the Lankaran-Astara zone belongs to the humid-subtropical Mediterranean climate type and has a mild humid winter, a dry summer, and a maximum rainy autumn. From this point of view, in order to increase the productivity of citrus plants in the country and increase the quality indicators, it is of great importance to increase the fertility of the soil under citrus plantations. Taking into account all this, research work was carried out with organic, mineral fertilizers and Lenkoran compost made from local waste under the yellow-clay soil conditions of the Lankaran-Astara zone under the citrus plant. The territory of the Lankaran branch of the Institute of Fruit and Tea Cultivation was selected for research. The analysis of the results of the eld experiments in the conditions of the yellow-clay soils of Lankaran showed that the applied fertilizers not only led to the accumulation of nutrients in the form absorbed in the soil, the improvement of the water-physical parameters, but also the increase of the productivity and quality indicators of the lemon plant. Among the applied options, the most good 10 tons of manure per hectare combined with mineral fertilizer \manure 10 t\ha. +N50P25K60 \ was a given option.

Keywords: sitrus plants, yellow-clay soil, fertilizer, organic, biohumus,

Introduction:

The results of the conducted research showed that when organic mineral fertilizers are applied under the lemon plant, nutrients in the form absorbed in the yellow-clay soil increase and the water-physical properties of the soil improve. Analogous results were also obtained in the yield and quality indicators of the lemon plant. 10 tons of manure was given together with mineral fertilizer (N50P25K60). sen./ha was 101 s/ha more than the control option without fertilizer.

Conducted research in order to study the effectiveness of organic and mineral fertilizers under the lemon plant under the conditions of yellow-clay soils. The research work was carried out in the subtropical climate zone of the country. Due to its natural climate, the climate of the Lankaran-Astara zone belongs to the humid-subtropical Mediterranean climate type and has a moderately humid winter, a dry summer, and a maximum rainy autumn. The amount of annual precipitation is 1500 mm, of which 75% falls in the autumn-winter months, 16% in the spring months, and 9% in the 3 months of summer. The average annual temperature is 14.1o C. The relative humidity of the air is 84%, which in the summer months reaches 10-15%.

The main characteristic of the yellow-clay soils of the Lankaran-Astara zone is that the pH here is 5.0 - 6.5 (in the water Itrate) and 4.0 - 5.5 (in the salt solution Itrate) and has an acidic and slightly acidic reaction. has Due to its mechanical composition, it belongs to granular soils. The density of silt on the horizon is not less than 1 meter. The amount of humus is 2.0-2.5%, nitrogen is 0.1-0.3%, phosphorus is 0.1-0.25%, and potassium is 1.7-3.1%. In the top layer of these soils, iron and aluminum compounds are low, and they have weak exchange ability [1.5].

To increase the productivity of citrus plants in the country and increase the quality indicators, it is of great importance to increase the fertility of the soil under citrus plants [6].

Research Object and Materials

Taking into account all this, research work was carried out with organic, mineral fertilizers and Lenkoran compost made from local waste under the yellow-clay soil conditions of the Lankaran-Astara zone under the citrus plant. Before starting the experiment, using the local waste spread in that zone, Lankara compost was prepared with the following mechanical composition: Manure - 40%, bird droppings - 10%, waste and residues of greening and tea plantations - 20%, residues from the processing of agricultural products - 25%, simple superphosphate - 3%, ammonium sulfate - 2%. Chemical composition of compost: N -1.36%, P2O5 - 0.65%, K2O - 1.34%, organic matter - 27.7%, ash - 22.0%.

Taking into account all this, research work was carried out with organic, mineral fertilizers and Lenkoran compost made from local waste under the yellow-clay soil conditions of the Lankaran-Astara zone under the citrus plant. Before starting the experiment, using the local waste spread in that zone, Lankara compost was prepared with the following mechanical composition: Manure - 40%, bird droppings - 10%, waste and residues of greening and tea plantations - 20%, residues from the processing of agricultural products - 25%, simple superphosphate - 3%, ammonium sulfate - 2%. Chemical composition of compost: N -1.36%, P2O5 - 0.65%, K2O - 1.34%, organic matter - 27.7%, ash - 22.0%..

The soil samples taken in order to study the in uence on the dynamics of nutrients in the form assimilated in the yellow-clay soils under the lemon plant were analyzed in laboratory conditions (using the Palintes apparatus).

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Results and Discussion

From the results of the analysis, it can be seen that in the control variant of the applied fertilizers without fertilizers, the amount of ammonia nitrogen in the form absorbed in the soil at the beginning of the period of biological activity of the lemon plant was 30.7 mg/kg in the 0-20 cm layer, activated phosphorus 117.0 mg/kg, available potassium 160, 9 mg/kg and 27.8 mg/kg in 20-40 cm layer,107.5 mg/kg, while it was 158.2 mg/kg, these indicators were changed depending on the dose and type of fertilizer.In the version with 10 tons of manure per hectare, ammonia nitrogen absorbed in the 0-20 cm layer of the soil was -43.3 mg/kg, active phosphorus -122.7 mg/kg, exchangeable potassium -165.7 mg/kg, and 10 tons of Lankaran per hectare. in the version given compost, these indicators increased to 48.5 mg/kg, 126.9 mg/kg, It was 168.8 mg/kg. More accumulation of nutrients in the soil was in the variant that gave 10 tons of manure per hectare together with mineral fertilizers (Manure 10t/ha + N50P25K60).Thus, in that variety, absorbed ammonia nitrogen is 51.6 mg/kg in the 0-20 cm layer, activated phosphorus is 133.7 mg/kg, exchangeable potassium is 173.0 mg/kg, and 45.1 mg/kg in the 20-40 cm layer. ,126.3 mg/kg, 168.5 mg/kg. As it can be seen, the indicators obtained in this option are higher than both the control option without manure and the options with 10 tons of manure and mineral fertilizer per hectare separately.

In the version with 10 tons of manure per hectare, ammonia nitrogen absorbed in the 0-20 cm layer of the soil was -43.3 mg/kg, active phosphorus -122.7 mg/kg, exchangeable potassium -165.7 mg/kg, and 10 tons of Lankaran per hectare. in the version given compost, these indicators increased to 48.5 mg/kg, 126.9 mg/kg, It was 168.8 mg/kg. More accumulation of nutrients in the soil was in the variant that gave 10 tons of manure per hectare together with mineral fertilizers (Manure 10t/ha + N50P25K60).

Thus, in that variety, absorbed ammonia nitrogen is 51.6 mg/kg in the 0-20 cm layer, activated phosphorus is 133.7 mg/kg, exchangeable potassium is 173.0 mg/kg, and 45.1 mg/kg in the 20-40 cm layer. ,126.3 mg/kg, 168.5 mg/kg. As it can be seen, the indicators obtained in this option are higher than both the control option without manure and the options with 10 tons of manure and mineral fertilizer per hectare separately.Plants grown in such soils are always provided with adequate amounts of water, air and nutrients. In order to improve soils without structure, it is necessary to enrich them with organic matter.

The fruits of the lemon plant, which is very common among citrus plants, are used in various elds. The main quality indicator of this plant is measured by the amount of acidity and vitamin C . Lemon fruits are richer in organic acids than other citrus fruits The effect of the applied fertilizers on the quality parameters of the lemon plant was also studied in the conducted research.Based on the results of the analysis, it can be said that the acidity of the lemon fruit varies between 5.34-5.88% in the leaf part (juice) and 0.22-0.30% in the peel in the fertilized variants, while these indicators are 5.2% in the control variant without fertilizer. % and 0.22 %. The best result was in the variant given together with 10 tons of mineral manure per hectare (manure 10 t/ha + N50P25K60) fertilizer (5.88% in the leaf part and 0.30% in the bark). Vitamin C (ascorbic acid), which is very useful and widely used due to its value, is suf cient in the lemon fruit. The lemon fruit has always been in the center of attention. The effect of the fertilizers used in the experiment on vitamin C in the fruit of the lemon plant was studied. It has been known that the amount of vitamin C in the fruit of the lemon plant depends on the soil-climate conditions where it is cultivated, cultivation and fertilization system [3,4].

As a result of the study of the amount of vitamin C in lemons by the method of I. Murri, it was found that in the control version without fertilizer, the amount of vitamin C (ascorbic acid) was 48 mg/% in the leaf part, and 133 mg/% in the peel, while fertilizer was given. in variants, these indicators varied between 56-66 mg/% and 141-189 mg/%. As it can be seen from the obtained results, the best indicator was in the given version of manure 10 t/ha + N50P25K60. Buda is 18 mg/% and 56 mg/% more than the control without fertilizer (48 mg/% and 133 mg/%).During the conducted research, the effect of organic and mineral fertilizers and Lenkaran compost made from manure waste on the productivity of the lemon plant was also studied. It was found that in the control option without fertilizer, the yield was 140 cents/ha, while in the options with added fertilizer, this indicator changed between 200.0 and 241.0 cents/ha. The best result was in the variety given together with mineral fertilizer at a dose of 10 tons of manure N50P25K50 per hectare (241.0 sen/ha). This is 101.0 sen/ha or 72.0% more than the variety without fertilizer.

Conclusion

The analysis of the results of the eld experiments in Lankaranan yellow-clay soils showed that the applied fertilizers had an effect on the accumulation of nutrients in the form absorbed in the soil, the improvement of water-physical parameters, and the increase of the productivity and quality indicators of the lemon plant. Among the applied options, the best 10 tons of manure per hectare was combined with mineral fertilizer \manure 10 t\ha. +N50P25K60 \ was a given option

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References

1. Abbasova T.S. In uence of micronutrients on lemon plant productivity against the background of macro fertilizers in the yellow-clay soils of humid subtropical zone\ Lankaran. International scienti c journal of Nature and Science. Baku. 2022, p. 22-28.

2. Babayev M.P., Ismayilov A.I., Hasanov S.M. Yellow-clay soils of Azerbaijan n VVRB in the international system. Soil and environment. Baku. 2020. No. 1. p. 112.

3. Voronchov V.V., Shteiman U.G. Cultivation of subtropical crops. Moscow, Colossus , 1982, 122-135.

4. Gogia V.T. Biochemistry of subtropical plants. Moscow, Kolos , 1984, pp. 141-152.

5. Khalilov H., Aliyev T. Agrochemistry. Baku, 1975, pp. 43-48.

6. B.A. Yagodina Practice on agricultural chemistry . Moscow, Fgroromizdat, 1987, article 212-219.

7. Isayeva F.H. Effect of organic and mineral fertilizers on the dynamics of nutrients in yellow-clay soils under lemon plants. Actual problems of modern natural and igbisad sciences , International Scienti c Conference. Part IV. Ganja, 2023, p. 34-36

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STUDYING THE EFFECT OF ORGANIC FERTILIZERS ON THE TRANSFORMATION OF ORGANIC MATTER IN THE SOIL

UNDER VEGETABLE CROPS IN THE GRASSLAND-FOREST SOILS OF THE GUBA-KHACHMAZ ZONE

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Abstract

In increasing the productivity of various agricultural plants, it is of great importance to supply plants with nutrients in full and on time, and in connection with this, to provide mineral and organic fertilizers. The main purpose of the work to be carried out is to study the effect of fertilizers under the onion plant on the decomposition of organic matter in the soil, soil fertility, yield, and quality of onions in the grassland-forest soils of the Guba-Khashmaz economic region. For the rst time, mineral fertilizer and new organic fertilizer Guba-Khachmaz compost, which is a new organic fertilizer, were used in Gusarchay Zone Experimental Station of Khachmaz region to improve soil fertility, conversion of nutrients, accumulation of nutrients in onions, absorption of nutrients by plants un The agrochemical properties of the experimented meadow-forest soils of the Gusarchay Zone Experimental Station of the Ministry of Agriculture s Scienti c Research Horticulture Institute located in Khachmaz were analyzed and it was determined that these soils were moderately supplied with nutrients based on the known gradation. As a result, in the variant with 20 tons of compost per hectare, in addition to the increase in nutrients in the soil, the yield of onions increased, the quality improved, and the production of plant nutrients increased.der onion variety Aytac effect has been studied.

Keywords: fertility, nutrients, tomato, fertilizers, onions

Introduction

The Kuba-Khachmaz zone is the main region for growing vegetable crops. The soil and climatic conditions of the zone are quite favorable for growing tomatoes. A number of researchers note that the soils of this zone are poorly supplied with nitrogen and phosphorus. Academician L.N.Pryanishnikov, attaching great importance to the role of organic and mineral fertilizers in increasing the yield of agricultural crops, wrote it is necessary to decisively put an end to the underestimation of the enormous importance that belongs to manure as the most important basic link in the correct system of fertilizer application.

Under the in uence of various doses of manure, changes in the content of soil nutrients occur, thereby improving soil fertility. Therefore, studying the effect of various doses of manure on the dynamics of available forms of essential nutrients in the soil is of great importance, both for the tomato nutrition regime and the balance of nutrients. The introduction of organic fertilizers Kuba-Khachmaz made from local waste that pollutes the environment, contributes to an increase in the accumulation of mineral forms in soils, the content of nutrients in the above-ground part of plants (Isayeva F.H., Rustamova E.E., 2007).

Research Object and Materials

During the owering period, tomatoes need complete balanced nutrition, since it is at this time that the setting and laying of the taste qualities of the fruits occurs. For feeding, it is recommended to use complex compositions containing a full set of minerals.

The most suitable time for applying fertilizers is after the appearance of the second ower brush. When using compost, the quality of agricultural plants is signi cantly improved. We studied the dynamics of nutrients in the soil and at the research site (B.A. Yagodina 1987). Thus, the sum of ammonia and nitrate nitrogen in the 0-20 cm layers in the variant of 20 t/ha of manure increases: at the end of May by 13.60 mg/kg, in June by 5.60 mg/kg and in August by 5.80 mg/kg compared to the control, where it was 30, 40; 25, 90; 17.75 mg/kg, respectively, in the 20-40 cm layer in May by 16.70 mg/kg, in June by 3.45 mg/kg, in August by 3.72 mg/kg (in the control, respectively 18.50; 16.50; 8.28 mg/kg). When 30 t/ha of manure is applied, the sum of ammonia and nitrate nitrogen in the 0-20 cm layer increases in May by 18.10 mg/kg, in June by 8.20 mg/kg, in August by 12.75 mg/kg (in the control, respectively, 30.40; 25.90; 17.75 mg/kg) in the 20-40 cm layer, these data were respectively equal to 20.20; 3.20; 5.02 mg/kg .

Result and Discussion

When 30 t/ha of manure is applied, the sum of ammonia and nitrate nitrogen in the 0-20 cm layer increases in May by 18.10 mg/kg, in June by 8.20 mg/kg, in August by 12.75 mg/kg (in the control, respectively, 30.40; 25.90; 17.75 mg/kg) in the 20-40 cm layer, these data were respectively equal to 20.20; 3.20; 5.02 mg/kg. When 30 t/ha of manure is applied, the sum of ammonia and nitrate nitrogen in the 0-20 cm layer increases in May by 18.10 mg/kg, in June by 8.20 mg/kg, in August by 12.75 mg/kg (in the control, respectively, 30.40; 25.90; 17.75 mg/kg) in the 20-40 cm layer, these data were respectively equal to 20.20; 3.20; 5.02 mg/kg. When 30 t/ha of manure is applied, the sum of ammonia and nitrate nitrogen in the 0-20 cm layer increases in May by 18.10 mg/kg, in June by 8.20 mg/kg, in August by 12.75 mg/kg (in the control, respectively, 30.40; 25.90; 17.75 mg/kg) in the 20-40 cm layer, these data were respectively equal to 20.20; 3.20; 5.02 mg/kg. When 20 t/ha of manure is added to a 0-20 cm layer during the budding period, water-soluble humus increases by 19.5 mg/kg, during the owering period by 10.3 mg/kg, and at the end of the growing season by 10.5 mg/kg compared to the control

Considering the great importance of phosphorus and potassium in the life of plants, we set the task of studying the dynamics of their mobile forms under the in uence of organic fertilizers. The results of the analyses show that when adding 10 t/ha and 20 t/ha of manure, the indicators signi cantly increase compared to the indicators of the control variant. When using 20 t/ha of compost, the content of mobile forms of phosphorus in the 0-20 cm layer increased by 7.8 mg/kg in May, by 2.5 mg/kg in June, by 3.0 mg/kg in August, in the 20-40 cm layer in May 5.5 mg/kg, in June 0.4 mg/kg, in August 1.0 mg/kg .

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When 20 t/ha of manure was applied, the exchangeable potassium in the 0-20 cm layer increased by 60 mg/kg in May, by 70 mg/kg in June, and by 90.3 mg/kg in August. Thus, the application of various forms and doses of manure increases the content of nutrients in the soil.

Our studies have shown that the greatest plant growth in the tomato budding phase with the introduction of 10 t/ha of manure, plant growth increased in the phases: budding by 1.9 cm, owering by 20.9 cm, at the end of the growing season by 20.1 cm compared to the control.

With the introduction of 10 t/ha of compost, plant growth compared to the control was higher in the budding phases by 2.4 cm, in the owering phases by 26.9 cm, at the end of the growing season by 22.0 sm.

When 20 t/ha of compost was added, the owering phase began 3 days earlier compared to the control. When 20 t/ha of compost was added, the owering phase began 3 days earlier compared to the control. The objective of the study was to study the agrochemical properties of meadow-forest soils, to establish the effectiveness of compost application under tomato. At the same time, the accumulation of nutrients in the soil and quality indicators under the in uence of compost were studied. The increased content of nutrients in tomato plants created by the application of fertilizers to the soil also contributes to the formation of a good quality harvest. Dry matter is one of the most important indicators of the biological quality of vegetable crops, which depends on soil and climatic conditions, irrigation, crop characteristics and the use of fertilizers.

Conclusion

Plant products containing large amounts of nitrates can have a harmful effect on the human body. Products containing 970 mg NO3 per 100 g of dry matter can cause acute poisoning or even death [Borisov, 1978]. The data show that with the introduction of 10 t/ha of manure, dry matter increases by 0.10% (in the control variant 6.50%), ascorbic acid increases by 0.3 mg% (in the control variant 18.4 mg%), acidity decreases by 0.04% (in the control 0.33%), total sugar increases by 0.18%, in the control variant 2.66%, nitrates do not change (50 mg/kg). Nitrogen supplied to plants with low doses of fertilizers is not fully utilized by the plant organism. Some of it may remain in the form of free nitrates. Plant food containing large amounts of nitrates can have a harmful effect on the human body. Products containing 970 mg /N 3 per 100 g of dry matter can cause acute poisoning or even death.

References

1. Isayeva F.H., Rustamova E.E., Ef ciency of the use of organic fertilizers obtained from local wastes that pollute the environment in horticulture , Collection of works on soil science and agrochemistry, volume XVII, Science Baku 2007, p. 261-263

2. B.A. Yagodina Practice on agricultural chemistry . Moscow, Fgroromizdat, 1987, article 212-219

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COMPARATIVE RESEARCH OF ORGANIC FERTILIZERS UNDER SUGAR BEET

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Abstract

As a result of the conducted research, it was found that there are enough resources in Azerbaijan to prepare organic fertilizer based on new technology. This includes industrial, agricultural, household waste, plant residues, silt brought by rivers, etc. includes Using the new organic fertilizers made from the above-mentioned wastes is of great importance in terms of protecting the ecology of the environment in that zone, in addition to meeting the soil s need for nutrients. The organic compounds contained in these fertilizers decompose and increase the amount of humus in the soil, improve the structure of the soil, increase its buffering capacity and weaken its acidity. As a result, soil fertility increases. Organic fertilizers are considered the best source of carbon dioxide for plants. They improve not only the biological, but also the physical, chemical, physico-chemical properties of the soil, as well as the water and air regime when given regularly, especially in large doses. The research work was carried out under the sugar beet plant with organic fertilizers of different composition in the conditions of gray-meadow soils at the Ujar support station of the Institute of Soil Science and Agrochemistry. Organic fertilizers such as biohumus, compost, and manure were used in the experiment. The effect of organic fertilizers with different contents on the water-physical properties of the soil, as well as on the biometric indicators of the sugar beet plant, was studied. Indicators of water-physical properties as a fertility factor were more satisfactory in all options given organic fertilizer. According to Shirvan compost and manure, the indicators are better in the variant with biohumus.

Keywords: Soil, fertilizer, organic, biohumus, sugar beet.

Introduction

As a result of the great care shown by the President of Azerbaijan to the non-oil sector in recent years, a fundamental ground has been created for the transition to a qualitatively new stage of development in the agricultural sector, which is one of the leading sectors of the economy, and important steps have been taken in the process of reliably ensuring the country s food security. The steps taken in the direction of increasing the ef ciency of the production of agricultural products and development of the eld in Azerbaijan have led to the development of the agrarian sector. Also, at the 29th meeting of international conferences on climate change within the framework of the Year of Solidarity for the Green World , which will be held in our country this year, it is planned to discuss the solutions to the problems in agriculture and the development of sustainable agriculture. Thus, the application of modern technologies, as well as the use of ecologically clean fertilizers obtained from local waste, are of particular importance in overcoming the dif culties caused by the severe impact of climate changes on soil salinization, the reduction of water and land resources, and agriculture. Ecologically clean (organic) products exist only in healthy environment and soil conditions. The concept of healthy soil is the basis of the basic principles of ecological production. Otherwise, the provision of the country s population with healthy food products, that is, the food security program, raises doubts (Vekilova, E. M., S. T. Talibova, F. G. Isaeva, and A. Z. Agaev, 2004)

Research Object and Materials

Environmentally friendly fertilizers such as biohumus, manure, compost were used in our research work. These fertilizers obtained as a result of the processing of plant, animal and household waste are environmentally friendly fertilizers because they are a part of nature. At the same time, mineral fertilizers equivalent to manure were also used for the purpose of comparison. The composition of the Shirvan compost used in the experiments is as follows: manure-30%, bird droppings-10%, waste from industrial processing of agricultural products-10%, plant residues-30%, household waste-10%, slaked lime + ash + simple superphosphate-10%. The chemical composition is organic matter - 27%; total nitrogen 1.3%; total phosphorus 0.82%; total potassium was 1.2%. The content of biohumus used during the experiment is 55% moisture, organic matter-30%; total nitrogen-3.2%; phosphorus-2.6%; potassium is 2.0%. The degree of salinity, agrochemical properties and organic fertilizers of the experimental area soils were analyzed using modern methods. Soil and organic fertilizer analyzes were carried out in the Institute s soil-agrochemical research and mass analysis laboratory (Palintest - 7500) according to the methodology established in agrochemical research. The Dayag district of the Institute of Soil Science and Agrochemistry, located in the territory of Garab rk village, Ujar district, was chosen as the research area, and the experiment was carried out in 2020-2024. The Ujar support station is located in the central part of the Shirvan plain. The formation of the initial relief in this area is related to the accumulative activity of Kurun and Goychay. The area is 12.5-14.5 m above sea level. In the Shirvan plain, mainly gray-grass soils and their species diversity are spread. Dry subtropical semi-desert climate prevails in this zone, climatic conditions are favorable for the formation of gray-meadow soils (Talibova S.T., Ahmadova A.F. 2018)

Results and Discussion

Soil samples of experimental areas were analyzed and certain results were obtained. Thus, the total humus in the 0-20 cm planting layer in weakly saline soil is 1.98%; total nitrogen 0.22%; total phosphorus 0.19%; while total potassium is 3.16%, these indicators are 0.94% at a depth of 80-100 cm; 0.06%; 0.08%; It decreased accordingly to 2.5%. According to different degrees of salinity, nutrients (NPK) were much lower in severely salinized soils than in weakly salinized soils. In all soil areas, the amount of nutrients assimilated by plants decreased with the soil depth (0-100 cm). During the vegetation period, phenological observation was carried out. The effect of organic and mineral fertilizers on the development of leaves and the average weight of one beet during the vegetation period in weakly saline soil under the sugar beet plant was studied. The number of leaves of a plant, the width of the leaf. length, total area, and height of the plant were also measured and the average values were calculated. In the control version, one plant has 21 leaves, while in the other version, it varies between 34-46 cm. It was similar in the total area of the leaf. The height of the plant is 81.0-104.0 cm in all fertilized options; the average weight of one plant was 350.0-727.6 g.

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As can be seen from the table, the yield of sugar beet in the control variant without fertilizer was 246.6-251.4 s/ha in different years, while in the fertilized variants there was an increase of 81-221 s/ha compared to the control variant without fertilizer. The best indicator was in the version with 10 tons of fertilizer per hectare. The noticeable difference was 42 centners per hectare.

Conclusion

20 tons of Shirvan compost, 20 tons of manure, 10 tons of biohumus and 20 tons per hectare the best indicators in a eld experiment given mineral fertilizer equivalent to manure 10 tons of biohumus per hectare was in the given version.

10 tons of biohumus per hectare of the sugar beet plant quality indicators have improved and productivity has increased. At the same time, an increase in the amount of nutrients in the soil has been observed

References

1. Vekilova, E. M., S. T. Talibova, F. G. Isaeva, and A. Z. Agaev. «The role of organics fertilizers in improvement of soil processes.» In Mater. Mezhdunar. Nauchno- practical. conf.«Actual problems of agriculture at the modern stage of development agriculture». Penza, pp. 74-75. 2004.

2. Talibova ST, Ahmadova AF - Influence of composts on the dynamics of nutrients elements in the soil under cultures of sugar beet and soy. Soils in the biosphere: material Vseross. науч. conference, pp. 155-158, 2018

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PROTECTION AND EFFICIENT USE OF THE LANDS OF THE OGUZ REGION OF THE SOUTHERN SLOPE OF THE GREATER CAUCASUS

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Abstract:

Keywords: forest, arable land, soil, agriculture, humus.

Intensive cutting of forests creates conditions for the increase of the area of land that has come out from under the forest in the region. Deforested lands are mainly used for agricultural purposes, as pastures and hay elds. In our time, as a result of the increase of anthropogenic in uences and due to the expansion of man s agricultural activities, the land of the once forested areas has become a steppe. The impact of anthropogenic factors on deforested lands is also observed in the Oguz region of the Southern slope of the Greater Caucasus. So, as a result of various anthropogenic and environmental factors, the deforested lands in the territory of Oguz region are subjected to degradation and various erosions. Agricultural products are mainly grown on deforested lands, which include cereals and legumes, various types of wheat, tobacco, potatoes, vegetables, melons and other crops. In order for the productivity of these plants to be high and of high quality, it is important to protect the deforested lands from anthropogenic in uences.

Introduction

Intensive deforestation creates conditions for an increase in the area of deforested lands in the region. Deforested lands are mainly used for agricultural purposes, as pastures and hay elds. In our time, as a result of increased anthropogenic impacts and the expansion of human economic activity, the process of steppe transformation has occurred in the lands of areas that were once forests. Main issues of all spheres of rural life are analyzed, and the necessity of practical implementation of state programs for sustainable rural development is argued. This is because they refer to one of the most important factors of production, which is real estate. The article assumes that REV is all the processes that allow for valuation, while REM is all the processes that allow for the management and administration of real estate. Both of these processes were referred to the real estate market cycle (REMC) and the real estate lifecycle (REL). Main issues of all spheres of rural life are analyzed, and the necessity of practical implementation of state programs for sustainable rural development is argued. [1.2.3.4]

A conversion threat index (CTI) was created to identify ecoregions with highest projected land-use conversion potential within closest proximity to existing protected areas. [5]

The impact of anthropogenic factors on deforested lands is also observed in the Oguz region of the Southern slope of the Greater Caucasus. [6]

Thus, as a result of the impact of various anthropogenic and ecological factors, deforested lands in the Oguz region are subject to degradation and various erosions. Agricultural products are mainly grown on deforested lands, which include cereals and cereal-legume plants, various types of wheat, tobacco, potatoes, vegetables, melon plants and other plants. In order for the productivity of these plants to be high and of high quality, it is important to protect deforested lands from anthropogenic impacts.

Area under agricultural crops, ha	**2020**	**2021**	**2022**
Cereals and cereal plants	16434	16687	16600
Tobacco	269	220	67
Winter and spring wheat	11970	12057	11283
Sunflower for grain	-	-	-
Potato	293	298	351
Vegetables	319	297	276
Melon products	6	2	5
Fruits and berries	5849	6053	6229
Grapes	31	31	31

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Table 1. Area of agricultural crops in Oguz region, ha

The table shows the areas of agricultural crops in Oghuz region. As can be seen from the table, cereals and legumes, spring and winter wheat, potatoes, vegetables, fruits and berries, melons and vineyards are grown in economically important areas located in the region. Over the years, the areas planted with potatoes, fruits and berries have increased, while the areas planted with other crops have decreased relatively. A number of measures are being taken in Oghuz region to protect the fertility and structure of these areas. Since the lands of the mountain-agricultural zone are widely used for agricultural purposes, erosion processes have spread intensively here. In order to protect the soil cover in the area from erosion, prevent the erosion process, maintain the productivity of agricultural crops, and ensure the protection of the soil, it is necessary to properly create agricultural areas and implement a number of measures. The system of these measures is as follows:

-Soil conservation measures;

-Agrotechnical measures;

-Planting perennial plants on low-yielding and eroded soils;

-Establishment of orchards and vineyards on washed-out parts of mountain slopes;

-Application of fertilizers to improve soil fertility;

-Organizational and economic measures;

Agrotechnical measures include irrigation, disease and pest control and the use of pesticides, plowing of arable land before cultivating various plants, preparing arable land for cultivation, cleaning of various agriculturally damaged lands from weeds, and also applying mineral and organic fertilizers to increase soil fertility.

In addition to the agrotechnical measures we have mentioned, the implementation of land reclamation measures also creates conditions for land improvement. The aforementioned land reclamation measures are of great importance in the development of arable land. Land reclamation measures directly affect the development of agriculture. In order to increase the fertility and productivity of the land, it is necessary to pay attention to the water-salt regime of irrigated lands. Reservoirs built and canals created in the region play a decisive role in the irrigation of arable land.

The composition of the water used for irrigation of arable land must be controlled and water rich in substances harmful to the soil should not be used for irrigation.

References

1. Immovable Property Cadastre, Cadastral activity in Russia: Experience of the present and prospects of the future, The 6th All-Russian Congress of Cadastral Engineers (SRO Cadastral Engineers , Moscow, 2017)

2. M. Ogryzek, R.Wisniewski, T.Kauko, Real Estate Management and Valuation, 26(3) (2018) https://doi.org/10.2478/remav-2018-0022

3. N. Ovchinnikova, D. Burdova, M. Garanova, E3S Web of Conferences, 91(2019) https://doi.org/10.1051/e3sconf/20199108023

4. T.S. Wilson, B.M. Sleeter, R.R. Sleeter, et al., Land, 3(2)(2014) https://doi.org/10.3390/land3020362

5. J. W jcik-Le a, K. Sobolewska Mikulska, N. Sajng, P. Le , Land Use Policy, 78(2018), https://doi.org/10.1016/j.landusepol.2018.06.044

6. H seynova G.A. B yk Qafqaz n C nub yamacnnme torpaqlarnnekoloji qiym tl indirilmsi. biol.elml.namiz.alimlik drcsi almaqn dis-nin avtoreferat , Bak , 2007, 19 s.

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CLIMATE ADAPTATION MEASURES FOR SUSTAINABLE AGRICULTURAL DEVELOPMENT IN THE ABSHERON PENINSULA

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Abstract

Climate change poses signi cant challenges for agriculture, and the Absheron Peninsula is particularly affected by these impacts. The article provides a detailed explanation of the effects of climate change on agriculture in the Absheron Peninsula and the ways to combat these challenges. Absheron is a strategic region with an arid and semi-arid climate, where traditional farming types such as horticulture and agriculture have historically thrived. However, in recent years, climate change has been characterized by rising temperatures, decreasing precipitation, and dwindling water resources. This has led to reduced agricultural productivity, soil erosion, and degradation. Therefore, the implementation of sustainable agricultural methods is essential. The study suggests several measures to mitigate the negative effects of climate change. These include the selection of drought-resistant crops, the use of ef cient irrigation technologies like drip irrigation, reforestation of the land, enriching soil with organic matter, and the creation of water reservoirs. Smart agricultural technologies, such as monitoring soil and plant conditions through sensors and drones, offer opportunities for water conservation and productivity enhancement. The article emphasizes that the application of these technologies can signi cantly contribute to the sustainable development of agriculture, environmental stability, and the ght against climate change. In the Absheron Peninsula, where water resources are limited, these measures will ensure agricultural sustainability and reduce ecological and economic risks in the future.

Keywords: Climate change, agriculture, Absheron Peninsula, productivity, adaptation measures

Introduction

The impact of climate change on agriculture covers a wide range of effects. Rising temperatures, changes in precipitation patterns, and the increase in extreme weather events negatively affect agricultural productivity and crop quality. Hotter weather conditions lead to the depletion of land and water resources, reduced soil moisture, and an increase in salinity issues. The decreasing availability of water sources limits irrigation possibilities, while the demand for irrigation increases. Temperature rises may shorten the growing periods of certain plant species and reduce their yields. Furthermore, climate change accelerates the spread of pests and diseases, leading to crop losses. The cultivation of crops unsuitable for climate conditions becomes risky, prompting a shift toward climate-resilient and adaptable varieties. Therefore, climate change weakens the resilience of agriculture and calls for adaptation measures to ensure future food security [5].

The agricultural sector in the Absheron Peninsula, which holds strategic importance for Azerbaijan, plays a signi cant role in the national economy. However, factors such as the region s climatic characteristics, soil and water resources, and industrial impacts make the sustainable development of agriculture in the area challenging. Several factors contribute to the rise in temperature in the Absheron Peninsula, including the characteristics of the existing industrial infrastructures, thermal power plants, their substantial greenhouse gas emissions, the extensive transportation infrastructure, a sharp increase in population density, and the rapid growth in construction in recent years. Climate change has led to agroecological issues in the region, such as reduced productivity, water scarcity, and soil erosion. Existing knowledge gaps and limited research hinder the effective resolution of these problems [1].

The aim of this paper is to identify climate adaptation measures to ensure the sustainable development of agriculture in the Absheron Peninsula and explore the obstacles encountered during their implementation. This research expands the knowledge base for sustainable agricultural development in the Absheron Peninsula and offers practical recommendations for climate adaptation at both local and international levels.

Research Object and Methodology

This research focuses on farmers and sector specialists operating in the agricultural eld within the Absheron Peninsula. The study takes into account the region s climatic characteristics and local resource potential. The primary data sources for the study include weather data, soil analyses, water resources, and other statistical information. Additionally, laboratory analyses and expert interviews are incorporated into the research. The study was conducted within the agricultural elds of the Absheron Peninsula, with a particular focus on farms operating in the region, eld specialists, and climate-sensitive agricultural products. The research objects include various crop types fruits, vegetables, cereals as well as water resources and soil samples.

Content of the Work

Climate change is one of the main global issues affecting agriculture. Particularly in arid and semi-arid regions like the Absheron Peninsula, these impacts are more pronounced. Therefore, necessary measures must be taken to adapt to climate change and ensure the sustainability of agricultural production. The Absheron Peninsula, strategically located on the coast of the Caspian Sea in Azerbaijan, is an area where traditional agricultural practices such as horticulture and crop cultivation dominate. However, in recent years, climate change has signi - cantly affected these sectors. Climate change negatively impacts the peninsula s ecosystem and soil characteristics, making agricultural activities more challenging. The climate of the Absheron Peninsula is classi ed as dry subtropical, divided into two climatic zones: the mild, hot, dry coastal zone and the southwestern coastal dry subtropical zone. Summers are very hot, and winters are short and mild. The average annual temperature is +14 C, with summer temperatures reaching 38-39 C, and the surface temperature of the soil ranging from 60-66 C in July. During the summer, rainfall is low, and the weather is dry. Windy days are relatively frequent throughout the year, with the strongest wind being the Khazri, a northern wind. Although the annual rainfall is 250-290 mm, evaporation is higher, and crops require additional water. Winters are short and mild, and the frost-free period is long [1].

The following table presents the multi-year temperature data for the years 2002 2020.

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Table 1. The Average Multi-Year Temperature Indicators for 2002-2020 Years

1961-1990 average multi-year temperature - 12.3																	
2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Medium annual temperature																		
12.3	12.2	13.8	13.2	13.2	12.9	13.0	13.1	14.4	12.1	13.3	13.4	13.4	13.6	13.0	13.5	15.0	14.4	14.4
Medium annual temperature average multiplicity difference																		
0.0	-0.1	1.5	0.9	0.9	0.6	0.7	0.8	2.1	0.2	1.0	1.1	1.1	1.3	0.7	1.2	2.7	2.1	2.1
Average monthly temperature																		
26.2	24.7	25.4	24.9	26.9	25.5	25.4	24.5	26.2	26.7	27.0	25.7	28.5	24.7	24.7	26.6	28.4	25.4	29.7
Minimum (lowest) average monthly temperature																		
2.2	2.1	3.2	1.4	1.2	0.3	-3.7	0.3	3.3	1.3	0.9	3.6	2.9	2.6	2.4	1.5	3.6	3.4	-1.9

According to data provided by the Ministry of Ecology and Natural Resources, as shown in the table, the temperature in the Absheron Peninsula has changed somewhat from 2002 to 2020 [4].

1. Average Annual Temperature Increase: Between 2002 and 2020, the average annual temperature gradually increased from 12.3 C to as high as 14.4 C in some years. This increase re ects the impact of global climate change.

2. Difference from Previous Decades: Compared to the period from 1961 to 1990, the annual temperature has generally shown positive changes. In 2020, a 2.1 C difference was recorded, which is higher than the long-term average.

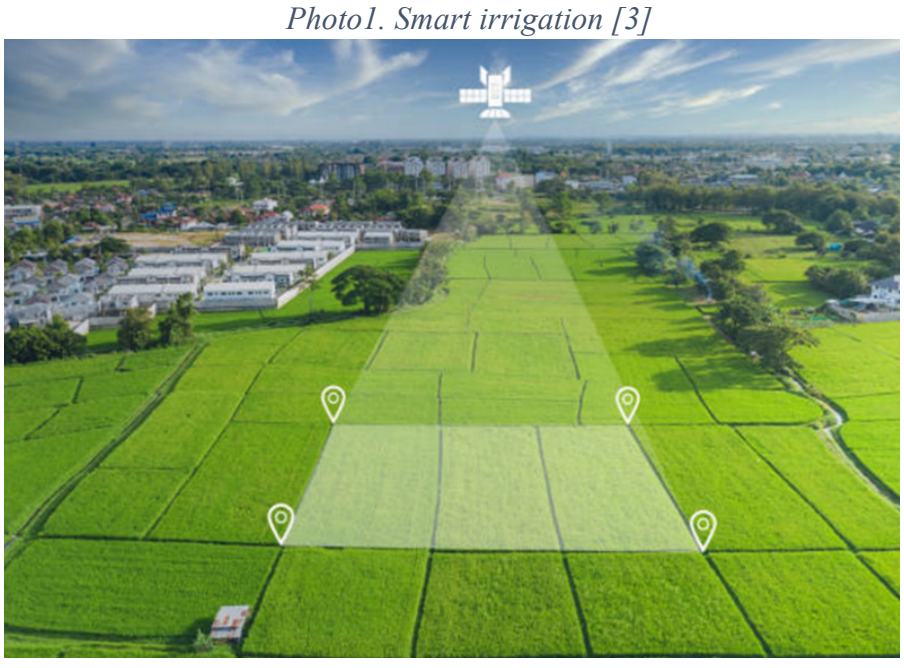
3. Average Monthly Temperature: The annual maximum monthly temperature uctuates between 26.2 C and 29.7 C. One of the highest recorded values was in 2019, at 28.4 C.

4. Lowest Average Monthly Temperature: The minimum monthly temperature varied between 2002 and 2020. For example, in 2020, it was recorded at -1.9 C, but in other years, it was higher.

The data in the table clearly indicates a gradual increase in temperature in the Absheron Peninsula and demonstrates the visible effects of climate change. These changes pose risks to agriculture and emphasize the necessity of implementing climate adaptation measures.

One of the main impacts of climate change on the Absheron Peninsula is the continuous increase in temperature. Signi cant rises in average temperature have been observed over recent decades. This increase raises plants water demand during the growing season, leading to a rapid depletion of water resources. Additionally, extreme heat negatively impacts plant growth and productivity, resulting in plant scorching and an increased incidence of drought-related diseases.Climate change has also led to a decrease in rainfall in the Absheron Peninsula. Periods of drought have become longer and more intense, reducing available water resources for irrigation and complicating crop production. The depletion of water sources exacerbates irrigation challenges in agriculture and limits crop yields.Another negative effect of climate change on the Absheron Peninsula is soil erosion and degradation. Rising temperatures and reduced rainfall cause soil to become dry and compact, which decreases productivity and leads to soil fertility loss. Soil degradation also results in a decline in areas suitable for agriculture, endangering the sustainability of the agricultural sector on the peninsula and indicating that additional resources may be required in the future.

Photo1. Smart irrigation [3]



Climate change negatively affects the natural ecosystems of the peninsula as well. The reduction of vegetation accelerates soil erosion, alters animal,
habitats, and adversely impacts biodiversity. These changes directly affect the quality of life and economic activities ofcommunities en-

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gaged in agriculture. Therefore, urgent measures to adapt to climate change and implement sustainable agricultural practices are essential. Implementing climate adaptation measures is crucial to mitigate the effects of climate change and maintain sustainable agricultural production. Key adaptation strategies include:

1.Selecting drought-tolerant, climate-adaptive crop varieties with longer growing seasons, and developing new varieties.

2.Applying ef cient technologies such as drip irrigation for effective water resource management.

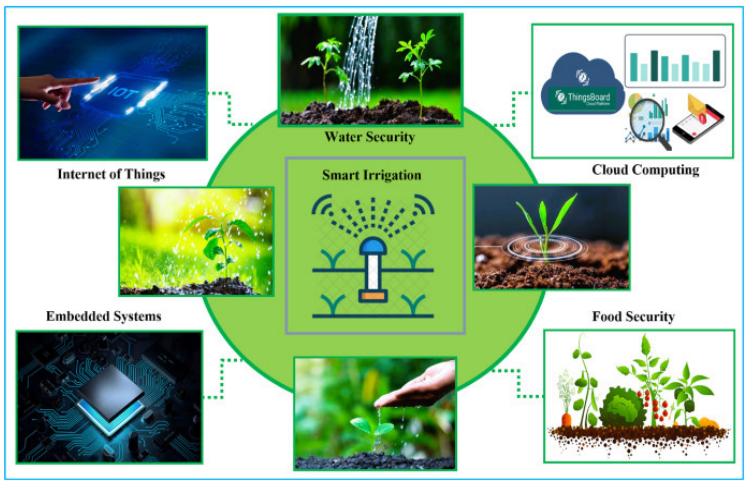
3.Implementing afforestation, enriching soil with organic matter, and other measures to reduce soil erosion and degradation.

4.Creating arti cial water reservoirs.

5.Mapping and recording eroded and salinized soils [1].

To ensure the sustainable development of agriculture and adapt to climate change in the Absheron Peninsula, it is essential to implement new technologies and farming systems. Given that the region is located in an arid and semi-arid area that limits agricultural productivity, these technologies aid in the ef cient use of resources and increase productivity.

Photo2. Use of Satellites in Agriculture [6]



These technologies aim to optimize farm management through data collection and analysis. Applying these technologies on the Absheron Peninsula can help reduce environmental impact by ensuring the ef cient use of water, fertilizers, and energy resources. Sensors that monitor soil moisture, temperature, and plant health can automatically manage irrigation systems, conserving water and improving crop quality.Drones can be used to monitor farm areas, identify plant diseases, and detect soil issues early, reducing crop losses and enabling timely interventions. Satellite technology can monitor soil and climate conditions on a large scale, helping identify optimal planting times and locations to improve eld productivity [2].

Photo3. Monitoring of Area through Drones [6]



Water scarcity is one of the major issues on the Absheron Peninsula, making the implementation of ef cient irrigation technologies essential. Drip irrigation systems deliver water directly to the roots of plants, minimizing waste. This method is ideal for Absheron s arid climate, as it reduces evaporation and maintains consistent soil moisture. Given the limited water supply on the peninsula, systems for collecting and storing rainwater can also be used for irrigation. This technology can partially meet water demand and support crop production.

Introducing new technologies and farming systems on the Absheron Peninsula contributes to increased agricultural productivity, ef - cient resource use, and climate adaptation. These approaches will enhance the income of local farms and ensure ecological sustainability [1].

Results and Discussion

Based on the ndings of the study, climate change has a negative impact on agricultural productivity in the Absheron Peninsula. Factors such as reduced water resources, soil erosion, and
temperature uctuations contribute to crop losses. An increase in productivity was observed in areas where adaptation measures were implemented.

The results indicate that appropriate adaptation measures (e.g., upgrading irrigation systems and implementing soil erosion control) can support the sustainability of the agricultural sector in the region. The application of these measures also has the potential to increase local farmers income.

The study s ndings suggest that adaptation measures not only mitigate the adverse effects of climate change but also help to im-

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prove agricultural productivity. Key ndings include the following:

- Increased temperatures and decreased rainfall have led to soil drying and reduced productivity in agricultural areas.
- The growing need for irrigation exacerbates the depletion of water resources, whereas farms that applied climate adaptation measures experienced an increase in productivity.

The ndings show that climate adaptation measures can play a vital role in the sustainable development of the region s agricultural sector. For example, optimizing irrigation systems, such as drip irrigation, can prevent water waste and help preserve soil productivity. To measure the impact of adaptation measures, signi cant improvements were also observed in the economic indicators of these farms. The research emphasizes the need for ef cient management of water resources and the application of appropriate land use technologies. Additionally, enhancing the capacity of farmers and agricultural professionals to adapt to climate changes is essential.

Conclusion

In conclusion, implementing climate adaptation measures is necessary to ensure the sustainability of agriculture in the Absheron Peninsula. Ef cient management of water and soil resources, selection of crop varieties resilient to climate change, and adoption of modern technologies will help increase agricultural production and reduce risks. At the same time, educating farmers and strengthening their adaptation skills are critical steps to support the sector s sustainable development.

1.Appropriate adaptation measures for mitigating the adverse effects of climate change in the Absheron Peninsula effectively contribute to sustainable agricultural development.

2.This study demonstrated that climate change adaptation measures not only enhance agricultural productivity but also strengthen ecosystem resilience.

3.The ndings suggest that optimizing irrigation systems and implementing sustainable land use strategies are effective real-world adaptation measures for the Absheron Peninsula.

4.Future research should explore the interactions of climate adaptation with other factors, such as economic and social impacts, and assess the economic ef ciency of adaptation measures.

The study s results show that implementing appropriate irrigation systems and using modern soil conservation technologies can be bene cial in real-world applications. These measures serve as effective strategies for maintaining and improving agricultural productivity in the context of climate change.

Future research is recommended to further investigate the relationships between agriculture and climate change and to test adaptation measures on various crop types. Additionally, studying the long-term economic impacts of adaptation measures would be bene cial. This research reaf rms the importance of climate change adaptation for sustainable agricultural development in the Absheron Peninsula. The application of these measures is critical for ensuring agricultural resilience and providing socio-economic bene ts to local farmers.

References

1. B.H. Aliyev (2002). Ecological Problems of the Absheron Peninsula and Their Solutions. Baku-AzMIU.]
2. Gurbanov, H.N. (2024). The Negative Effects of Climate Change on Agriculture and Digital Technologies Addressing These Effects. Ganja: Agromechanics Research Institute.
3. Abdennabi Morchid, Rachid Jebabra , Haris M. Khalid, Rachid El Alami, Hassan Qjidaa, Mohammed Ouazzani Jamil.(2024) Results in Engineering(23), 1-16
4. Mammadov, T., & Ashrafova, Sh. (2022). Climate Change Impact on the Absheron Peninsula Vegetation. Bulletin of Science and Practice, 8(5), 102-111. https://doi.org/10.33619/2414-2948/78/12
5. Climate Change and Agriculture (CABI Publishing) https://www.cabidigitallibrary.org
6. https://www.istockphoto.com

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DEVELOPMENT OF CITRUS FRUIT AND TEA CULTIVATION IN THE LANKARAN NATURAL REGION

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Abstract

The article discusses the development of citrus fruit cultivation and tea growing in the Lankaran natural region and the factors in uencing it. Located in the southeastern part of the Republic, the Lankaran Natural Region is bordered by the Caspian Sea to the east. This region includes Lankaran, Masalli, Astara, Jalilabad, Yardimli, and Lerik districts. Upon examining the increase in subtropical fruit cultivation and tea growing, we observe that within the natural region, it has developed into a diversi ed agricultural system. Although many scienti c studies have focused on the development of tea growing and citrus fruit cultivation, the establishment of tea and citrus fruit plantations of industrial signi cance has not yet been achieved. The study notes that after the Republic of Azerbaijan gained independence, national leader Heydar Aliyev paid special attention to the development of these sectors. The development of tea growing is crucial for the economic growth of the country, as it plays a significant role. By improving this sector, it is possible to reduce dependence on imports from foreign markets and stimulate the growth of the domestic market. Research has shown that the region s natural climatic conditions are favorable for the cultivation of citrus fruits and tea plants. The scienti c research examines the quality indicators of the natural resources that in uence the development of these sectors. The innovation in this study lies in investigating the impact of the region s ecological-geographical and natural climatic conditions on the development of tea growing and citrus fruit cultivation to achieve higher productivity.

Keywords: Geographical position, tea cultivation, citrus fruit cultivation, natural climatic conditions, development

Introduction:

The Lankaran natural region, located in the southeastern part of the Republic, is bordered by the Caspian Sea to the east and southeast and by the Islamic Republic of Iran to the southwest. Administratively, the region encompasses the districts of Lankaran, Masalli, Jalilabad, Astara, Lerik, and Yardimli. Situated in a humid subtropical zone, Lankaran stands out from other regions due to its natural climatic conditions, geographic position, and diverse relief forms. These features have created favorable conditions for the development of signi cant agricultural sectors in the region. The primary agricultural activities within the area include vegetable farming, potato cultivation, grain production, rice farming, and viticulture. Overall, the region is primarily known as a citrus fruit and tea production area.[3] Research shows that the subtropical agriculture of the region has evolved into a diversi ed agricultural system. The region produces 75% of the country s tea, 100% of its citrus fruits, and 60-65% of its vegetables. This is attributed to the presence of yellow and acidic soils, which are particularly suitable for citrus cultivation.[1]

Problem Statement: Despite its potential, the area of tea plantations and their productivity declined signi cantly until 2010. Although numerous scienti c studies have been conducted on the development of tea and citrus production, industrial-scale plantations have yet to be established.

Research Objective: This study aims to identify pathways for establishing industrial-scale tea plantations and enhancing the development of citrus cultivation in this subtropical region. The research examines the qualitative characteristics of natural factors in uencing tea and citrus cultivation, the impact of state programs, and other contributing factors.

Research Object and Materials

The development of industrial-scale plantations is economically signi cant. Research ndings indicate that improving the key agro-landscape systems of the region, such as citrus fruit and tea cultivation, can address a substantial portion of domestic demand and reduce unemployment in the region. National Leader Heydar Aliyev paid special attention to this sector, and the current President Ilham Aliyev continues to prioritize its development. Since 2016, various measures have been implemented in this direction. The Presidential Decree No. 3227, issued on September 12, 2017, On Additional Measures for the Development of Citrus Fruits, Tea, and Rice Production in the Republic of Azerbaijan, further strengthened state support for the tea industry. By improving this sector, it is possible to reduce dependence on imports and stimulate growth in the domestic market. Notably, by 2017, the area of tea plantations had doubled compared to 2010. Between 2017 and 2021, 980 hectares of new tea plantations were established, and new tea processing factories were launched. Currently, there are 10 operational tea processing factories.[5] A table summarizing the growth in production between 2017 and 2021 can provide further insights. [4] Under the framework of the State Program, the area of tea plantations is planned to be further expanded by 2027 [5].

Table 1. Amount of tea production in the province (tons)

Regions	Years					
	2016	2017	2018	2019	2020	2021
Astara	645,6	476,8	530,3	583,4	628,2	788,7
Lankaran	313,3	241,3	278,3	281,8	232,1	317,3
Masallı	3,2	3,1	5.4	8,8	15,6	15,5
Total	962,1	721,2	814	874	875,9	1121,5

The state programs adopted in 2017 have facilitated the development of citrus fruit cultivation alongside other agricultural sectors. A State Program for the development of citrus fruit cultivation in the Republic for the years 2018-2025 was also adopted. Compared to 2010, an increase in the area of orchards and productivity was observed in 2017. A table provides the productivity indicators for the years 2016-2021 [6].

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Table 2. Annual production of citrus fruits (tons)

Citrus fruits	Years					
	2016	2017	2018	2019	2020	2021
Lemon	4515	4523	4555	4762	4881	5275
Orange	3004	3017	3091	3477	3926	4517
Tangerine	39153	35222	37016	38536	39924	45767
Total	46672	42762	44662	46775	48731	55559

The research focuses on the development trends of tea plantations and citrus orchards in the Lankaran-Astara economic region, a sub-tropical zone. Fieldwork was conducted in tea plantations and citrus orchards located in Istisu settlement and Girdani village of Lankaran district. During the research, it was observed that tea cultivation predominantly employs Japanese technology.

Results and Discussion

The study revealed that the development of citrus fruit and tea cultivation, as the main agro-landscape complexes of this region, meets a signi cant portion of domestic demand and contributes to reducing unemployment. Approximately 68-75% of the country s demand for dry tea is met through domestic production.[4] Thereby reducing dependency on foreign markets and stimulating the growth of the domestic market. It is known that tea plants begin yielding harvests after 7-9 years, making proper agro-technical care crucial during this period. Proper irrigation plays a pivotal role among these measures. In the tea plantations examined, irrigation was carried out using a sprinkling method with modern technical equipment. Additionally, organic fertilizers were predominantly used, facilitating the production of ecologically clean tea leaves.

The study also con rmed that tea cultivation in the region relies signi cantly on Japanese planting techniques. Depending on the ecological, geographical, and climatic conditions, tea and citrus plants can produce yields for 60-70 years, and they adapt well to the local vegetation cycle. Since subtropical plants have high heat requirements, it is essential to consider the length of frost-free days during their growth. Considering the ecological and geographical features of this district, it would be prudent to use various tea varieties and citrus fruits with different ripening periods.[2]

Conclusion

This research introduces an analysis of how the ecological, geographical, and natural climatic conditions of the region, along with state programs, in uence the development of tea and citrus cultivation to achieve higher productivity. State programs such as the 2018-2027 Development Program for Tea Cultivation and the 2018-2025 Development Program for Citrus Cultivation in the Republic of Azerbaijan have signi cantly contributed to achieving positive outcomes in the traditional agricultural sectors of tea and citrus production.

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References

1. Aliyev, R.F. (2005). Economic-Geographical and Ecological Problems of the Territorial Organization of Subtropical Agriculture in the Lankaran Region. Baku.

2. Agazade, S.A. (2021). Integrated Development Directions of Agricultural Sectors in the Lankaran-Astara Economic Region. Nature and Science International Journal, 3(2), 68.

3. Balayev, K.A., Mammadzade, E.A., & Ahmadli, T.N. (2022). The Role of Ecological Factors in the Development of Agriculture in the Lankaran-Astara Economic Region. Azerbaijan National Aerospace Agency Journal, 2 (25), 36.

4. State Program on the Development of Tea Growing in the Republic of Azerbaijan for 2018 2027.

5. State Program on the Development of Citrus Growing in the Republic of Azerbaijan for 2018 2025.

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INFLUENCE OF SEMI-DESERT CLIMATIC CONDITIONS AND IRRIGATION ON MORPHOGENETIC DIAGNOSTICS OF IRRIGATION ALLUVIAL-MEADOW-FOREST SOILS IN THE FLOODPLAND OF THE KUR RIVER

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Abstract.

The importance of river valleys has long been known for the development of agriculture in the ancient East. The river Kur is a major artery of eastern Transcaucasia. The oodplain strip of the lower reaches of the Kur river, 3-5 km wide, is geomorphologically included in the Kur lowland. The river Kura is a major artery of eastern Transcaucasia. The oodplain strip of the lower reaches of the Kura river, 3-5 km wide, is geomorphologically included in the Kura lowland. At the object of study (2021-2023), were selected 2 characteristic plots with an area of 10-15 hectares, in each of which more than 10 soil sections were laid at a depth of 1.3-1.5 m and their detailed soil maps were compiled (1:1000). Weighted deposits of stream and irrigation water have been found to signi cantly in uence irrigated soils, which results in forming a deep (50-60 cm) cultured horizon in the soil pro le, and distinct indications of irrigation deposits. Weighted deposits of stream and irrigation water have been found to signi cantly in uence irrigated soils, which results in forming a deep (50-60 cm) cultured horizon in the soil pro le, and distinct indications of irrigation deposits. Irrigated soils are distinguished by relatively high carbonate content (15-17%), absorption capacity (24-27 mmol-eq) and heavier granulometric composition (<0.01mm=60-67%). Soil density commonly reaches to values of 1.38-1.45 g/cm3 in subsurface and agric horizons that is due to an accumulation of clay (65-70%) and clay-loam (28-39%).

Keywords: alluvial-meadow-forest soils, soil pro le, humus, irrigation, cultivated soil, oodplain, carbonate, fractional composition of humus

Introduction

An importance of the river valleys for the agricultural development of the ancient East has been certain for a long time. The rst information about early agriculture is concerned the places with the favorable regime humidity and high natural potential fertility of the soils which are ood-alluvial [7]. The morphogenetic diagnostics and meliorative characters, of the irrigative soils that spread widely in the river valleys of the subtropics and semidesert zones in Middle Asia and Azerbaijan possessing an ancient farming culture have been comprehn sively learnt [8.9.10].Our comparative geographic studies and their detailed mapping made it possible to signi cantly re ne the structure of the soil cover, classi cation position and nomenclature of the alluvial-meadow-forest soils of Azerbaijan, including the oodplain strip of the Kur river, and stop in more detail on their morphogenetic diagnostics. Irrigated variants of these soils were identi ed as an independent type [2,4].

The results of the research and their discussion byV.V.Akimtsev [5], V.P.Smirnov-Loginov [11] who conducted research in the soils of the lowland forests of Azerbaijan, these soils were rst described as tugai , where the annual precipitation is only 250-300 mm, and where the appearance of forest vegetation is caused by special hydrological features of the area. Therefore, lowland forests are con ned to river oodplains, receiving the water they need from spring and summer oods and from lateral in ltration of river water.In his studies in the arid zones of Azerbaijan, including the oodplain of the Kur river, H.A.Aliyev [1] was against calling soils located in lowland forests tugai . He called them alluvial-meadow-forest, which are formed in combination with alluvial-meadow and alluvial-marsh soils of river oodplains.

Research object and methodology

The river Kur is a major artery of eastern Transcaucasia. The oodplain strip of the lower reaches of the Kur river, 2-5 km wide, is geomorphologically included in the Kura lowland [3]. The soil-forming rocks here are carbonate clay-loamy and sandy loamy layered alluvial deposits. Depending on the microrelief, the groundwater level ranges from 1.0-1.5 m to 2.0-2.5 m and is weakly mineralized (1.5-2.0 g/l). The climate is arid semi-desert subtropical, with an annual rainfall of 350-400 mm, a moisture coef cient <0.3, and an average annual air temperature of 12.5-13.2 C. The vegetation cover, mainly consisting of tugai-liana forests, under the in uence of human economic activity, signi cant areas have been cut down and have undergone fundamental changes. Irrigated areas are used for vegetable, fodder, grain and orchards.At the object of study (2021-2023), were selected characteristic plots with an area of 10-15 hectares, in each of which more than 10 soil sections were laid at a depth of 1.3-1.5 m and their detailed soil maps were compiled (1:10 000).

Results and Discussions

Alluvial-meadow-forest soils are characterized by a normal genetic pro le, a well-developed dark gray humus-accumulative horizon (AUz=25-30cm), with a granular-nutty structure, which is weakly compacted in the middle part of the pro le (AU a=20-25cm) unstable lumpy structure, where the middle and deep layers are clearly distinguished with bluish and brownish-ocher spots of varying degrees of gleying. In the lower layers of the soil pro le, a buried humus horizon (AU_9^h=85-120 m) is observed, which is con rmed by the alluvial origin of these soils. In the object of research, under the in uence of long-term irrigation with muddy river waters, the soil pro le is constantly growing. In contrast to the forest variants, a rather thick cultivated layer (AU +AU a=45-50 m) of dark gray color has formed here and humus is relatively deeply stretched (70-90cm), signs of irrigation sediment are clearly distinguished. Subarable horizon (AU a=22-25cm) is distinguished by a noticeable compaction and a blocky lumpy structure. It is known that, with the degree of turbidity, the physicochemical parameters of suspended sediments also signi cantly affect the morphogenetic diagnostics of irrigated soils [7]. It was revealed that suspended sediments are quite rich in humus (1.0-1.7%), nitrogen (0.07-0.12%), and also contain a signi cant amount of $CaCO_3$ (5.1-10.2%). Suspended sediments are formed from highly humus mountain-meadow and mountain-forest soils of the underlying limestones. Analysis of the salt composition of irrigated river waters showed that they are characterized by high hydrocarbon content (HCO_3=0.12-0.21%), which leads to a noticeable alkalinization of irrigated soil pro les.

According to the regimes of irrigation of agricultural crops in the Republic of Azerbaijan, the following irrigation norms are recommended: for vegetables - 4500-5000 m^3/ha (number of irrigations 6-8 times), alfalfa - 3000-4000 m^3/ha (4-5 times), and for cereals 1000-1500 m^3/ha (3 times). Irrigation is carried out by furrow method 500-700 m^3/ha [8].The granulometric composition of irrigated soils exposed to the above turbid river waters for a long time is heavier than forest soils. A common feature of irrigated alluvial-meadow-forest soils is a signi cant gleying of the middle parts of the soil pro le, where the amount of physical clay (<0.01 mm) reaches up to 62.5-65.2%. A sharp increase is observed in the content of silty particles

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Physico-chemical indicators of alluvial-meadow-forest soils irrigated by the Kura river.

Cut no	Genetic layers and depth, cm			C:N	$CaCO_3$, %	pH of water in solution	Sum of absorbed bases, mmol-ekv	Granulometric composition, %, mm	
								< 0,001mm	< 0,01 mm
Alluvial-meadow-forest soils (under tugai forests)									
325	AO 0-2				Forest litter				
	AU'ca 2-18	4,50	0,26	10,0	12,1	7,8	35,8	17,2	48,1
	AU»ca 18-34	2,15	0,15	7,6	12,7	8,0	28,3	15,6	50,5
	Bgca 34-62	1,06	0,07	8,3	14,6	8,2	29,8	11,7	39,3
	B/Cgca 62-95	0,84	to as.	-	14,6	8,3	25,6	11,2	42,2
	CIgca 95-120	0,70	«--»	-	13,1	8,4	19,3	9,0	33,4
	CIIgca 120-155	0,56	«--»	-	12,7	8,5	14,5	2,2	27,2
Alluvial-meadow-forest irrigated soils (under a perennial alfalfa plant)									
314	AU'aca 0-24	3,01	0,20	9,7	12,5	8,2	26,3	27,2	62,0
	AU'aca 24-46	2,29	0,17	8,5	12,3	8,2	25,4	34,0	69,0
	A/Bca 46-68	2,52	0,13	7,1	11,8	8,4	22,5	17,7	42,8
	CIgca 68-91	0,68	to as.	-	11,4	8,5	20,3	13,7	33,6
	AU^h ca 91-126	1,48	"—"	-	10,2	8,3	24,6	26,8	39,0
	CIIgca 126-160	0,93	"—"	-	11,4	8,6	18,4	6,8	25,9
Under tomato									
323	AY'aca 0-23	2,01	0,19	6,1	10,5	7,9	19,3	21,8	46,6
	AY»aca 23-42	1,78	0,16	6,4	11,3	8,1	17,4	24,1	52,2
	A/Bca 42-67	1,67	0,13	7,0	12,2	8,4	15,3	27,6	53,5
	CIgca 67-90	0,92	to as.	-	13,0	8,5	14,5	12,2	21,6
	AU^h_g ca 90-115	1,38	"—"	-	12,6	8,3	18,6	20,4	40,3
	CIIgca 115-150	0,45	"—"	-	11,4	8,6	14,2	5,6	18,1
Under grain (wheat)									
327	AU'aca 0-25	2,83	0,22	7,6	9,1	8,3	32,9	25,5	68,0
	AU'aca 25-48	2,44	0,17	7,5	11,5	8,4	29,8	28,5	69,7
	A/Bca 48-73	1,78	0,18	5,5	12,7	8,4	30,1	32,7	78,5
	Bgca 73-98	1,34	to as.	-	14,9	8,5	28,7	29,8	76,8
	B/Cgca 98-126	0,88	"—"	-	11,8	8,6	23,5	8,9	46,9
	Cgca 126-170	0,59	"—"	-	11,0	8,7	19,3	12,2	31,8

(<0.001mm=28.2-30.6%). In the subsurface horizon, the density usually increases to 1.42-1.48 g/cm^3.

Irrigation processes signi cantly change the content and nature of the distribution of carbonates along the soil pro le. Compared to forest soils, in the upper layers (0-25 cm) of irrigated soils, the $CaCO_3$ content is 3-5% higher. This can be explained by the high carbonate content of irrigation water sediments. A fairly high content of $CaCO_3$ (13-17%) is observed in the middle part of the soil pro le of irrigated soils.

In the cultivated layers of irrigated soils, the value of the exchange capacity is 24.0-30.5 mmol-eq, then with depth there is a gradual drop of 17.4-21.0 mmol-eq. Usually in the lower buried humus horizons (AU^h_9) its value reaches 25.8-28,4 mmol-eq. Compared to forest soils, the upper horizons of irrigated soils are alkaline (=8.0-8.5).

Conclusion

Suspended sediments of irrigation waters are characterized by rather rich humus (0.9-1.7%), gross nitrogen (0.07-0.12%), high carbonate content ($_3$=5.1-10.2%).

Irrigated soils are distinguished by relatively high carbonate content (15-17%), absorption capacity (24-27 mmol-eq) and heavier granulometric composition (<0.01mm=60-67%).

In arable horizons (AU a=0-25cm), the content of humus (2.8-3.1%) and nitrogen (0.21-0.24%) is somewhat reduced. However, with the accumulation of agro-irrigation sediments, the establishment of the direction of the cultural soil-forming process, the content and stock of organic matter gradually increase in the soil pro le (230-245t/ha).

References

1. Əliyev H.Ə. Böyük Qafqazın şimal-şərq hissəsinin meşə və meşə-bozqır torpaqları. // Azərb. SSR EA-nın nəşriyyatı, Bakı, 1964, 264 s.
2. Həsənov V.H. Azərbaycanın allüvial-hidromorf torpaqlarının təkamülü və təsnifatı. // AMEA Torpaqaqşünaslıq və Aqrokimya İn-nun əsər., XVI cild, "Elm", Bakı, 2004, s. 134-156
3. Şirinov N.Ş. Kür-Araz ovalığının hidroloji quruluşu. Bakı, 1973,342s.
4. Hasanov V.H., Ismayilov B.N., Morphogenetical diagnostics of alluvial-meadow-forest soils dry subtropics in the flood-lands of Azerbaijan, // ISSN: 2146-7072 Soil-Water journal, 2013,Vol. 2, N 2 (1) pp. 1167-1176.
5. Акимцев В.В. Почвы Прикаспийской низменности Кавказа. Ростов н/Д, 1957, 392 с.
6. Бабаев М.П. Орошаемые почвы Кура-Араксинской низменности и их производительная способность. Изд. "Элм", Баку, 1984, 172 с.
7. Бернал Дж. Наука и история общество. Изд. иност. литер.,М.,1956, 367 с.
8. Ковда В.А. Основы учения о почвах. Наука, М., 1973, кн. 2, 467 с.
9.Минашина Н.Г.Орошаемые почвы полупустынь и их мелиорация. М. Колос, 1974, 365 с.
10. Орлов М.А. Новая терминология окультуренных почв долин Средней Азии. Труды Ташкентского университета. 1966, вып. 283. С. 69-78.
11. Смирнов-Логинов В.П. К вопросу о называемых "тугайных" почвах. // Тр. Азерб. ФАН СССР, 1938, т.2, с. 45-67.

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THE EFFECT OF CLIMATE CHANGE ON INSECTS

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Abstract

Global warming and climate change have profound effects on many living species on earth. Insects are at the forefront of these creatures. Climate change has various effects on insects. Increasing temperatures can cause some insect species to shift their habitats to higher altitudes or to the north. In this case, it can disrupt the balance of local ecosystems. Since high temperatures can affect the reproductive cycles and development rates of insects, some species can reproduce faster, while others can be negatively affected by this situation. Since climate change can affect the growth, phenology and owering time of plants, insects can be directly affected by the change since these plants are the food source of insects. This situation can also affect the life cycle of pollinator insects. In addition, climate change can facilitate the spread of diseases and parasites for insects. Warm weather can increase the population of harmful insects. In addition, insects play important roles in the ecosystem. Climate change can disrupt the ecosystem balance by affecting prey-predator relationships and interactions with other species. All these effects can threaten both insect populations and general ecosystem health. This article will examine the effects of climate change on insects in detail.

Keywords: Warming, Arthropods, Pests.

Introduction

Climate change refers to changes in average weather conditions over long periods of time. These changes occur in climate elements such as temperature, precipitation and wind. Climate change leads to higher temperatures, rising sea levels, more extreme weather events and changes in ecosystems. These changes can have serious consequences for the ecosystem. All living things in the ecosystem can be affected by climate change (Dash, 2020; Huang et al. 2021; Skend i et al. 2021; Bhairavi and Sravanthi 2023; Eickermann, 2023). Climate change affects many biotic and abiotic factors in nature, particularly plant production (Dash, 2020; Kumar et al., 2024). Insects are among the groups of organisms expected to be most affected by global climate change, as they represent the majority of living species on Earth (Menendez, R. 2007). In particular, insects that produce many offspring, insects with high reproductive potential, and invasive insects that have newly invaded a region are the insects most affected by global warming (Zhou et al. 1995, Harrington 2007; Kannan and James, 2009; Stoeckli et al., 2012; A k n and Ak a 2022;). Climate change not only affects insects in agricultural production areas, but also directly affects urban pests such as mosquitoes and house ies, which are important pests in human habitats, and forest pests such as the pine processionary caterpillar in forest areas (A k n and Ak a 2023).

Climate change has many direct and indirect impacts on insects. This article focuses on some of the direct effects of temperature, which plays an important role in climate change, on insects.

Research Object and Materials

The Effect of Climate Change on Insect Development

Temperature change is one of the most important factors directly affecting the metabolism and biology of insects (Menendez, R. 2007; Dahi et al. 2009; Dash, 2020; Huang et al. 2021; Bhairavi and Sravanthi 2023; Eichermann et al., 2023). As insects adapt their body temperature to their environment, changes in temperature affect their energy expenditure and biological activities. In general, the metabolic rate of insects increases with increasing temperature (Skend i et al. 2021; Kumar et al., 2024). Insects continue their lives depending on the host, temperature and other environmental factors. The phenology of host plants is very important in the life of insects. Each insect feeds on the plant during different phenological periods. Temperature directly affects both the biology of the insect and the phenology of the plant. For example, if the winter is very cold and harsh, the insect will emerge late from hibernation and the phenological development of the plant will be later than in normal seasons. If the winter is warmer, the insect emerges from its overwintering sites earlier and starts feeding on plants earlier. The increase in insect metabolic rate due to temperature also increases the nutritional requirements of insects. Therefore, high temperatures cause insects to expend more energy. Of course, depending on the biology of the insect, this is the case when the temperature rises to a certain extent. Temperature can shorten the life cycle of insects by affecting their development period (Sable and Rana, 2016; Skend i et al. 2021). A certain increase in temperature causes the pre-adult biological stages of the insect to be completed more quickly and in a shorter period of time. The most important reason why the Mediterranean fruit y (Ceratitis capitata) has a shorter developmental period and produces more generations in the Mediterranean region of Turkey compared to the Black Sea region is temperature. However, extreme temperatures can cause stress in the developmental process of some insects and may also negatively affect the development of some individuals.

The Effect of Climate Change on Insect Reproduction

Temperature can affect reproduction rates and survival times of insects (Golizadeh et al. 2009; Dash, 2020; Huang et al. 2021; Skend i et al. 2021). However, this is only true within certain temperature ranges. Extreme temperatures can negatively affect reproductive success. The egg-laying ef ciency of female insects can vary with temperature changes. Each insect has a speci c temperature requirement. This temperature requirement has minimum, optimum and maximum values. Increasing the temperature from minimum to optimum within these limits increases the insect s biological parameters such as feeding, egg-laying and number of generations. For this reason, the number of generations and the development times of the insects that give rise to generations are different, especially in different countries and regions. It is estimated that the number of generations produced per year in aphids (Hemiptera: Aphididae) will increase by 4 or 5 generations with a 2 C temperature increase (Harrington et al., 2001).

Impact of Climate Change on Insect Populations

Rising temperatures due to climate change have important consequences for insect populations, affecting their dynamics, distribution and interactions in ecosystems (Wilson et al., 2005; Sable and Rana, 2016; Sohail et al.2017). Rising temperatures cause insects to develop in less time by accelerating their physiology, increasing their reproductive output and increasing the number of generations per year. Although it is thought that rising temperatures may reduce insect populations under some conditions, it is known that warm weather in temperate

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climates leads to more insect species and higher insect populations (Petzoltd and Seaman, 2007). Reduced insect winter mortality due to warmer winters can play an important role in increasing insect populations (Bale et al., 2002; r and Tuncer 2011). Higher temperatures generally accelerate the development of insects and lead to shorter life cycles. Many species may reproduce more rapidly, leading to population explosions (Skend i et al. 2021; Kumar et al., 2024). For example, warmer conditions can lead to increased egg production and faster maturation of larvae and nymphs. However, extreme temperatures can cause stress, potentially increasing mortality and negating the bene ts of faster reproduction. Insects may also expand their geographical ranges and move into previously unsuitable habitats as temperatures rise (Wilson et al., 2005). This change can lead to population growth in new areas, but it can also lead to the extinction of native species in the new area as some species struggle to adapt to the changing conditions (Thomas et al. 2004). Insect populations are closely linked to their ecosystems, and changes in temperature can disrupt these relationships. For example, predator-prey dynamics may change as temperatures rise. Some predators may reproduce faster than their prey, potentially leading to imbalances in food webs. These changes can cascade through the ecosystem, affecting plant health and the survival of other species. In some cases, rising temperatures can cause physiological stress in insects, affecting their growth, reproduction and survival. Heat stress can weaken the immune response, making insects more susceptible to diseases and parasites. In extreme cases, this can lead to population declines. Conversely, some species may develop tolerance to higher temperatures, potentially changing the structure of insect communities. Furthermore, species that cannot adapt quickly enough to rising temperatures may become extinct, while more adaptable species may thrive, leading to the homogenisation of insect communities. This loss of diversity can have profound effects on ecosystem functions such as pollination, nutrient cycling and pest control. In short, the impact of rising temperatures on insect populations is diverse and profound.

The Impact of Climate Change on the Distribution of Insect Species

As insects are cold-blooded organisms, their distribution is closely linked to climate (Burgi and Bills, 2012; Sheikh et al. 2017). Fundamental parameters such as insect phenology, mating, host finding and colonisation affect the migratory behaviour of insects. The temperature thresholds required for insect flight vary both between and within species, depending on season and region. In addition to their physiological structures, insects are also influenced by environmental conditions, such as weather, in their flight activities (Yaşar et al. 2021). The geographical ranges of many insect species in temperate regions are determined by temperature thresholds. For example, reduced snowfall has recently caused Thaumetopoea pityocampa to expand into high mountains (Kiritani, 2006). About 63% of 35 butterfly species in Europe have shown a tendency to migrate northwards in response to a 0.8°C increase in temperature. It is estimated that these changes will continue over the next century and that many species will become extinct (Ward and Master, 2007). An example of insect migration due to temperature is Nezara viridula (L.), which started to live in England, and Tuta absoluta, one of the most important tomato pests today. The best example of global warming and climate change is Halyomorpha halys (Stål, 1855), which has been a problem in Turkey in recent years and was first seen in Turkey in 2017 and has now spread to about 27 of our provinces.

Results and Dicussions

Climate change has profound and far-reaching effects on insects. When we think of climate change, we think of changes in temperature, precipitation and carbon dioxide in the air. These factors also have direct and indirect effects on insects. Among these, temperature plays an important role. This article discusses some of the direct effects of temperature on insects due to climate change. Apart from the effects of temperature on insects described in the article, there are also many indirect effects. We can list these as: effects on insect hosts, parasites and predators, and control methods. The impact of climate change on the ecosystem should be assessed as a whole. In order to reduce the negative effects of ongoing climate change on the ecosystem in the future, the necessary measures should be taken by thinking holistically.

References

Aşkın, A.K., Akça, İ., Saruhan, İ., Altaş, K. (2022). "Karadeniz Bölgesindeki Önemli İstilacı Böcek Türleri", İstilacı Zararlı Türler Ve Mücadelesinde Yeni Yaklaşımlar, eds. Gülay Kaçar, Paradigma Akademi, 2022, ss. 171-205, ISBN:978-625-6957-26-8.

Aşkın, A.K., Akça, İ. (2023). "Önemli Kentsel Zararlılardan Musca domestica L. (Diptera: Muscidae)'nin Tanınması, Biyolojisi ve Mücadele Yöntemleri", Böcek ve Nematodlarda Davranış Şekilleri ve Mücadele Olanakları, eds. Gülay Kaçar, Paradigma Akademi, 2023, ss. 228-281, ISBN: 978-625-6714-22-9.

Bale, J. S., Masters, G. J., Hodkinson, I. D., Awmack, C., Bezemer, T. M., Brown, V. K., ... & Whittaker, J. B. (2002). Herbivory in global climate change research: direct effects of rising temperature on insect herbivores. Global change biology, 8(1), 1-16.

Bhairavi, KS. and Sravanthi, E., 2023. Global Warming and Effect on Insect Pests. Advances in entomology. Editors: Saai Vignesh B., Rajan Kamboj, B. Sujatha, Dr. Shrawan Kumar Sahani and Kapil Attri . Vol. 3, Chapter 5. 251-267. Book DOI: https://doi.org/10.22271/int.book.298

Bürgi, L. P., & Mills, N. J. (2012). Ecologically relevant measures of the physiological tolerance of light brown apple moth, Epiphyas postvittana, to high temperature extremes. Journal of Insect Physiology, 58(9), 1184-1191.

Dahi, H. F., Ibrahem, W. G., & Ali, M. M. (2009). Heat requirements for the development of the black cutworm, Agrotis ipsilon (Hüfnagel)(Noctuidae: Lepidoptera). Egyptian Academic Journal of Biological Sciences. A, Entomology, 2(1), 117-124.

Dash, L. (2020). Effect of Climate Change on Insect Behaviour. International Journal of Current Microbiology and Applied Sciences .9(2): 1667-1672

Eickermann, M., Junk, J., & Rapisarda, C. (2023). Climate change and insects. Insects, 14(8), 678.

Fu, D. M., He, H. M., Zou, C., Xiao, H. J., & Xue, F. S. (2016). Life-history responses of the rice stem borer Chilo suppressalis to temperature change: Breaking the temperature–size rule. Journal of Thermal Biology, 61, 115-118.

Golizadeh, A., Kamali, K., Fathipour, Y., & Abbasipour, H. (2009). Effect of temperature on life table parameters of Plutella xylostella (Lepidoptera: Plutellidae) on two brassicaceous host plants. Journal of Asia-Pacific Entomology, 12(4), 207-212.

Harrington, R., Fleming, R. A., & Woiwod, I. P. (2001). Climate change impacts on insect management and conservation in temperate regions: can they be predicted?. Agricultural & Forest Entomology, 3(4).

Harrington, R., Clark, S. J., Welham, S. J., Verrier, P. J., Denholm, C. H., Hulle, M., ... & European Union Examine Consortium. (2007). Environ-

ISBN: 978-9952-8545-1-0 https://doi.org/10.30546/19023.978-9952-8545-1-0.2025.0756

mental change and the phenology of European aphids. Global change biology, 13(8), 1550-1564.

Huang, L. L., Xue, F. S., Chen, C., Guo, X., Tang, J. J., Zhong, L., & He, H. M. (2021). Effects of temperature on life history traits of the newly invasive fall armyworm, Spodoptera frugiperda in Southeast China. Ecology and Evolution, 11(10), 5255-5264.

Kannan, R., & James, D. A. (2009). Effects of climate change on global biodiversity: a review of key literature. Tropical Ecology, 50(1), 31.

Kiritani, K. (2006). Predicting impacts of global warming on population dynamics and distribution of arthropods in Japan. Population Ecology, 48(1), 5-12.

Kumar S., Kumar P., Suryawanshi D. and Omar V., 2024. Effect of Global Warming on the Insect-Pest of Agricultural Crops. Advances in Agricultural Entomology. Chief Editor Dr. Karem Ghoneim Volume – 26, Chapter 5. 69-83.

Kurt, Y., Aşkın, A.K., Akça, İ. (2022). "Investigation of the effect of low temperature against Sitophilus granarius (L.) (Coleoptera: Curculionidae)". Campılho, R.D.S.G. (Eds.). in: VI. Internatıonal New York Academic Research Congress On Life And Applied Sciences Proceedings Book (s. 59-65). New York: Bzt Academy Publishing House.

Jamieson, M. A., Burkle, L. A., Manson, J. S., Runyon, J. B., Trowbridge, A. M., & Zientek, J. (2017). Global change effects on plant-insect interactions: the role of phytochemistry. Current opinion in insect science, 23, 70-80.

Johansen, B.E. 2002. The Global Warming Desk Reference. Greenwood Press,Westport,CT.353pp

Menéndez, R. (2007). How are insects responding to global warming?. Tijdschrift voor entomologie, 150(2), 355.

Ögür, E. & Tuncer, C. (2011). Küresel Isınmanın Böceklere Etkileri. Anadolu J Agr Sci, 26(1):83-90

Petzoldt, C., Seaman, A., (2007). Climate change effects on insects and pathogens. Climate change and agriculture: promoting practical and profitable responses. Available from URL: http://www.climateandfarming.org/pdfs/ FactSheets/III.2Insects.Pathogens.pdf [Erişim: 10 Eylül 2010].

Sable, M. G., & Rana, D. K. (2016). Impact of global warming on insect behavior-A review. Agricultural Reviews, 37(1), 81-84.

Sharma, H. C. (2010, April). Effect of climate change on IPM in grain legumes. In 5th International Food Legumes Research Conference (IFLRC V), and the 7th European conference on grain legumes (AEP VII) (pp. 26-30).

Sheikh, A. A., Rehman, N. Z., & Kumar, R. (2017). Diverse adaptations in insects: A review. Journal of entomology and zoology studies, 5(2), 343-350.

Skendžić, S., Zovko, M., Živković, I. P., Lešić, V., & Lemić, D. (2021). The impact of climate change on agricultural insect pests. Insects, 12(5), 440.

Sohail, M., Aqueel, M. A., Ellis, J. D., Afzal, M., & Raza, A. M. (2017). Seasonal abundance of greater wax moths (Galleria mellonella L.) in hives of western honey bees (Apis mellifera L.) correlates with minimum and maximum ambient temperature. Journal of Apicultural Research, 56(4), 416-420.

Stoeckli, S., Hirschi, M., Spirig, C., Calanca, P., Rotach, M. W., & Samietz, J. (2012). Impact of climate change on voltinism and prospective diapause induction of a global pest insect–Cydia pomonella (L.). PloS one, 7(4), e35723.

Thomas, M. B., & Blanford, S. (2003). Thermal biology in insect-parasite interactions. Trends in Ecology & Evolution, 18(7), 344-350.

Thomas, C. D., Cameron, A., Green, R. E., Bakkenes, M., Beaumont, L. J., Collingham, Y. C., ... & Williams, S. E. (2004). Extinction risk from climate change. Nature, 427(6970), 145-148.

Ward, N. L., & Masters, G. J. (2007). Linking climate change and species invasion: an illustration using insect herbivores. Global Change Biology, 13(8), 1605-1615.

Wilson, R. J., Gutiérrez, D., Gutiérrez, J., Martínez, D., Agudo, R., & Monserrat, V. J. (2005). Changes to the elevational limits and extent of species ranges associated with climate change. Ecology letters, 8(11), 1138-1146.

Yaşar, İ., Kök, Ş., & Kasap, İ. (2021). Küresel Isınma ve İklim Değişikliğinin Böcekler Üzerindeki Olası Etkileri. Lapseki Meslek Yüksekokulu Uygulamalı Araştırmalar Dergisi, 2(4), 67-75.

Zhou, X., Harrington, R., Woiwod, I. P., Perry, J. N., Bale, J. S., & Clark, S. J. (1995). Effects of temperature on aphid phenology. Global Change Biology, 1(4), 303-313.

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PROTECT ON OF WATER RESOURCES AND THE R EFF C ENT USE

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Abstract

Water resources are one of the main parts of the economic and ecological system of every country. Due to the geographical location and climatic characteristics of Azerbaijan, the protection and ef cient management of water resources are of particular importance. In recent years, climate change, population growth and expansion of economic activity have further increased the demand for water resources in the country. According to statistical data, in 2023, approximately 70% of Azerbaijan s water resources were used in agriculture, which indicates a high demand for water in the country s main economic activity. According to data for 2023, 70% of the existing water resources in Azerbaijan were used for agriculture, 18% for the industrial sector, and 12% for drinking water needs. The article analyzes ways to reduce losses and use them ef ciently by applying modern water management models. The article, which aims to assess the current state of Azerbaijan s water resources and identify strategic measures aimed at their protection, emphasizes the importance of recycling technologies, water loss reduction and modern approaches to water resource management.The results show that the reuse and reconstruction of water supply networks are important directions for ef cient water management. Information is provided on strategies aimed at sustainable management of water resources and protection of ecological balance in our republic.

Keywords: water resources, environmental sustainability, ef cient management.

Introduction.

The republic s drinking water sources mainly include our rivers, some lakes, various types of wells, wells, etc. The most common types of water sources today are characterized by mild pollution, severe pollution, and salinity. The rivers and springs located in the mountainous and foothill regions of Azerbaijan are notable for their ecological purity. The liberated territories, especially the water resources of the Lesser Caucasus, are very valuable in this regard. Since these territories are located above sea level, the ecosystem has been preserved in a more natural way. In these places, where the population is sparsely or sparsely populated, the soil cover and forest areas are almost untouched. The absence of farms using chemical fertilizers and the absence of other sources of pollution ensure the natural purity of the waters in these areas. These waters contain enough minerals necessary for the human body. Therefore, the rivers and springs in the liberated territories have great potential for both drinking water and other purposes. Now the study, protection and ef cient use of these water resources is of strategic importance for Azerbaijan. This can make a great contribution not only to improving the water supply of the population but also to increasing the overall water resources of our country. Proper management of these natural resources in our liberated lands creates a great opportunity for the future.

Water Sources and Usage in Azerbaijan

The renewable fresh water resources of the Republic of Azerbaijan are 26.2 billion cubic meters. Of these water resources, 8.4 billion cubic meters are formed by groundwater, 4.6 billion cubic meters by local river ows, and 13.2 billion cubic meters by transboundary surface waters. 17.8 billion cubic meters (67.9 percent) of the renewable fresh water resources are formed by surface fresh water resources. Azerbaijan s water resources are limited compared to other bordering countries of the South Caucasus and constitute about 15 percent of the water resources in the entire region. The per capita water resources in Azerbaijan are also the lowest compared to neighboring countries.

Renewable surface freshwater resources, billion cubic meters

	2000	2005	2010	2015	2020	2023
Transboundary water resources	18.8	19.6	23.1	14.2	9.4	13.2
Local rivers	4.6	4.3	5.6	4.2	4.5	4.6
Total	**23.4**	**23.9**	**28.7**	**18.4**	**13.9**	**17.8**

Surface water resources are mainly concentrated in rivers. There are 8359 rivers in the territory of our republic. Most of them are small (less than 5 km long) and low- owing. Approximately 75 percent of the territory of Azerbaijan is included in the Kura River basin. 70 percent of the river s water resources are formed in the territory of neighboring states, and the rest (local ow) is formed from internal rivers.During drought years, a sharp decrease in the volume of transboundary water resources is observed. At the same time, the water resources of the Kura and Araz rivers are signi cantly reduced as a result of absorption by water intake facilities in the territory of neighboring countries. This creates serious dif culties in meeting the country s water demand. Currently, the use of water resources is rapidly increasing all over the world, and water supply in most regions and countries is sharply decreasing. If in the future the water economy develops at the same pace as in the last 10-15 years, then by 2035 catastrophic water shortages will be observed in regions where 40% of the Earth s population lives. In such regions, the amount of water per capita per year will be less than 1000 m3, which corresponds to a very low level of water supply. In order to improve water supply in the future, it is not enough to simply reduce water use, and research and practical work should be accelerated to increase water resources. All measures aimed at reducing anthropogenic impact on water resources and solving the problem of freshwater shortage, thus stabilizing and even increasing water supply, can be divided into two groups.

Strategies for Water Resource Management

The rst group of measures involves increasing usable water resources in the regions in the following ways.

Perennial and seasonal regulation of river ow;

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Using centuries-old reserves of freshwater;

Arti cially increasing atmospheric precipitation;

Redistribution of water resources across the territory through canals and water pipelines.

The second group of measures is based on the use of more modern technologies that allow saving water used in agriculture, industry, and utilities.Protecting and properly managing water resources in Azerbaijan is an integral part of our daily lives and future. As climate change and population growth increase the demand for water, the ef cient use of available resources becomes even more important. Improving irrigation systems, introducing water reuse methods and cost-effective approaches should be at the center of attention of each of us. River water resources of any country, as a natural process, are considered one of the main guarantees of socio-economic, stable and sustainable development. In this regard, the correct assessment of water resources, more accurate prediction of processes occurring in water bodies under the in uence of modern climate changes, meeting the country s water needs, and their use are of great social, economic, and even political importance. A large part of our country s water resources depend on transboundary rivers, which highlights the importance of international cooperation and appropriate water policies. Water is not only a natural resource, but also of strategic importance for the sustainability of life. Therefore, a culture of water conservation should be a priority at the individual and national levels tegic Importance of Water Protection in Azerbaijan.

Water resources play a crucial role in maintaining food security and social stability. Water scarcity in Azerbaijan negatively affects food production and agriculture. Therefore, saving water is essential for the country s economic stability and sustainable development. A large part of Azerbaijan s water resources are supplied by transboundary rivers, which emphasizes the importance of properly establishing regional water policy. Improper management of water resources increases the risk of both regional con icts and water scarcity. Protection and sustainable use of water resources for national security should be one of the top priorities.The protection and sustainable use of water resources in Azerbaijan is of paramount importance. Climate change, rapid population growth, and increasing demand for water necessitate more ef cient and careful management of existing resources. Therefore, proper management of water resources and strengthening international cooperation in this area should be one of the important priorities. Protection of water resources will serve not only to solve current problems, but also to ensure long-term sustainability and water supply for future generations. Promoting regional cooperation through agreements on shared water resources can help reduce potential con icts and increase mutual bene ts. By integrating science, technology, and policy, Azerbaijan can build a sustainable water management system that meets current needs and future sustainability. The protection and ef cient management of water resources is a key objective of national policy. It aims to reduce the impact of limited water resources, solve social and environmental problems, as well as regulate interstate relations, and implement strategies that contribute to economic growth. A holistic approach should be adopted, taking into account both the economic value and strategic importance of water. The quantitative and qualitative issues of water resources of internal and transboundary rivers should be an integral part of this approach.

Conclus on The limited water resources in Azerbaijan and the dependence on transboundary rivers in particular make water management an even more important issue for our country. Natural water sources in the liberated territories offer great opportunities from an ecological perspective, and their ef cient use can make a signi cant contribution to the development of our country. Cooperation at both the local and international levels is essential to overcome water shortages. At the same time, the application of modern technologies and the preservation of ecological balance also play an important role in this process. A well-planned approach will have a positive impact on both social stability and food security.

References

1. T. Guliyev, Economics of Nature Use and Environmental Protection , Baku 2006. p. 260
2. Ziyadkhan Nabibeyli Baku 2012 Ecology and emergencies (168-182) https://www.anl.az/el/Kitab/92715.pdf
3. National strategy for ef cient use of water resources Baku 2020 (5-7) https://static.president.az/upload/Files/2024/10/11/3579828d4b3fb5cd36b497304e510793_1179943.pdf
4. Modern changes and integrated management of water resources of Azerbaijan. Imanov F.A., Alekbarov A.B. Baku 2017 (13-19) https://www.sukanal.az/wp-content/uploads/2017/03/F.Imanov-A.Alekberov.pdf
5. Improving water infrastructure in Azerbaijan using an expenditure support scheme 2023 (13-14) https://www.eu4environment.org/app/uploads/2023/12/Summary-Improving-water-infrastructure-in-AZE-using-an-expenditure-support-scheme.pdf
6. Integrated water resources management Baku-2009 (312-315) https://anl.az/el/m/mz_seiio.pdf

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FEASIBILITY, GREEN SUPPLY CHAIN MANAGEMENT AND SUSTAINABILITY ANALYSIS OF PINEAPPLE FARMING BUSINESS

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Abstract

The purpose of this study was to analyze production costs and pro ts; analyze nancial feasibility, and analyze the practice of green supply chain management in pineapple farming in Kualu Village, Tambang District, Kampar Regency. The method used in this study is descriptive, namely a method that focuses on solving existing problems at present by collecting data, analyzing, explaining, and concluding it. The results of the study indicate that all aspects of business feasibility have been met. The result also in line with sustainability theory. By implementing Green Supply Chain Management (GSCM) in pineapple farming in Kualu Village, environmental sustainability can be achieved without sacri cing economic bene ts. Future studies should focus on the long-term effects of implementing GSCM in pineapple farming.

Keywords: Feasibility, Green Supply Chain Management, Sustainability, Pineapple, Farming

INTRODUCTION

Farmers are not enough to just understand how to produce the best and as many agricultural products as possible and then sell them at the farming level, but currently farmers are required to be able to process them into semi- nished or nished materials (Holyoak et al., 2019)if present, lack the sophistication to allow growers to analyze use, loss, and productivity of water. Water-accounting technologies, if present, do not readily link to business systems to provide the optimal real-time nancial decision-making data, nor the necessary context for new technologies to support a broader integrated approach to water management. Findings of desk-based technology benchmarking suggest elements required include real-time sensory data integration that allows for strategic allocation to the full suite of direct and indirect water costs. Key actor interview and producer surveys highlight demand for a farm business integrated water productivity tool and ndings from eld data collected in a potato case study provide demonstration of how irrigation decision-making can be supported by the crucial link between producers business systems and sensing technology. , author :[{ dropping-particle : , family : Holyoak , given : Joanne L. Tingey , non-dropping-particle : , parse-names :false, suf x : },{ dropping-particle : , family : Pisaniello , given : John , non-dropping-particle : , parse-names :false, suf x : },{ dropping-particle : , family : Buss , given : Peter , non-dropping-particle : , parse-names :false, suf x : },{ dropping-particle : , family : Wiersma , given : Ben , non-dropping-particle : , parse-names :false, suf x : }], container-title : Outlook on Agriculture , id : ITEM-1 , issue : 2 , issued :{ date-parts :[[2019]]}, page : 172-184 , title : Water productivity accounting in Australian agriculture: The need for cost-informed decision-making , type : article-journal , volume : 49 }, uris :[http://www.mendeley.com/documents/?uuid=d07c7fca-9059-44c9-9442-ab959b8da03d]}], mendeley :{ formattedCitation : (Holyoak et al., 2019. The agro-industrial subsystem can be a container for agricultural development, by empowering farmer groups in an area, this is interrelated because agro-industrial activities cannot be separated from the procurement of raw materials that can be obtained from farmers. Kualu Nenas Village is a very potential area for pineapple cultivation. The area of Kualu Nenas Village is 35,000 Ha. Pineapple commodities in Kualu Nenas Village are superior commodities, this is the reason researchers took the research location in Kualu Nenas Village, besides pineapple chip agro-industry entrepreneurs are also only found in Kualu Nenas Village, the area of pineapple cultivation is 1050 Ha. The raw materials for making pineapple chips are superior commodities of Kualu Nenas Village, while the raw materials for making jackfruit chips are brought in from outside the Kualu Nenas area. Pineapple is one of the raw materials needed for agro-industrial activities in the area. In addition to the provision of raw materials, internal and external factors of this agro-industry greatly in uence the development of agro-industry businesses based on farmer groups.

One of the efforts taken to increase farmers income is by cultivating agricultural commodities that have high economic value and have quite large market potential, both domestic and foreign markets. One of the agricultural sectors that is being developed is horticulture which includes fruits, vegetables, and owers. Fruits are quite potential to be developed considering that demand continues to increase. One of the fruit commodities that has prospects for development is pineapple.

Riau Province is the 4th highest producer of pineapple in Indonesia, one of the pineapple producers is in Kualu Village, Tambang District, Kampar Regency. Pineapples from this district can meet the needs of Riau Province and are even sent to other provinces such as Sumatra and even Java. Farmers as implementers expect even greater production in order to obtain greater income, for that, in running their farming businesses, farmers use labor, capital (Chandra & Augustine, 2019; Wati et al., 2024)selected using purposive sampling method in period 2015 to 2017.The result of the analysis indicated that green intellectual capital index had positive in uence on nancial rm performance and transparency could moderating positive in uence sustainability disclosure to nancial rm performance (ROA, and production facilities as bait to obtain the expected production. Sometimes the production obtained is actually smaller and vice versa, sometimes the production obtained is greater.

Farmers in farming always aim to obtain a high income. Income is in uenced by several factors including product selling price, production costs, and sales volume. The size of production costs can of course be in uenced by the use of inputs such as seeds, fertilizers, and labor. The farming business is said to be successful if the farming business can ful ll its obligations to pay interest on capital and tools used, labor wages, production facilities, and others.

From the description above, the problems in this study are, namely (1). How much is the cost of pineapple production per hectare of land in watermelon farming in Kualu Village, Tambang District, Kampar Regency; (2) What is the level of production and income per hectare in pineapple farming in Kualu Village, Tambang District, Kampar Regency; (3) What is the Net Present Value (NPV) per hectare in pineapple farming in Kualu Village, Tambang District, Kampar Regency.

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The objectives of this research are: (1) To analyze production costs and pro ts in pineapple farming in Kualu Village, Tambang District, Kampar Regency; (2) To analyze nancial feasibility in pineapple farming in Kualu Village, Tambang District, Kampar Regency; (3) To analyze practical green supply chain management in pineapple farming in Kualu Village, Tambang District, Kampar Regency.

Sustainability Theory

Sustainability theory provides a framework for assessing the social, environmental, and economic aspects of pineapple farming (Putri et al., 2022; Renaldo, Hafni, et al., 2022)although environmental performance is also important in achieving business sustainability. This study aims to examine the effect of digital technology, ef ciency strategy on business sustainability with quality management as a moderating variable. This study used 91 respondents with structural equation modeling analysis. The novelty of this research is the formation of the dimensions of the variables and the modi cation of the indicators. The results show that digital technology has a negative effect on business sustainability, ef ciency strategy has no effect on business sustainability, quality management has a positive effect on business sustainability, quality management strengthens the positive effect of digital technology on business sustainability, and quality management weakens the effect of ef ciency strategy on business sustainability. Quality management and digital technology are variables that have the biggest in uence on business sustainability, with the main key factor being the customer, so treating customers well will improve the company s sustainable performance. Then all feedback received by the company must be considered and evaluated in order to achieve business sustainability. , author :[{ dropping-particle : , family : Renaldo , given : Nicholas , non-dropping-particle : , parse-names :false, suf x : },{ dropping-particle : , family : Hafni , given : Layla , non-dropping-particle : , parse-names :false, suf x : },{ dropping-particle : , family : Hocky , given : Agus , non-dropping-particle : , parse-names :false, suf x : },{ dropping-particle : , family : Suhardjo , given : , non-dropping-particle : , parse-names :false, suf x : },{ dropping-particle : , family : Junaedi , given : Achmad Tavip , non-dropping-particle : , parse-names :false, suf x : }], container-title : 2nd International Conference on Business & Social Sciences , id : ITEM-1 , issued :{ date-parts :[[2022]]}, page : 1464 , title : The In uence of Digital Technology and Ef ciency Strategy on Business Sustainability with Quality Management as Moderating Variables , type : paper-conference }, uris :[http://www.mendeley.com/documents/?uuid=162e984c-4d40-4180-89f7-c8c142949d68]},{ id : ITEM-2 , itemData :{ author :[{ dropping-particle : , family : Putri , given : Ienne Yoseria , non-dropping-particle : , parse-names :false, suf x : },{ dropping-particle : , family : Renaldo , given : Nicholas , non-dropping-particle : , parse-names :false, suf x : },{ dropping-particle : , family : Andi , given : , non-dropping-particle : , parse-names :false, suf x : },{ dropping-particle : , family : Fransisca , given : Luciana , non-dropping-particle : , parse-names :false, suf x : },{ dropping-particle : , family : Suhardjo , given : , non-dropping-particle : , parse-names :false, suf x : },{ dropping-particle : , family : Suyono , given : , non-dropping-particle : , parse-names :false, suf x : },{ dropping-particle : , family : Erwin , given : , non-dropping-particle : , parse-names :false, suf x : }], container-title : International Journal of Advanced Multidisciplinary Research and Studies , id : ITEM-2 , issue : 1 , issued :{ date-parts :[[2022]]}, page : 100-104 , title : Sustainability Report Disclosure and Pro tability as a Strategy to Increase Future Firm Value in the Indonesian Banking Sector , type : article-journal , volume : 2 }, uris :[http://www.mendeley.com/documents/?uuid=d1eddfc1-96ea-49be-82f8-dfc0f64220ed]}], mendeley :{ formattedCitation : (Putri et al., 2022; Renaldo, Hafni, et al., 2022. This theory is important in the context of green supply chains because it aims to achieve a balance between pro tability and long-term environmental sustainability.

Green Supply Chain Management

Green Supply Chain Management (GSCM) focuses on environmentally friendly supply chain practices, including in the agro-industrial sector. This theory includes steps such as sustainable resource management, waste reduction, and increasing the ef ciency of agricultural processes. The application of GSCM in pineapple farming will consider aspects of sustainability and environmental impact, such as the use of organic fertilizers, emission reduction, and waste management from pineapple chip production (Renaldo & Augustine, 2022)the majority of respondents are more concerned with nancial performance than environmental performance. This study aims to examine the effect of green supply chain management (GSCM.

Research Object and Materials

The method used in this study is a descriptive method (Lind et al., 2018; Sekaran & Bougie, 2016), namely a method that is aimed at solving existing problems at the present time by collecting data, analyzing, explaining and concluding it. While data collection is carried out using a survey technique, namely a method of collecting data from a number of individuals at the same time using a questionnaire (Sugiyono, 2013: 115) The unit of analysis in this study is production costs, pineapple farming income and nancial feasibility. The study was conducted in Kualu Village, Tambang District, Kampar Regency. Respondents in this study were farmers in Kualu Village, Tambang District, Kampar Regency. The number of pineapple farmers in Kualu Village, Tambang District, Kampar Regency is distributed in 3 (three) hamlet areas as many as 30 farmers. Determination of the number of respondents was determined using the Census Method.Data Analysis Production Cost

To nd out the income from pineapple farming, it is analyzed using cost and income analysis of farming (Soekartawi, 2006):

1. Total Fixed Cost (TFC) This is a cost that does not depend on the quantity of production incurred if the producer temporarily stops production, then this xed cost must be paid in the same amount. Examples are the purchase of buildings, machines, building rent, taxes, and others.
2. Total Variable Cost (TVC) This is a cost that changes according to changes in the quantity of products produced, the greater the quantity of production, the greater the cost of the product produced. Examples are the purchase of raw materials, labor costs, and so on.

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3. Total Cost (TC) This is the sum of total xed costs and total variable costs.
4. Marginal Cost (MC) This is how much the company s total costs change if the amount of output produced changes by one unit. Mathematically written: MC =
5. Average Fixed Cost (AFC) This is the xed cost that must be incurred for each unit of output. Mathematically written: AFC = .
6. Average Variable Cost (AVC) This is the variable cost charged to each unit of output. Mathematically written: AVC = .
7. Average Cost (AC) This is the cost of production calculated for each unit of output. Mathematically written: AC = .

Income Aspect

To determine the income from watermelon farming, it is analyzed using cost and income analysis of farming (Soekartawi, 2006):I = TR TC

TR = Y *x*P *y*

TC = FC + VC

Description:

I = Income, Rp

TR = Total Revenue, Rp

TC = Total Cost, Rp

Y = Physical Production (Unit)

Py = Selling Price (Rp/unit)

FC = Fixed Cost, Rp

VC = Variable Cost

Financial Feasibility Study

The nancial aspect is one of the aspects used in assessing the investment plan of a commercial project. The assessment of the nancial aspect includes the assessment of the sources of funds that will be used in nancing the investment, the estimation of income and expenses and costs during the investment period. Leonardo (Andos Roganda L.Gaol, 2013). The nancial feasibility analysis in this paper uses the NPV (Net Present Value) feasibility parameter. Net Present Value (NPV) is a method of calculating net value at the present time. Present itself is assumed if the initial time of the calculation coincides with the time the evaluation is carried out. So, the purpose of calculating the net present value is to reduce all cash in ows with cash out ows to the present value.

NPV = In Out

Description:

NPV = Net present value

PV In = Cash In ow

PV Out = Cash Out ow

NPV criteria indications are:

a) If NPV > 0, then the investment is pro table or feasible (Feasible).

b) If NPV < 0, then the investment is not pro table or feasible (Unfeasible).

Analysis of Production Cost and Revenue Aspects

This Pineapple business takes 12 months, from planting to harvesting. Therefore, all costs in this article are for 12 months.

Cost

Fixed cost:

Land rental cost = Rp. 4,000,000

Rental cost of watering machine = Rp. 500,000

Total xed cost = Rp. 4,500,000

Variable cost

Seeds = Rp. 1,500,000

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Fertilizer = Rp. 3,000,000

Pesticides and medicines = Rp. 1,000,000

Labor cost = Rp. 8,000,000

Harvest cost = Rp. 1,000,000

Total variable cost = Rp. 14,500,000

Total cost = Rp. 19,000,000

Income:

Production = 10 tons/ (10,000) kg

Price = 6,000 per kg

Total Income = Rp. 60,000,000

Table 1: Production costs and revenue

Production/Q (kg)	FC (Rupiah)	VC (Rupiah)	TC (Rupiah)	AC	TR (Rupiah)	Profit (Rupiah)
10,000						

Source: processed data, 2024.

The pineapple farming business in Kualu Village, Tambang District, Kampar Regency produces 10,000 kg of pineapple per hectare of land. The xed cost spent is IDR 2,500,000 and the variable cost is IDR 14,500,000 with a total cost of IDR 19,000. The average cost to produce 1 kg of pineapple is IDR 1,700. The price of pineapple per kg is IDR 6,000 and the harvest is 10,000 kg, so the total income is IDR 60,000. Income minus total costs produces a pro t of IDR 43,000,000 for 12 months.

Financial Feasibility Analysis

Annual interest rate 12%.

Interest rate for 12 months = 12%/4 = 3%

Table 2: Net Present Value

Time (Year)	FV	$1/(1+R)^t$	PV
0	-	-	
1	60.000.0000	0.97	58.200.000
NPV			**39.200.000**

Source: processed data, 2024

The Net Present Value of the watermelon business is positive Rp. 39,200,000 > 0, so the watermelon business is feasible to run.

Results and Discussion

Economic Sustainability Theory focuses on the importance of creating sustainable economic value in the long term while optimizing existing resources (Youssef, 2023). In this study, the success of pineapple farming is re ected in positive pro tability with a Net Present Value (NPV) of Rp. 39,200,000, which indicates that pineapple farming in Kualu Village has pro table economic prospects. Implementing the GSCM principle helps improve resource ef ciency and reduce production costs, which in turn increases the competitiveness and market potential of pineapple products, both domestically and internationally, supporting economic sustainability for farmers and agro-industry.

Social Sustainability Theory emphasizes the importance of paying attention to community welfare and equalizing bene ts for all parties involved in the supply chain (Younis & Sundarakani, 2020). In the context of this study, GSCM is implemented to improve the quality of life of farmers through empowerment and increasing their capacity to produce higher quality and sustainable products (Renaldo, Junaedi, et al., 2022). The application of GSCM focuses on reducing negative impacts on the surrounding community by encouraging environmentally friendly agricultural practices. In addition, the success of this farming business can create jobs for local communities, and improve social welfare by increasing farmers income.

Environmental Sustainability Theory focuses on protecting and preserving the environment by minimizing the negative impacts of human activities (Tippayawong et al., 2015)recycling, reuse, and the substitution of materials. With increased public awareness and strict regulations

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on environmental and sustainability policy, green supply chain management (GSCM. The application of GSCM in this study supports environmental sustainability by reducing the environmental impacts of the pineapple production process, such as waste management and more ef cient use of inputs (Renaldo, Fadrul, et al., 2022). One of the main principles of GSCM is sustainable management of natural resources, which can be applied to the use of organic fertilizers, water management, and the use of environmentally friendly technologies to support ef cient and environmentally friendly production. This will reduce the carbon footprint and provide bene ts to the wider ecosystem (Renaldo, Suhardjo, et al., 2022).

Green Supply Chain Management (GSCM) is an approach that integrates environmental sustainability principles into all stages of the supply chain, from raw material selection to nal products (Islam & Murakami, 2020). In the context of pineapple farming in Kualu Village, GSCM can be applied to manage and minimize environmental impacts generated during the production and distribution process.

One of the rst steps in GSCM is the selection of environmentally friendly raw materials (Moshood et al., 2022). In pineapple farming in Kualu Village, farmers can consider using organic fertilizers and natural pesticides to reduce negative impacts on the soil and ecosystem. The selection of quality pineapple seeds that are resistant to disease can also reduce the use of chemicals in the long term. The use of compost or organic fertilizers can increase soil fertility and reduce soil or water pollution that can occur due to excessive use of chemical fertilizers.

Ef cient management of natural resources includes the sustainable use of water, energy, and land (Green et al., 2015)thereby limiting generalization to other sectors. Practical implications Manufacturing practitioners are provided with information emphasizing the importance of implementing and maintaining a strong market orientation as a precursor to establishing an environmental sustainability strategy. Social implications The results have important societal implications, inthat amarketing approach that leads to the more rapid adoption of environmental sustainability programs within the manufacturing sector is identifed. Originality/value This is believed to be the frst empirical investigation of the relationship between market orientation and environmental sustainability. , author :[{ dropping-particle : , family : Green , given : Kenneth Wilburn , non-dropping-particle : , parse-names :false, suf x : },{ dropping-particle : , family : Toms , given : Lisa C. , non-dropping-particle : , parse-names :false, suf x : },{ dropping-particle : , family : Clark , given : James , non-dropping-particle : , parse-names :false, suf x : }], container-title : Management Research Review , id : ITEM-1 , issue : 2 , issued :{ date-parts :[[2015]]}, page : 217-238 , title : Impact of market orientation on environmental sustainability strategy , type : article-journal , volume : 38 }, uris :[http://www.mendeley.com/documents/?uuid=f1c15c44-de3f-4940-af51-46b193a332a1]}], mendeley :{ formattedCitation : (Green et al., 2015. In pineapple farming, this includes ef cient irrigation management, the use of renewable energy for machine operations, and good land management to avoid soil degradation. Implementation of a water-ef cient drip irrigation system to prevent waste and maintain groundwater availability in areas prone to drought.

Agricultural waste, such as crop residues, pineapple peels, and other by-products, can be utilized or recycled to reduce negative impacts on the environment (Mensah et al., 2020)supply chain environmental cooperation (SCEC. In GSCM, it is important to manage and reduce this waste in an ef cient manner. Pineapple peel waste can be processed into raw materials for processed products such as pineapple chips, or used as animal feed or compost to increase added value.

In the pineapple agro-industry, such as making pineapple chips, the production process must pay attention to energy ef ciency and pollution reduction (Ahmed et al., 2019)green information sharing, and adapting, sharing behavior over organizational environmental performance in the context of green supply chain management. This study has observed the empirical evidences to classify the associations among variables through close-ended questionnaires as measurement archetypal. A total of 117 industrial managers as subjects were used from the warehouse service provider. Furthermore the structural equation modeling is used for auxiliary ampli cation of the relationship amongst the variables. Thus, the study, analyzes that the adoption of sharing green information creates the green system that craft a sig- ni cant impact over organizational environmental performance. The results support the requirement for warehouse service provider to develop the knowledge behavior and green information system abilities to enhance the environmental enactment. This research empirically assesses the function of information systems in attaining environmental stability in the warehouse. Further, the results correspondingly sustain the impact of information system amongst the green supply chain management to attain the environmental performance in an organization. Mangers have prodigious implications regarding supply chain which results in augmentation of organizational performance. The acceptance of the model has a signi cant impact on distributors and consumers that will guide to augment environmental performance. , author :[{ dropping-particle : , family : Ahmed , given : Shariq , non-dropping-particle : , parse-names :false, suf x : },{ dropping-particle : , family : Khan , given : Abdullah , non-dropping-particle : , parse-names :false, suf x : },{ dropping-particle : , family : Paul , given : Sameer , non-dropping-particle : , parse-names :false, suf x : },{ dropping-particle : , family : Kazmi , given : Syed Hasnain Alam , non-dropping-particle : , parse-names :false, suf x : }], container-title : Proceedings ofthe Twelfth International Conference on Management Science and Engineering Management , id : ITEM-1 , issued :{ date-parts :[[2019]]}, page : 465-476 , publisher : Springer International Publishing , title : Role of Green Information System and Information Cycle in Environmental Performance , type : paper-conference }, uris :[http://www.mendeley.com/documents/?uuid=b492c9fa-0bae-4540-8b56-55391f6601bc]}], mendeley :{ formattedCitation : (Ahmed et al., 2019. Environmentally friendly technology and ef cient production processes can reduce energy use and reduce waste generated. The use of energy-ef cient and environmentally friendly pineapple chip processing technology, such as using ovens or drying machines with renewable energy (for example, solar energy) to reduce fossil fuel consumption.

After agricultural products are processed into nished goods (for example, pineapple chips), the storage and distribution processes must also consider sustainability. The use of environmentally friendly packaging and ef cient distribution in terms of reducing carbon emissions is important. The use of packaging that can be recycled or made from environmentally friendly materials such as paper packaging or biodegradable plastic, as well as product delivery using vehicles that are ef cient in fuel consumption or based on renewable energy.

Effective collaboration between farmers, agro-industry entrepreneurs, and other related parties (such as government agencies or environmental organizations) is very important in implementing GSCM. This can ensure that all stages of the supply chain from upstream to downstream are oriented towards sustainability. Collaboration between farmer groups and local agro-industry companies to introduce

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environmentally friendly practices such as selecting superior seeds, using sustainable farming techniques, and training farmers on the importance of GSCM.

To ensure that GSCM practices are implemented effectively, it is important to conduct continuous evaluation and monitoring. This involves measuring the environmental and social impacts of each stage in the supply chain and making continuous improvements. Developing a technology-based monitoring system to monitor water use, energy use, and ef ciency in product processing, to reduce environmental impacts and increase operational ef ciency.

The implementation of GSCM must also be in line with the empowerment of local farmers, especially in terms of increasing their capacity to run sustainable and pro table farming businesses. This will strengthen the local economy and improve farmer welfare. Providing training and mentoring for farmers in managing environmentally friendly farming businesses, as well as introducing them to modern farming techniques that reduce costs and increase yields.

Conclusion

Based on the results of pineapple farming research in Kualu Village, Tambang District, Kampar Regency, it can be concluded that the average production of pineapple farming in Kualu Village, Tambang District, Kampar Regency is 10,000 kg per hectare. The total production cost is IDR 19,000. The pro t obtained is IDR 43,000,000 for 12 months/one planting season. The Net Present Value of the pineapple business is positive IDR 39,200,000> 0, so the pineapple business is feasible to implement. All aspects of business feasibility have been met.

By implementing Green Supply Chain Management (GSCM) in pineapple farming in Kualu Village, environmental sustainability can be achieved without sacri cing economic bene ts. Efforts to reduce environmental impacts, increase resource ef ciency, and optimize production processes will provide long-term bene ts, for farmers, agro-industry entrepreneurs, and the surrounding community. The application of GSCM principles in pineapple farming has the potential to increase the competitiveness of pineapple products, especially pineapple chips, in domestic and international markets, while maintaining environmental sustainability.

Implications

With the results of the study showing decent pro ts and positive NPV values, pineapple farming in Kualu Village can be a pro table business option for local farmers. The application of GSCM provides farmers with the opportunity to reduce production costs and increase resource ef ciency, as well as create more environmentally friendly products, which can increase product competitiveness in the market. Pineapple farming that applies GSCM principles not only focuses on economic bene ts but also on environmental sustainability. Practices such as the use of organic fertilizers, agricultural waste management, and the use of environmentally friendly technologies can help farmers operate more ef ciently and reduce negative impacts on the environment.

The results of this study can be a basis for local and central governments to strengthen policies that support sustainable farming. The government can provide incentives or technical assistance to facilitate the adoption of GSCM in the agricultural sector, especially in areas with potential superior commodities such as Kualu Village. The government can also focus on developing infrastructure and providing technology that supports sustainable agricultural practices, such as ef cient irrigation systems and training on the use of environmentally friendly technologies. This will help farmers implement GSCM principles more effectively.

This research can inspire agro-industry entrepreneurs to develop more sustainable business models based on GSCM principles. The implementation of a business model that takes sustainability into account can be an attraction for consumers who are increasingly aware of the importance of environmental sustainability in choosing products. The implementation of GSCM can encourage innovation in processing agricultural products, including processing pineapple into value-added products such as pineapple chips and other processed products. This can increase the competitiveness of Indonesian agro-industry products in the global market, especially in facing the increasing demand for environmentally friendly products.

Limitations

This research was only conducted in Kualu Village, Tambang District, Kampar Regency, with a focus on pineapple farming. The results obtained cannot be fully generalized to other areas that have different geographical conditions, climates, or agricultural characteristics. The commodities studied were also limited to pineapple and its processed products (pineapple chips), so the application of GSCM to other agricultural commodities or other types of agro-industries cannot be guaranteed to provide the same results.

Suggestions

Further research could develop the application of GSCM principles to other agricultural commodities besides pineapple, such as vegetables, other fruits, or other agricultural products. This would provide a more comprehensive picture of how GSCM can be implemented in various types of farming businesses and broaden the understanding of sustainability in the agricultural sector in general. This study only covered one cropping cycle (12 months). To assess the impact of implementing GSCM more sustainably, it is recommended to conduct a long-term study (e.g., 3-5 years) to see the cumulative effects on business pro tability, natural resource use, and environmental impact. Such studies could also measure resource ef ciency over a longer period.

Future Research

Future studies should focus on the long-term effects of implementing GSCM in pineapple farming. A multi-year study could assess how the

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practices evolve, examining their sustainability, pro tability, and environmental impact. This would provide deeper insights into the scalability of GSCM and its bene ts across different agricultural seasons.

To broaden the understanding of GSCM in the agricultural sector, future research could explore its application to other agricultural commodities, such as fruits, vegetables, and herbs. This would provide comparative insights into the effectiveness and challenges of GSCM across diverse farming systems.

Investigating the role of technological innovations, such as precision agriculture, IoT for real-time monitoring, and blockchain for supply chain transparency, would be valuable. Future research could examine how these technologies can enhance GSCM practices, reduce environmental footprints, and increase operational ef ciencies in pineapple farming and other agro-industries.

Future studies could analyze the resilience of the pineapple supply chain to external shocks, such as natural disasters, market volatility, and climate change. Research on risk management strategies within GSCM could help identify best practices for making supply chains more adaptable and sustainable.

Future research should expand the analysis to include a comprehensive assessment of the economic, social, and environmental impacts of GSCM in pineapple farming. This would include not only nancial returns but also the social bene ts to farmers and the surrounding community, as well as the environmental improvements achieved through sustainable practices.

Referencess

Ahmed, S., Khan, A., Paul, S., & Kazmi, S. H. A. (2019). Role of Green Information System and Information Cycle in Environmental Performance. *Proceedings Ofthe Twelfth International Conference on Management Science and Engineering Management*, 465 476. https://doi.org/10.1007/978-3-319-93351-1_37

Chandra, M., & Augustine, Y. (2019). Pengaruh Green Intellectual Capital Index dan Pengungkapan Keberlanjutan terhadap Kinerja Keuangan dan Non Keuangan Perusahaan dengan Transparansi sebagai Variabel Moderasi. *Jurnal Magister Akuntansi Trisakti*, *6*(1), 45 70. https://doi.org/10.25105/jmat.v6i1.5066

David, 2004. Business Policy and Strategic Management.

Green, K. W., Toms, L. C., & Clark, J. (2015). Impact of market orientation on environmental sustainability strategy. *Management Research Review*, *38*(2), 217 238. https://doi.org/10.1108/MRR-10-2013-0240

Holyoak, J. L. T., Pisaniello, J., Buss, P., & Wiersma, B. (2019). Water productivity accounting in Australian agriculture: The need for cost-informed decision-making. *Outlook on Agriculture*, *49*(2), 172 184. https://doi.org/10.1177/0030727019879938

Islam, K., & Murakami, S. (2020). Accounting for Water Footprint of an Open-Pit Copper Mine. *Sustainability*, *12*(9660), 1 18. https://doi.org/10.3390/su12229660

Lind, D. A., Marchal, W. G., & Wathen, S. A. (2018). Statistical Techniques in Business & Economics. In *Economics* (17th ed.). McGraw-Hill Education.

Mardikanto, T. 2008. Re eksi dan Rekomendasi Implementasi Penyuluhan Pembangunan Peratanian. Dalam Pemberdayaan Manusia Pembangunan yang Bermartabat. Pustaka Bangsa Press. Medan

Mensah, Y. A., Ahenkorah, E., Afum, E., Agyemang, A. N., Agnikpe, C., & Rogers, F. (2020). Examining the in uence of internal green supply chain practices, green human resource management and supply chain environmental cooperation on rm performance. *Supply Chain Management: An International Journal*, *25*(5), 585 599. https://doi.org/10.1108/SCM-11-2019-0405

Moshood, T. D., Nawanir, G., Mahmud, F., & ... (2022). Sustainability of biodegradable plastics: New problem or solution to solve the global plastic pollution? In *Green and Sustainable* . Elsevier. https://www.sciencedirect.com/science/article/pii/S2666086522000157

Prasetya, H., Handayani, F. S., & Sugiyarto, S. (2017). Analisis Teknis Dan Finansial Proyek Pembangunan Apartemen U-Residence 3 Karawaci Tangerang Selatan. Matriks Teknik Sipil, 5(3).

Putri, I. Y., Renaldo, N., Andi, Fransisca, L., Suhardjo, Suyono, & Erwin. (2022). Sustainability Report Disclosure and Pro tability as a Strategy to Increase Future Firm Value in the Indonesian Banking Sector. *International Journal of Advanced Multidisciplinary Research and Studies*, *2*(1), 100 104.

Rangkuti, F. 2005. Analisis SWOT Teknik Membedah Kasus Bisnis. PT Gramedia Pustaka Utama. Jakarta

Renaldo, N., & Augustine, Y. (2022). The Effect of Green Supply Chain Management, Green Intellectual Capital, and Green Information System on Environmental Performance and Financial Performance. *Archives of Business Research*, *10*(10), 53 77. https://doi.org/10.14738/abr.1010.13254

Renaldo, N., Fadrul, Andi, Sevendy, T., & Simatupang, H. (2022). The Role of Environmental Accounting in Improving Environmental Performance through CSR Disclosure. *International Conference on Business Management and Accounting (ICOBIMA)*, *1*(1), 17 23. https://doi.org/https://doi.org/10.35145/icobima.v1i1.2743

Renaldo, N., Hafni, L., Hocky, A., Suhardjo, & Junaedi, A. T. (2022). The In uence of Digital Technology and Ef ciency Strategy on Business Sustainability with Quality Management as Moderating Variables. *2nd International Conference on Business & Social Sciences*, 1464.

Renaldo, N., Junaedi, A. T., Sudarno, Hutahuruk, M. B., Fransisca, L., & Cecilia. (2022). Social Accounting and Social Performance Measurement in Corporate Social Responsibility. *International Conference on Business Management and Accounting (ICOBIMA)*, *1*(1), 10 16. https://doi.org/https://doi.org/10.35145/icobima.v1i1.2742

Renaldo, N., Suhardjo, Suyono, Putri, I. Y., & Cindy. (2022). Bagaimana Cara Meningkatkan Kinerja Lingkungan Menggunakan Green Accounting? Pers-

ISBN: 978-9952-8545-1-0 https://doi.org/10.30546/19023.978-9952-8545-1-0.2025.0756

pektif Generasi Z. *Kurs: Jurnal Akuntansi, Kewirausahaan Dan Bisnis*, *7*(2), 134 144.

Sekaran, U., & Bougie, R. (2016). *Research Method for Business A Skill-Building Approach Seventh Edition* (Seventh Ed). John Wiley & Sons. https://doi.org/10.1007/978-94-007-0753-5_102084

Sugiyono. (2013). *Metode Penelitian Bisnis.* Bandung: Alfabeta.

Tippayawong, K. Y., Tiwaratreewit, T., & Sopadang, A. (2015). Positive In uence of Green Supply Chain Operations on Thai Electronic Firms Financial Performance. *Procedia Engineering*, *118*, 683 690. https://doi.org/10.1016/j.proeng.2015.08.503

Wati, Y., Irman, M., Yusrizal, Anton, & Renaldo, N. (2024). Green Intellectual Capital, Financial Performance, and Good Corporate Governance. *Jurnal Akuntansi Keuangan Dan Bisnis*, *17*(1), 28 37. https://doi.org/10.35143/jakb.v17i1.6267

Younis, H., & Sundarakani, B. (2020). The impact of rm size, rm age and environmental management certi cation on the relationship between green supply chain practices and corporate performance. *Benchmarking: An International Journal*, *27*(1), 319 346. https://doi.org/10.1108/BIJ-11-2018-0363

Youssef, M. (2023). Blue Economy Literature Review. *International Journal of Business and Management*, *18*(3), 12. https://doi.org/10.5539/ijbm.v18n3p12

http://jurnalsdm.blogspot.com/2009/08/konsep-strategi-de nisi-perumusan.html. Diakses pada tanggal 7 Oktober 2011.

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IMPACT OF CLIMATE CHANGE ON POPULATIONS OF RARE GEOPHYTES

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Abstract

The article presents the results of the study of the in uence of climatic and anthropogenic factors on the coenopopulations of rare species Tulipa L. Violations of phylogenetic connections in the plant community against the background of the impact of unfavorable factors lead to a change in the state of populations of rare geophytes. Some recommendations for the conservation of rare species in their natural habitat are proposed.

Keywords: Geophytes, population, climate change, adaptation

Introduction

In modern times, the global climate change and the increase of anthropogenic effects lead to the transformation of natural areas, the disruption of phytocenotic relations in plant groups, and the weakening of the population stability of rare plants. Rare geophyte species with limited environmental tolerance are more vulnerable to adverse effects. As a result of the strengthening of extreme climatic effects, the number of plants in the populations of geophytic plants of rare species of *Tulipa* L., is depleted and the ontogenetic structure is disturbed.

Included in the Red Book of Azerbaijan the *T. biebersteiniana* Schult. et Schult (NT) and *T. julia* C. Koch (VU A2c+3c) species occur in a small number of small localities in the areas where they inhabited during the historical evolution process [4]. Researches were conducted in Shamakhi, Shabran, Gobustan and Ismayilli regions in order to assess the impact of climate changes and anthropogenic activity on local populations. The modern distribution area of populations of rare species *T. biebersteiniana* and *T. julia* was studied by the method of geobotanical research. During multi-year monitoring, the effects of climate change and anthropogenic activity on the ontogenetic structure of the population of rare species in test plots designated in untouched natural areas and agrocenoses were comparatively studied.

Limiting factors that lead to the extinction of rare species of *Tulipa* L. in conditions of extreme climate changes: increase in cattle grazing load, disruption of phytocenotic relationships in plant groups, transformation of natural landscape, excessive use of fertilizers in agricultural areas, mass collection of owers further reduces the sustainability of local populations. Rare species can be found on dry stony mountain slopes, cliffs, forest clearings, dry steppe plant formations with grain-variety. As a result of climate changes and anthropogenic pressure, disruption of phytocenotic relations in plant communities leads to weakening of ontogenetic development dynamics of rare geophytes, reduction of owering and seed yield [3].

Underground bulbs of species belonging to the genus *Tulipa* L. develop rapidly in early spring and complete the vegetation period by the summer period. During the summer and winter rest periods, the embryos of future organs are formed in the bulbs during underground development. Bulbous plants, which are distinguished by their relative resistance to adverse effects, are negatively affected by extreme climate changes that have occurred in recent years. The full development of bulbs depends on the cold winter season. Increased temperatures and mild weather conditions in the winter months, as well as anomalous frosty weather conditions in the spring, limit the development of plants. As a result, the dynamics of aboveground development of plants is disrupted, sprouts are destroyed, owering and seed productivity are reduced.

Research Object and Materials

In the conditions of global warming, relatively mild weather in winter negatively affects the process of seed germination in the phase of winter rest periods. The time of seed germination depends on climatic conditions and is adapted to cold winter. For successful seed germination in natural conditions, low positive temperatures in the range from 0 to 10 are required [1]. The process of further development of the embryo in the seed depends on the temperature in the winter period. At a higher temperature in the winter months, seeds that have not passed the cooling period eventually do not germinate. The *latent* period of seed development lasts about 3-7 years. Rare geophytes, which reproduce naturally by seeds, lose their vitality and ability to reproduce the population in adverse climatic conditions. In the conditions of climatic anomalies of the last years, the drying of the generative shoot during the period of budding on the test sites was noted. A sharp reduction in the number of *generative* individuals reduces the sustainability of the population. Mass collection of plants during the owering period is also one of the reasons for the weakening of the fruiting.

The ontogenesis of *T. biebersteiniana* and *T. julia* consists of several stages: *latent* (*l*), *juvenile* (*j*), *immature* (*im*), *virginal* (*v*), *generative* (*g*), *senile* (*s*). In untouched natural areas, dynamic development of plants is observed, full ontogenesis proceeds through the *juvenile*, *virginal*, *immature*, *generative* and *senile* stages (*j-v-im-g-s*). The annual increase in the number of *juvenile* and *generative* plants increases the sustainability of the population. The full representation of the age spectrum of plants is the main sign indicating the sustainability and self-renewal ability of the population. The analysis of the age spectrum, taking into account the bioecological characteristics of the species, allows to predict the state of the population.

The ontogenetic structure of populations in the agrocenoses where the study was conducted and in untouched areas differs.

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Ontogenetic analysis of *T. julia* and *T. biebersteiniana* species in the test plots determined in the agrocenoses where plants settled in the historical evolutionary process shows the rapid extinction of primarily *juvenile* (*j*) and *immature* (*im*) plants as a result of anthropogenic pressure. On average, plants in the 2-3 *generative* (*g*) stages are encountered in the test plots. The surrounding area of Ivanovka and Gushenja villages of Ismayilli district is mainly used for haymaking, pastures and recreational purposes. *T. biebersteiniana* is encountered singly and rarely in haymaking and pastures under anthropogenic pressure. Observations show that the annual increase in grazing load on slopes under climate change has a negative impact on a small number of localities. Mass collection of the plant during the owering period reduces the number of *generative* plants in the ontogenetic structure of the population. In nature, the self-renewal ability of plants that reproduce by seed weakens.

Results and Discussions

On test sites on the outskirts of crop elds and pastures near the village of Kushenja, Ismailli district, a critical state of the local population of *T. biebersteiniana* was noted under the in uence of climate change and anthropogenic impact. This area is subject to strong anthropogenic pressure in the form of intensive grazing. In the population, the density of generative individuals decreases every year, in contrast to cenopopulations free of anthropogenic impact. Climatic anomalies intensify the process of degradation of the natural plant community and reduction of biodiversity. Changes in the species composition of the phytocenosis and disruption of phytocenotic relationships led to the accumulation of oppressed plants and a reduction in the number of *generative* plants [2].

The incomplete ontogenetic structure of the population of *T. julia*, which is found in agricultural elds around the villages of Takhtalar and Daghbilici in the Shabran region, weakens the vitality of the plants. In conditions of climatic anomalies, a reduction in the number of adult plants leads to a subsequent sharp decrease in the proportion of the *juvenile* age group. The destruction of natural vegetation in pastures leads to the spread of weeds in the plant community. The ratio of plants in the *virginal* and *generative* stages of ontogenesis in forest glades and pastures, where anthropogenic pressure is strong, indicates that a small part of *juvenile* plants has passed into the *virginal* stage. In experimental plots, this ratio varies between 2-4%. The number of plant seedlings depends on adverse climatic conditions and anthropogenic in uences (table 1).

Table 1. Ontogenetic structure of T.julia and T.biebersteiniana species in experimental plots

Species	Year	Number		Ontogenetic structure									
		I SP	II SP	*j*		*im*		*v*		*g*		*s*	
				I	II	I	II	I	II	I	II	I	II
T. julia	2019	5	7	-	2	-	1	2	2	3	2	-	-
	2021	4	8	-	2	-	1	2	2	2	3	-	-
	2022	3	10	-	3	-	2	1	2	2	3	-	-
	2023	2	13	-	5	-	2	1	1	1	4	-	1
	2024	1	12	-	4	-	2	-	2	1	4	-	-
T. biebersteiniana	2019	5	8	-	3	-	1	1	1	4	3	-	-
	2021	4	10	-	3	-	2	1	2	3	3	-	-
	2022	3	12	-	5	-	1	1	2	2	3	-	-
	2023	2	15	-	6	-	2	-	2	2	4	-	1
	2024	2	14	-	5	-	2	-	3	2	4	-	-

As can be seen from the table, in the area where anthropogenic impact is relatively low, the age spectrum of *T. julia* and *T. biebersteiniana* species has the highest indicator in the *virginal* and *generative* stages. At the same time, the development *j*, *im*, *v* stages of plants in the ontogenesis continues, allowing them to have a full spectrum of ontogenesis. As a result of intensive anthropogenic pressure on arable and pasture lands in the Tulunj Plateau area of the Gobustan region, the *j*, im, *v* stages of plants of *T. biebersteiniana* species are dying out. In the population where the ontogenesis spectrum is incomplete, development continues only as a result of the annual renewal of the bulbs of *generative* plants with replacement bulbs. Under the in uence of limiting factors, the viability of the population is threatened. The study shows that the single-peaked left-sided ontogenesis of *T. biebersteiniana* species is characterized by a maximum abundance of *generative* plants. As the in uence of the anthropogenic factor increases, buffer mechanisms arise at the border of the geographical range of the population, which is becoming depleted. The predominance of *generative* plants in the ontogenetic structure of *T. yulia* and *T. biebersteiniana* species is the main indicator of the exposure of the population to strong anthropogenic in uences. The studies on the in uence of climatic conditions on the dynamics of the *T. biebersteiniana* population allowed us to compare the obtained data with the data on average monthly temperature and precipitation. The studies revealed changes in the natural renewal of the cenopopulation and age composition depending on weather conditions. Depending on weather conditions, plant growth and development in recent years have been lower. Due to global warming, an increase in the average monthly temperature in winter, the amount of moisture in the soil and a sharp cooling of the spring period were accompanied by changes in the vegetation period. A decrease in seed productivity in the population and a reduction in the number of *generative* plants depending on climate change were also noted (table 2).

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Table 2. The in uence of climatic factors on the population of T. biebersteiniana

Year	Average temperature, degrees			Average precipitation, mm			Number of plants	Number of generative plants
	annual	winter	spring	annual	winter	spring		
2021	11-13	-2-4	12-16	522-527	350	42-63	24-58	12,5
2022	11-12,4	0-6	15-21	425-520	250	30-48	17-46	8,1
2023	14-14,5	9-12	20-27	350-430	120	25-38	10-32	5,3
2024	13-15	11-14	23-28	350-430	180	22-36	8-27	3,4

In relation to weather conditions, a change in the dynamics of tulip development was noted in different periods of vegetation. The years 2021-2022 in terms of the amount of spring precipitation were more optimal for plant development. In favorable weather conditions an increase in the number of *juvenile* plants was observed. In subsequent years, a sharp change in weather conditions in winter and spring had an adverse effect on the growth and development of plants. In recent years, under conditions of climate change, plant fruiting has weakened due to the lack of development of *generative* plants or complete drying of in orescences during the budding period. In 2023-2024, the proportion of owering plants in the studied part of the range sharply decreased. The percentage of fruiting plants from the total number of owering plants was 3.4%. The anomaly of the average monthly temperature during the active growing season led to a decrease in the productivity of the population. Dry weather in the spring caused the loss of seedlings at an early stage of development. Climate uctuations in recent years have affected the ontogenesis of the population. The number of *generative* plants in the studied populations varied in the range of 0.1- 3.2 plant/m^2. The proportion of *generative* plants in the population, is in uenced by temperature and amount of precipitation during the winter rest period and during the active growing season in spring.

Conclusion

Climate change leads to a shift in the boundaries of natural zones and steppe formation of meadow ecosystems. Typical types of steppe meadows are mesophytes and xerophytes with a predominance of forbs [5]. Rare geophyte species with a high conservation status are reliable indicators of disturbance of plant communities and reduction of biodiversity under the in uence of climatic and anthropogenic factors. Transformation of natural areas into agrocenoses is one of the main reasons for loss of biodiversity and soil degradation. The vitality and reproduction of populations of rare species of *Tulipa* L. largely depends on the preservation of species diversity of a certain type of plant grouping. Considering the constancy of phytocenotic relationships of rare geophytes, it is necessary to comprehensively preserve biodiversity in these types of plant communities. Studies show that the replacement of natural vegetation with the second type of weeds and the loss of biodiversity in the plant group have a limiting effect on the populations of *T. biebersteiniana* and *T. julia* species due to climate change and anthropogenic effects. Rare geophytes allow to determine the ecological status of agrocenosis as indicator plants. The normal growth dynamics of plants is the main indicator of sustainable use of arable and pasture lands. Violation of agrotechnical rules, excessive fertilization, decrease in soil fertility, increase in pasture load, thinning of plant communities result in the extinction of rare species. The loss of rare species can be seen as soil and vegetation degradation.Based on the research carried out to study the current state of rare species of geophytes, measures to maintain the stability of populations in unfavorable environmental conditions have been proposed. For the in situ protection of rare *Tulipa* L. localities, it is necessary to place warning signs in agrocenoses, to increase the resilience of the population against climate and anthropogenic in uences, to create micro-refuges within the area, to carry out genetic certi cation of plants, to conduct monitoring through the GIS system, and to implement protection measures. It is possible to create a remote database using aerospace data to determine the sustainability of local populations and predict population status.In order to adapt the vegetation to climate changes, it is necessary to implement extensive measures for the purpose of increasing the erosion resistance of the slopes, alternating use of pastures and meadows, reducing the load of pastures, protecting natural vegetation in agricultural areas and creating buffer zones. Effective use of the natural potential of biological and landscape diversity, sustainable management of agricultural land is important in reducing the impact of climate change.

Reference

1. Akhmetova, A.Sh. Seed propagation of representatives of the genus Tulipa L. / A.Sh. Akhmetova, L.N. Mironova // Bulletin of the Botanical Garden of the Saratov State University, 2009. - No. 8. - P. 130-137.
2. Bulokhov, A.D. Phytocenotic connections as a criterion for preserving rare species of regional ora / A.D. Bulokhov, Y.A. Semenishchenkov, N.N. Panasenko, A.V. Kharin // Bulletin of the Bryansk branch of the RBO. Bryansk: BSU, 2016. - No. 1. - P. 10-22.
3. Dadashova, L.K. Monitoring the state of rare geophyte populations in agrocenoses // Theoretical and applied aspects of organizing, conducting and using monitoring observations. Materials of international sci. conference dedicated to the 95th anniversary of the Corresponding Member of the NAS of Belarus E.A. Sidorovich (March 9-10, 2023). Central Botanical Garden of the NAS of Belarus. - Minsk: IVC of the Ministry of Finance, 2023. - P.180-182.
4. The Red Book of the Republic of Azerbaijan. Rare and endangered species of plants and fungi. Baku, 2023. - 3rd ed. - T. I - P. 60-64.
5. https://eco.gov.az/az/hidrometeorologiya/iqlim-deyismeleri

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AMELIORATIVE SITUATION OF IRRIGATED SOILS IN SOUTH MUGHAN (IN THE EXPERIMENTAL AREA)

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Abstract

It is known that the climatic change affected agriculture. One of the most important issues of the day is improvement of the irrigated soils in order to solve the population s growth and their food problems in the republic. From this point of view, the raised issues meet the requirements of the modern era, and their solution is relevant in the gradual improvement of soils subjected to varying degrees of salinization and solonetzi cation, in fertility increase and getting high productivity from agricultural plants. Firstly, a quantity of salts, absorbed bases, humus, pH $CaCO_3$ was studied in the soils during the researches in South Mughan. It is important to prevent from the water loss in the plot. Researches were conducted in the territory of Aghayri village of the Bilasuvar district in South Mughan. The soil sections were applied and chemical analyses were ful lled by noting coordinates in the experimental plot of the Aghayri village. It was determined that a sum of the absorbed bases changed 17.00-28.50 mg.ekv, but pH is 7.68-7.93 at 0-100cm. The amount of physical clayin these soils was between 60.38 65.71 %. On the basis of the obtained results it was determined that the soils are clayey and loamy. The amount of salts in these soils was 0.10-1.92 %. The measures were offered in order to improve the ameliorative state of soils in the research area.

Keywords: Granulometric composition, humus, absorbed bases, the salts quantity, the salt type.

Introduction

Increase of the products obtained from agricultural plants have been taken into account in the statutes about protection of the food safety of the Azerbaijan Republic and provision of the population with food products accepted in the State Program. As we know different types of soils with the rich soil resources spread in the Azerbaijan Republic. The fertility characters of the same soils are rather good for cultivation of some valuable agricultural plants. Application of agrotechnics and getting of higher product from the same soils are possible. Study of the ameliorative state of irrigated soils used under agricultural plants is of great importance in modern times [2].

At present, one of the global problems that worry the world is climatic changes. Azerbaijan wasn t left out of the in uence of climate changes. Against the backdrop of climate change, Azerbaijan underwent oods, landslide, storms, hurricanes, surges, strong winds, heats, aridity, melting of glaciers, salinity, soils degradation, deserti cation, decrease of rainfalls and water resources, etc such extreme climatic events. The climatic changes restrict the human s food safety in regional and global level, they are a reason for hunger, poverty and other severe socio-economic consequences, migration strengthening, increase infectious and and it is surrounded by warming are successful, the de nite parts of the negative effects as increase of the sea level, ocean heat and acidity will continue for centuries [3]. An aim of the research was study of ameliorative state of the irrigated soils in South Mughan.

Research Object and Materials

The experimental area was selected as an object in the Aghayri village of Bilasuvar in the South Mughan and coordinates were noted and soil cuts were laid out and samples were taken from characteristic places. The chemical analyses were ful lled according to (granulometric composition, absorbed bases, pH, salt amount, humus,etc) the method that is widely applied in the republic [6].

Results and Discussion

As it is known, the Mughan plain is a part of the Kur-Araz valley and in the northwest, it is separated from the Mil plain by the Araz river, and from the Shirvan plain by the Kur river. South Mughan with inclined plain is an alluvial-delluvial wave-like plain according to its genesis and it is surrounded by the debris cone of the Araz river from northwest, but from south Bolgar river. The south foothill part of South Mughan is very high, some smooth hills, wave-like blocs and terraces disturb general plain character of the zone. It was known by M.A.Museyibov [8] , V.R.Volobuyev [7] and others the relief of South Mughan was formed as a result of Caspian Sea s ebb and ow and accumulation of the Araz and Bolgar rivers. There was a great role in rise and fall of the zone relief as a result of the Caspian Sea s exposure to transgression and regression for some times. An annual temperature of the air is 13-14^{0}C, but a maximal temperature is higher than 41^{0}C in summer months [9]. The vegetation is various in the zone and the eld formation takes a wide place.

The rst soil researches in South Mughan were performed by M.F.Kalinin, S.A.Zakharov in 1902-1905. Later, the reasons of soils salinization were studied by S.I. Tyuremnov, N.A.Dimo, V.R.Volobuyev. As a result of the researches the following types of soils were determined in South Mughan: grey-brown; grey, meadow-grey; grey-meadow; salinized-solonetzi cated irrigated soils; typical solonchaks; salinized boggies; meadow soils, etc. It was determined that loam, sandy layers are available and the long researches show that the salinized process occurs fast in the soils of South Mughan. For this purpose, Kh.F. Jafarov thoroughly investigated an ameliorative state in South Mughan in 1961 and he gave his recommendations for ameliorative estimation.

As it is known, granulometric composition greatly affects the soil-formation process and soil use in agriculture. The cultivation condition, time of the eld work, fertilization norm, location of the agriculrural plants change depending on soil granulometric composition [4]. The granulometric composition of the experimental soils was also determined. A quantity of physical clay in the same soils (particles less than 0.01 mm) changes 60.38-65.71% and this shows that they are clayey and loamy. The absorbed bases changed by 17.00-28.50 mg/eq (Table 1) in these soils. Ca and Mg dominate in a sum of the absorbed bases. A quantity of Ca was 56.10-67.37% in the soils under cotton,

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61.50-69.50% in the soils under grain, Mg amount was 28.60 -38.10% in the soils under cotton, 23.10-33.20 % under grain. The number of Na was 2.82-6.80% in the soils under cotton, it was 4.00-7.40% under grain. The humus quantity was 0.11-2.30% in the soils under cotton, 0.20-2.52% under grain, but pH-amount was 7.68-7.90.

Table 1. Absorbed bases in the soils of experimental plot

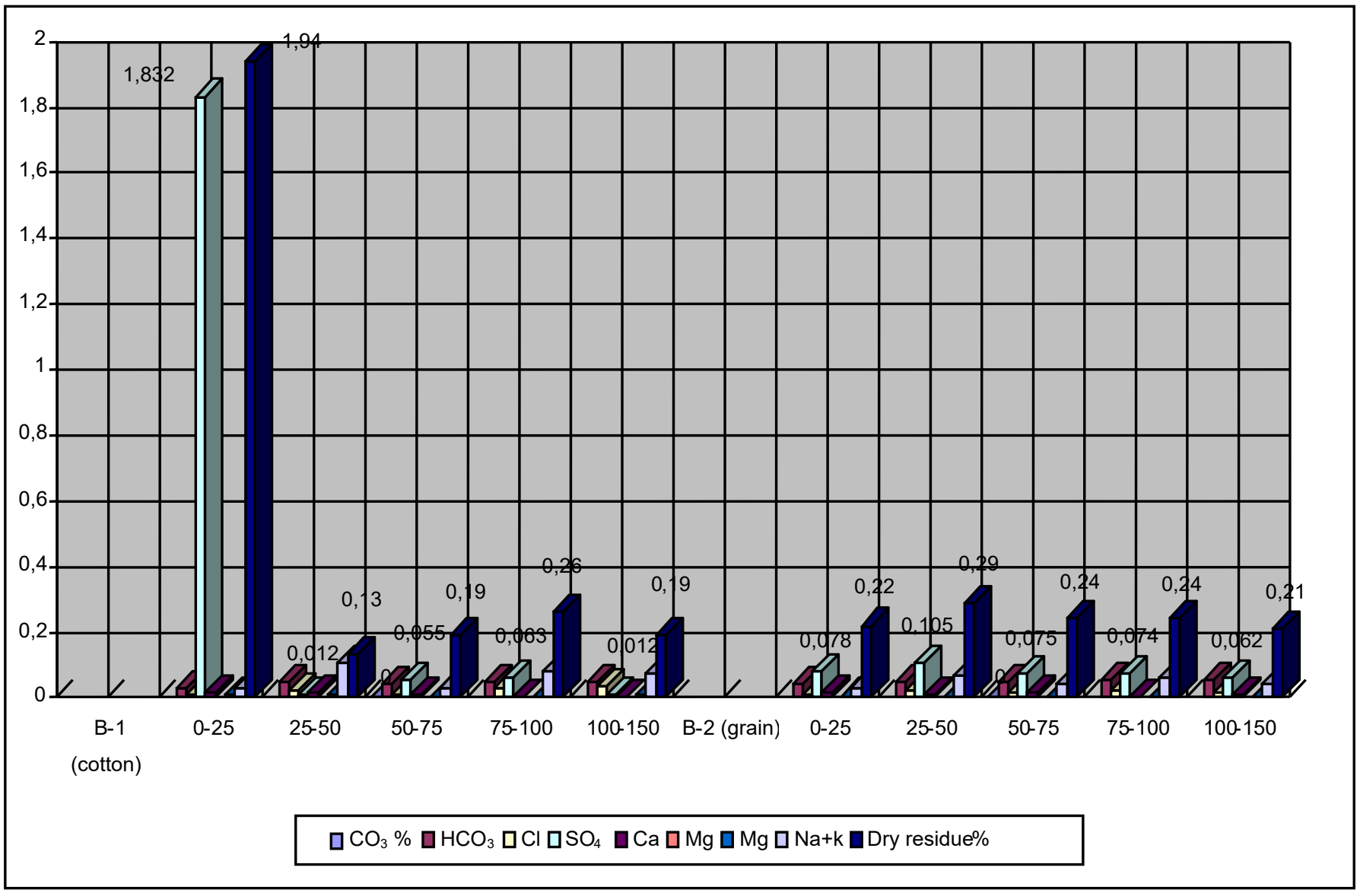
Depth, cm	Absorbed bases			Sum of the absorbed bases, mg.ekv	Absorbed bases, %			pH	Humus, %
K-1 cotton									
	Ca	Mg	Na		Ca	Mg	Na		
0-25	19,20	8,15	1,15	28,5	67,37	28,60	4,03	7,68	2,30
25-50	10,27	8,23	1,23	21,6	56,35	38,10	5,55	7,68	1,23
50-75	10,25	6,80	1,25	18,3	56,10	37,10	6,80	7,85	0,78
75-100	11,15	5,37	0,48	17,0	65,58	31,58	2,82	7,82	0,11
K-2 grain									
0-25	15,20	8,2	1,3	24,70	61,50	33,2	5,3	7,86	2,52
25-50	17,80	5,9	1,9	25,60	69,50	23,1	7,4	7,68	1,30
50-75	20,40	7,40	1,7	29,50	69,20	25,1	5,7	7,93	0,81
75-100	17,8	8,2	1,1	27,10	65,70	30,3	4,0	7,90	0,20

It is known that the soils used under intensive agricultural crops exposed to salinization to a different degree and their morphogenetic characters change as a result of construction of the collector-drainage and irrigation networks. The plant development in the salinized soils depends on chemical composition and salt concentration of the soil solution [5]. The salt quantity in the experimental soils was determined and got consequences were shown on Table 2. As it is seen, CO_3 ion wasn t observed in anion content of salts. An amount of HCO_3 anion in the soils under cotton was 0.030-0.049%, Cl was 0.008-0.035%, SO_4 -0.012-1.832%. Ca-0.005-0.020 % in salts cation content, Mg- 0.003 -0.012%, but Na+k ion was 0.006-0.109. Content of anion and cation changed in the soils under grain. The salt quantity (for dry residue) was 0.08-1.92% in the soils under cotton, but it was 0.13-0.25% in the soils under grain [1].

Table 2. Anion and cation content of salts in the experimental are

№	Depth, cm	CO_3	HCO_3	Cl	SO_4	Ca	Mg	Na+k	Sum of salts, %	Dry residue, %
		Mg.ekv/%								
B-1 (cotton, N39°31'38.0'' E48°28'13.0'')										
1	0-25	no	0,50 0,030	0,24 0,008	0,088 1,832	0,75 0,015	0,75 0,009	1,28 0,028	1,92	1,94
2	25-50	-	0,80 0,049	0,60 0,021	0,249 0,012	0,75 0,015	0,75 0,009	0,149 0,109	0,11	0,13
3	25-50	-	0,70 0,043	0,30 0,010	1,145 0,055	0,50 0,010	0,25 0,003	1,390 0,032	0,16	0,19
4	75-100	-	0,80 0,049	0,90 0,032	1,312 0,063	0,25 0,005	0,25 0,005	2,500 0,080	0,24	0,26
5	100-150	-	0,80 0,049	1,00 0,035	0,249 0,012	0,25 0,005	0,84 0,010	3,120 0,072	0,18	0,19
B-2 (cotton, N39°31'38.5'' E48°28'14.0'')										
6	0-25	no	0,50 0,030	0,50 0,017	0,249 0,012	0,75 0,015	0,25 0,003	0,249 0,006	0,08	0,12
7	25-50	-	0,50 0,030	0,50 0,017	0,249 0,012	0,75 0,015	0,25 0,003	0,249 0,006	0,08	0,12
8	25-50	-	0,50 0,030	0,50 0,017	0,249 0,012	0,75 0,015	0,25 0,003	0,249 0,006	0,08	0,12
9	75-100	-	0,50 0,030	1,00 0,035	0,249 0,012	0,50 0,010	1,00 0,012	0,249 0,006	0,11	0,14
10	100-150	-	0,50 0,030	0,50 0,017	0,449 0,024	1,00 0,020	0,25 0,003	0,249 0,006	0,10	0,18
B-2 (grain, N39°31'38.9'' E48°28'11.0'')										
11	0-25	no	0,70 0,043	0,30 0,010	1,62 0,078	0,75 0,015	0,50 0,006	1,39 0,032	0,18	0,22
12	25-50	-	0,80 0,049	0,60 0,021	2,18 0,105	0,50 0,010	0,25 0,003	2,83 0,065	0,25	0,29
13	50-75	-	0,80 0,049	0,50 0,017	1,56 0,075	0,75 0,015	0,25 0,003	1,87 0,043	0,21	0,24
14	75-100	-	0,90 0,055	0,70 0,024	1,541 0,074	0,25 0,005	0,25 0,003	2,64 0,061	0,22	0,24
15	100-150	-	0,90	0,40	1,290	0,50	0,25	0,85	0,18	0,21

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Picture 1. Change diagram of salts in soil.

igure 1. Change diagram of salts in soil.

From the carried out researches it is clear that the experimental soils are non- salinized, weak, medium and strong salinized. It is important to clean the salinized soils of experimental area from salts and ful ll ameliorative measures for fertility increase. These include planting of salt-tolerance grain plants; clean the soils from salts in drainage background; correctly realize irrigation norm; deep ploughing and smoothing the areas, etc. It is possible to obtain high and stable product by using soils under agricultural plants .

Conclusion

1. It was determined that a quantity of physical clay in granulometric content of the experimental soil areas (the particles less than 0.01 mm) was 60.38-65.71 % and this shows that the soil is clayey and loamy in the same soils.

2. As a result of the researches it was determined that a quantity of salts in the soils under cotton was 0.08-1.92%, but it was 0.13-0.25% in the soils under grain and this indicates that the same soils were salinized to non-salinized, weak, medium and strong degree.

3. A sum of absorbed bases in the experimental soils area was 17.00-28.50 mg/eq in the soils under cotton, but it was 24.70-27.10 mg.eq in the soils under grain.

4. It is important to ful ll ameliorative measures system for improvement of the soil state.

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References

1. Jalilova L.Z., Mustafayev F.M.,Ahmadova A.R. Some fertility indicators of the soils area in South Mughan. Azerbaijan Technology University, Scienti c News, 2024, p.64-68

2. Feyzullayev H.M. In uence of main cultivation methods on vitality of the autumnal grain in the arid condition of South Mughan. Institute of Soil Science of ANAS. In theme of Problems of the environment and its protection strategy held among students, magisters and doctorants dedicated to science day: a look into the future , Materials of Scienti c-practical conf. Baku, 2020, p.25-26.

3. https://eco.gov.az/az/hidrometeorologiya/iqlim-deyismeleri

4. Mammadov G.Sh. Bases of soil science and soil geography. Baku, Science, 2007, p.13

5. Mustafayev M.G. Modern state of soils and scienti c bases of their improvement in the Mughan-Salyan massive. Baku 2019, p.324.

6. Arinushkina E.V. Guide on chemical analysis of soils. M., pub. MSU, 1970, p.488.

7. Volobuyev V.R.,Azizov K.Z. Salinized soils in the Kur-Araz plain. Lecture. Symp.V Representative Congress USSR, Tbilisi,1981, p.104-124

8. Museibov M.A. Physical geography of Azerbaijan. Pub. Maarif , Baku, 1998, p.40.

9. Shikhlinsky E.M. Climate of Azerbaijan. Pub.AS Azerb,SSR, Baku, 1968, 343

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AN ANALYSIS OF TEMPERATURE, PRECIPITATION, AND SUNSHINE IN BAKU: INFLUENCES, CHARACTERISTICS AND IMPLICATIONS

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Abstrzact

Baku, the capital of Azerbaijan, experiences a distinct semi-arid climate shaped by its Caspian Sea location and the surrounding Caucasus Mountains. This article provides a comprehensive overview of Baku s climate, examining temperature patterns, precipitation, wind regimes, humidity, and sunshine hours. The in uence of geographical factors and the potential impacts of climate change are discussed. An analysis of historical climate data and current trends reveals the city s vulnerability to rising temperatures and altered precipitation patterns. The article concludes by highlighting the importance of climate-conscious urban planning and adaptation strategies to mitigate the challenges posed by a changing climate in Baku.

Keywords: Baku, Azerbaijan, climate, semi-arid, Caspian Sea, climate change, urban planning

Introduction

Baku, situated on the Absheron Peninsula by the Caspian Sea, is characterized by a unique climate in uenced by its geographical setting. This article aims to provide a detailed analysis of the city s climate, examining its key features, in uential factors, and potential implications in the face of climate change. The Caspian Sea, the world s largest inland body of water, plays a crucial role in shaping Baku s climate. The Caucasus Mountains to the west also exert a signi cant in uence, creating a rain shadow effect that limits precipitation. This combination of geographical factors contributes to Baku s semi-arid climate.

Research Objective: This paper aims to:

- Characterize the distinct climatic features of Baku.
- Analyze the in uence of geographical factors on the city s climate.
- Assess the potential impacts of climate change on Baku.
- Discuss the implications for urban planning and adaptation strategies.

Signi cance. Understanding Baku s climate is crucial for various sectors, including urban planning, infrastructure development, tourism, and public health. This knowledge can inform sustainable development strategies and enhance the city s resilience to climate change.

Research Object and Materials

This study focuses on the climate of Baku, Azerbaijan, with a particular emphasis on the interplay between geographical factors, climate characteristics, and potential climate change impacts. Materials. This research delves into the climatic intricacies of Baku, Azerbaijan, by examining the key meteorological elements that shape its environment. The investigation is grounded in a robust analysis of statistical meteorological data, providing a quantitative foundation for understanding the city s climatic norms and variations.

Climate Classi cation. Baku s climate is classi ed as warm-temperate and semi-arid, with hot and dry summers and mild, relatively wet winters. The city experiences signi cant temperature variations throughout the year.

Urban Planning. The distinctive climate of Baku presents both opportunities and challenges for urban planners and developers. The city s hot summers and mild winters in uence building design and infrastructure development.

Geographical Context and Climate Classi cation. Baku is situated on the Absheron Peninsula, which protrudes into the Caspian Sea. This unique geographical position places the city at approximately 40.4 N latitude and 49.9 E longitude. The peninsula s location creates a microclimate in uenced by both continental and maritime factors. The city s terrain is characterized by a combination of lowlands and hills, with elevations ranging from sea level to about 100 meters above sea level. This varied topography contributes to localized climate variations within the urban area. According to the K ppen-Geiger climate classi cation system, Baku falls under the BSk category, indicating a cold semi-arid climate. This classi cation is characterized by hot summers, mild winters, and low annual precipitation, typical of regions on the boundary between arid and temperate zones.

Temperature Patterns in Baku. Winter (December - February). Baku experiences mild winters with average temperatures ranging from

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5.6 C to 7 C. January is typically the coldest month, with occasional frost and rare snowfall. The moderating in uence of the Caspian Sea prevents extreme cold temperatures.Spring (March - May). Spring brings a gradual warming trend, with temperatures rising from an average of 9 C in March to 19 C in May. This season is characterized by variable weather conditions and occasional temperature uctuations.Summer (June - August). Summers in Baku are hot and dry, with average temperatures exceeding 25 C. July is the hottest month, with average temperatures reaching 27.3 C. Heat waves can push temperatures above 35 C, particularly in urban areas due to the heat island effect.Autumn (September - November). Autumn sees a gradual cooling trend, with temperatures decreasing from an average of 23 C in September to 12 C in November. This season often brings pleasant, mild conditions ideal for outdoor activities.

Precipitation Patterns and Water Resources: *Annual Precipitation:* Baku receives relatively low annual precipitation, averaging around 210 mm per year. This places it in the semi-arid category, necessitating careful water resource management for the city s growing population and industrial needs.Seasonal Distribution. Precipitation in Baku is unevenly distributed throughout the year. The wettest period occurs during the cooler months, from October to April, with January being the wettest month (28.5 mm on average). Summers are notably dry, with minimal rainfall from June to August.*Water Resources:* Given the limited rainfall, Baku relies heavily on water resources from outside the immediate area. The Kura and Araz rivers, along with groundwater reserves, play crucial roles in meeting the city s water demands. Desalination plants have also been implemented to supplement freshwater supplies.*Climate Change Impact:* Recent trends indicate a potential decrease in annual precipitation, coupled with more intense but less frequent rainfall events. This shift poses challenges for water management and increases the risk of both droughts and ash oods in urban area.Sunshine Duration and Solar Potential. Baku enjoys abundant sunshine throughout the year, making it an ideal location for solar energy development. The city receives an average of 2,500 hours of sunshine annually, with peak duration occurring in July (320 hours). Even during winter months, Baku experiences considerable sunshine, with January averaging 110 hours. This high solar irradiance translates to signi cant potential for both photovoltaic and solar thermal applications.

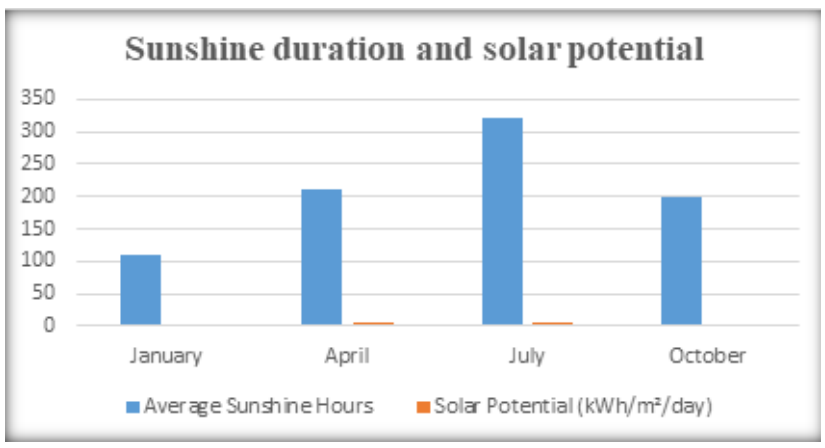


Figure 1. Sunshine duration and solar potential

The consistent sunshine not only contributes to Baku s energy potential but also plays a crucial role in the city s tourism industry and overall quality of life for residents. Urban planners and architects increasingly incorporate this abundant natural light into building designs, promoting energy ef ciency and creating vibrant public spaces that capitalize on he city s sunny climate.

Wind Patterns: Baku s wind patterns are predominantly in uenced by its coastal location. The city experiences prevailing winds from the north and northwest, shaped by the regional topography and the temperature differential between the land and the Caspian Sea.

A unique feature of Baku s climate is the Khazri, a cold northern wind that occurs primarily in autumn and winter. These winds can dramatically lower temperatures and create challenging conditions for maritime activities and urban life. In contrast to the Khazri, the warm southern wind known as Gilavar brings milder temperatures and is generally considered more pleasant. These winds typically occur in the spring and summer months.*Urban Planning Considerations*: Understanding these wind patterns is crucial for urban planning in Baku. Building orientation, street layout, and the design of public spaces all take into account the prevailing winds to create comfortable microclimates and mitigate the effects of strong gusts. Climate Change Trends and Projections
Temperature Increase: Analysis of long-term temperature data reveals a clear warming trend in Baku. The city has experienced an average temperature increase of approximately 1.5 C over the past century, with accelerated warming observed in recent decades.
Precipitation Changes. While annual precipitation totals have shown less consistent trends, there is evidence of increasing variability in rainfall patterns. Projections suggest a potential decrease in overall precipitation, coupled with more frequent extreme rainfall events.
Sea Level Rise: As a coastal city, Baku is vulnerable to sea level rise in the Caspian Sea. While the Caspian s water level is in uenced by complex factors, climate change could potentially lead to increased coastal erosion and ooding risks.
Adaptation Strategies. In response to these climate change projections, Baku is implementing various adaptation strategies. These include improving water management systems, enhancing green infrastructure, and developing climate-resilient urban planning policies.
Implications for Urban Planning and Development

Energy-Ef cient Building Design: Baku s climate characteristics necessitate innovative approaches to building design. The abundance of sunshine allows for widespread implementation of solar technologies, while the need for cooling during hot summers drives the adoption of passive cooling techniques and energy-ef cient HVAC systems.
Water Management: Given the semi-arid climate and potential for decreased precipitation due to climate change, sustainable water management is crucial. Urban planners are focusing on implementing water-ef cient landscaping, rainwater harvesting systems, and advanced wastewater treatment and reuse technologies. Green Infrastructure. To combat the urban heat island effect and improve air quality, Baku is investing in green infrastructure. This includes the creation of urban parks, green corridors, and the integration of vegetation into building designs, which also help in managing storm water runoff. Climate-Resilient Transportation. The city s transportation infrastructure is being adapted to withstand climate extremes. This includes the use of heat-resistant materials for roads and railways, improved drainage systems to handle intense rainfall events, and the promotion of public transportation and cycling to reduce urban heat and emissions. To promote the use of environmentally friendly vehicles, was introduced an 18% VAT exemption in January 2022. This exemption applies not only to the customs clearance and sale of electric and hybrid cars but also to the import of electric charging stations. Today we have over 600 charging stations. In the last 3 years, the import of electric vehicles to Azerbaijan has increased by 33 times. Also, about 160 electric buses are in use.

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Results and Discussion

Baku s climate presents both opportunities and challenges. The city s pleasant weather and abundant sunshine are attractive for tourism and outdoor activities. However, the dry climate, strong winds, and potential impacts of climate change require careful consideration in urban planning and development.

Adapting to a changing climate will be crucial for Baku. This may involve measures such as:

- Improving water management and conservation;
- Developing heat-resilient infrastructure and urban design;
- Promoting sustainable transportation and energy ef ciency;
- Enhancing public awareness and preparedness for extreme weather events.

Conclusion

Baku s climate is a de ning feature of the city, in uencing its environment, economy, and lifestyle. Understanding the complexities of this climate, including the potential impacts of climate change, is essential for sustainable development and ensuring the well-being of its residents. By integrating climate considerations into urban planning and implementing adaptation strategies, Baku can build resilience and thrive in a changing world.

Acknowledgment

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References

1. Hashimov, R. (2015). Climate Change Vulnerability and Adaptation in Azerbaijan. *Environmental Science & Policy*, 51, 123-131.
2. IPCC. (2021). Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press.
3. Mammadov Q. ., Khalilov M.Y. (2005) Ecology and Environmental Protection , Baku, Elm publishing house - 880 pages
4. Mammadov Q. ., Khalilov M.Y. (2006) Ecology, Environment and Human Publication Information: Baku, Elm publishing house -, 608 pages
5. Climate Change Knowledge Portal (World Bank) https://climateknowledgeportal.worldbank.org/country/azerbaijan/climate-data-historical
6. Third National Communication to the United Nations Framework Convention on Climate Change Republic of Azerbaijan:https://unfccc.int/sites/default/ les/resource/azenc3.pdf
7. Building Climate Resilient Cities and Communities in the Republic of Azerbaijan (Adaptation Fund): https://www.adaptation-fund.org/wp-content/uploads/2024/05/UN-Habitat_Azerbaijan-Proposal-1.pdf
8. Climate Centre https://www.climatecentre.org/wp-content/uploads/RCCC-Country-pro les-Azerbaijan_2024_ nal.pdf
9. State Statistical Committee- https://www.stat.gov.az/?lang=en

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ASSESSMENT OF GENETIC DIVERSITY OF TEA PLANT

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Abstract

In the research work, the genetic diversity of the tea plant (Camellia sinensis L.Kuntze) cultivated in the Lankaran-Astara region was studied using genetic markers. In this study, phylogenetic analyses with RAPD (Randomly Ampli ed Polymorphic DNA) markers showed that there is high genetic differentiation between tea genotypes at the genome level. RAPD markers were used to assess genetic diversity in the study objects, and it was determined that the presence of polymorphism varied between 50% and 95% on average. The genetic similarity between the tested genotypes varied between 0.445 and 0.819 and was equal to 0.512 on average [7]. At the same time, the results obtained showed a correlative relationship between the morphological characteristics of varieties (Farmanchay 1/73 and Lankaran) and forms (Faq-11 and Faq-18) with low genetic similarity (0.445) and the morphological characteristics and quality indicators of varieties Farmanchay 1/73, Khazar 3/341 and forms (Faq-13 , Faq-14 , Faq-15) with high genetic similarity (0.819). The study of genetic diversity among local varieties and the identi cation of economically more valuable varieties always attracts attention with its relevance, and extensive research is given to this direction. The results are useful for creating scienti c foundations for assessing the genetic diversity of tea genotypes cultivated in the region].

Keywords: Tea plant,genetic diversity, determination, different genotypes, assessment

Introduction

Tea (Camellia sinensis L.) is one of the most widely distributed non-alcoholic beverages in the world and is consumed by approximately 70% of the world s population for its refreshing taste, attractive aroma, medicinal effect and emollient properties [1]. Tea is an economically important plant grown in more than 52 countries in Asia, Africa and South America[1]. Tea is a plant with high heterozygosity and high sensitivity to changing environmental conditions. The Chinese variety of tea is cultivated in the humid subtropics of Azerbaijan. The leaves of the Chinese variety are medium-sized, smooth-stemmed, bushy, 3-4 m high, densely branched, semi-branched [2]. Various varieties, forms and clones of the tea plant (Camellia sinensis L. Kuntze), introduced to the Lankaran-Astara region and sensitive to the effects of external environmental factors, are distinguished by a high frequency of spontaneous variation[2]. The unique genetic structure of plant populations not only distinguishes them from other populations, but also determines their ability to adapt to changing conditions and potentially create new forms [3]. The availability of information about genetic variation within samples and differentiation between samples plays an important role in the formulation of appropriate management strategies for the conservation of genetic resources [4]. The determination of genetic diversity can be based on morphological, biochemical and molecular data [5]. Unlike morphological and biochemical markers, DNA markers are independent of environmental factors and the stage of plant development [7]. The development and use of molecular markers for the assessment of genetic diversity in tea plants is relatively new.

Our scienti c research and studies show that tea bushes in tea plantations established in the republic differ from each other in terms of productivity, leaf quality, budding intensity, length of vegetation period, branching character, generative activity, drought, cold resistance, etc. economic and biochemical indicators of the nished product. From the observations conducted, it became known that tea plants grow and develop normally in areas with an average annual rainfall of 1200-1500 mm and a relative humidity of 70-75%.

Research Object and Materials

The objective of our research is to assess the genetic diversity of certain varieties and forms of te Research object and methods used RAPD markers were used to assess the genetic diversity of various varieties, forms and clones of the tea plant (Camellia sinensis L. Kuntze), which was rst introduced to the Lankaran-Astara region and is sensitive to the effects of external environmental factors [5]. The studies were conducted on eleven tea genotypes such as Faq-11, Faq-13, Faq-14, Faq-15, Faq-18, Faq-19, Farmanchay 1/73, Kolkhida, Lankaran 2/17, Khazar 3/341 and Chahrayi 4/44, cultivated in the experimental eld of the Lankaran Tea Branch of the Scienti c Research Institute of Fruit Growing and Tea Growing of the Ministry of Agriculture in the Lankaran-Astara region in 2021-2022[7].a plant (Camellia sinensis L.Kuntze) cultivated in the Lankaran-Astara region.

Genomic DNA was extracted according to the CTAB protocol [8], dissolved in sterile deionized water, diluted to 20 ng/ L, and stored at -200C. In the study, PCR was performed with 10 different RAPD primers [Table 1]. The PCR mixture consisted of 40 ng genomic DNA, 1U Taq polymerase, 1x PCR buffer, 0.2 mM dNTP mix, and 0.5 uM RAPD primers, totaling 25 l. The PCR regimen consisted of initial denaturation (5 min at 95 C), 30 cycles (1 min at 94 C, 1 min at annealing temperature, and 1 min at 72 C), and nal elongation (10 min at 72 C). The ampli cation products were electrophoresed on 1% agarose gels in 1xTAE (Tris acetate EDTA) buffer (pH=8.0) at 100 V. The gels were stained with ethidium bromide solution (0.5 mg/mL) and visualized in a gel documentation system (UVIPRO , Great Britain). The ampli cation fragments were analyzed using the PAST [9] computer program. The calculated genetic parameters were PPB (percentage of polymorphic bands), PIC (polymorphic information content) [10], MI (marker index) and EMR (effective multiplex ratio). The calculations were performed according to the following formulas: PIC =1 S(Pij)2, where Pij is the frequency of the sample detected by the th primer; EMR=nPi b, where b is the ratio of polymorphic DNA fragments to the total number of ampli ed fragments; MI = PIC EMR. Cluster analysis and PCoA were performed

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using the Jaccard similarity index (Jaccard similarity index) computer program [9].

Results and Dicussions

The gene pool of varieties and forms whose genetic diversity was determined using genetic markers was studied. Among molecular marker systems, RAPD (Randomly Ampli ed Polymorphic DNA) markers are the most widely used method for detecting genetic diversity and analyzing phylogeny due to their speed, simplicity, and ease of use. As a result of the application of 10 RAPD primers in 11 tea genotypes in the experiment, a total of 132 DNA fragments were obtained, of which 113 were selected for polymorphism. The number of DNA fragments observed per genotype varied from eight (OPA-19) to twenty (OPAB-18). The percentage of polymorphic sites varied between 50% and 95%, with an average of 83.94% [Table 1].

Table 1. The primer sequences and parameters of genetic variation generated by RAPD markers

Primer	Sequence (5'–3')	TAB	NPB	PPB	PIC	EMR	MI
OPA-09	GGGTAACGCC	15	13	86.67	0.510	4.98	3.09
OPA-16	AGCCAGCGAA	10	9	90.00	0.569	6.56	3.73
OPA-18	AGGTGACCGT	16	13	81.25	0.891	9.56	8.52
OPA-19	CAAACGTCGG	8	4	50.00	0.489	3.96	2.98
OPAB-04	GGCACGCGTT	18	15	83.33	0.989	10.12	10.00
OPAB-05	CCCGAAGCGA	10	8	80.00	0.612	5.92	3.62
OPAB-07	GTAAACCGCC	9	8	88.89	0.524	5.94	3.11
OPAB-09	GGGCGACTAC	11	10	90.91	0.885	6.82	6.03
OPAB-18	CTGGCGTGTC	20	19	95.00	0.968	10.12	9.80
OPAB-19	ACACCGATGG	15	14	93.33	0.936	8.86	8.29
Total	–	132	113	–	–	–	–
Minimum	–	8	4	50.00	0.489	3.96	2.98
Maximum	–	20	19	95.00	0.989	10.12	10.00
Medium	–	13.20	11.30	83.94	0.737	7.28	5.92

TAB - total ampli ed bands; NPB - number of polymorphic bands; PPB - percentage of polymorphic bands; PIC - polymorphic information content; EMR - effective multiplex ratio; MI - marker index.The difference between genotypes ranged from 0.30 to 0.83 for the Jaccard genetic similarity index. The average genetic similarity across all 11 genotypes was 0.57, indicating that all genotypes differed moderately from each other. The maximum genetic similarity was observed between the genotypes Faq-19 and Chahrayi 4/44 with a similarity coef cient of 0.83, and between Fag-13 and Chahrayi 4/44 with a similarity coef cient of 0.79. The similarity index between the genotypes Faq-14 and Khazar 3/341 was 0.30, which made them the most distant genotypes. The average number of ampli ed bands and polymorphic bands per primer was 13.20 and 11.30, respectively. The polymorphic information content (PIC) for 10 RAPD primers varied between 0.489 and 0.989, with an average value of 0.737. The highest and lowest values of the PIC parameter were recorded for primers OPAB-04 and OPA-19, respectively. The high value of PIC obtained in our study indicates the presence of high genetic diversity among Azerbaijani tea genotypes and, at the same time, the effectiveness of RAPD markers in assessing genetic variability[7].

Conclusion

1. RAPD markers were used to assess genetic diversity in the study objects, and the presence of polymorphism was found to vary between 50% and 95% on average.

2. The genetic similarity between the tested genotypes varied between 0.445 and 0.819 and was equal to 0.512 on average.

3. There is a correlative relationship between the differences in the genotypes of existing varieties and forms of tea plants in the Lankaran-Astara region and their biological potential;

4. The uneven distribution of atmospheric precipitation throughout the year (less than 1200-1300 mm), the lack of humidity (less than 70-75%) necessary for normal yield of tea plants as a result of anomalous heat, and changes in sea level height weaken the genetic stability of productive varieties and forms;

Suggestions for the application of the results

The use of DNA markers will allow for the effective use of selection by determining the genetic diversity occurring in the genome of tea grown in areas far from its homeland.

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References

1. Karak, T., and Bhagat, R.M., Trace Elements in tea leaves,made tea and tea infusion. // A review, Food Res. Int.,2010,vol.43,no.9,pp.2234 2252.

2. Huseynov M.B., Frequency of chromosomal changes during spontaneous mutagenesis in tea plants cultivated in Lankaran-Astara region. //Land of Fire University Scienti c and Pedagogical News, No.56, Baku -2020. No.56, P.295-301

3. Mohammadi, S., and Prasanna, B., Analysis of genetic diversity in crop plants salient statistical tools and considerations. //CropSci., 2003, vol. 43, no. 4, pp. 1235 1248

4. Shikhseyidova, G., Akhundova, E., Guliyev, R., Eshghi, R., Salayeva, S., and Ojaghi, J., Molecular diversity and genetic structure of durum wheatlandraces. //AlbanianJ.Agric.Sci.,2015,vol.14,no.2,pp.112 120.

5. Youse , V., Najaphy, A., Zebarjadi, A., and Safari, H., Molecular characterization of thymus species using ISSR markers. //J. Anime. Plant Sci., 2015, vol. 25, no. 4, pp. 1087 1094.

6. Wambulwa, M.C., Meegahakumbura, M.K., Kamunya, S., Muchugi, A., M ller, M., Liu, J., Xu, J.C., Li, D.J., and Gao, L.M., Multiple origins and a narrow genepool characterize the African tea germplasm: Concordant patterns revealed by nuclear and plastid DNA markers, Sci. Rep., 2017, vol. 7, art. ID 4053.

7. M. Huseynov, Z. Suleymanova, J. Ojaghiand A. Mammadov, Characterization and Phylogeny Analysis of Azerbaijan Tea (Camelliasinensis L.). //GenotypesbyMolecularMarkers. Cytology and Genetics Vol. 56 No. 3. 2022

8. Murray, M.G., and Thompson, W.F., Rapid isolation of high molecular weight plant DNA, Nucleic Acids Res.,1980,vol.8,no.9,pp.4321 4325.

9. Hammer, ., Harper, D.A.T., and Ryan, P.D., PAST: paleontological statistics software package for education and data analysis. // PalaeontologiaElectronica, 2011, vol.4, no.1, art.ID9

10. Botstein, D., White, R.L., Skolnick, M., and Davis, R.W., Construction of a genetic linkage map in man using restriction fragment length polymorphisms. //Am. J. Hum. Genet., 1980, vol. 32, pp. 314 331.

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EFFECT OF FERTILIZERS ON SOIL FERTILITY AND CORN CROP

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Abstract:

The study of the effect of fertilizers on soil fertility and corn yield was conducted in the Zakatala Zonal Experimental Station in the Danachi section under dryland conditions. Fertilizers give the greatest effect only with a high culture of agriculture, subject to proper and timely soil cultivation, and the implementation of a set of measures. Manure is the best fertilizer for corn. Manure is applied under deep autumn plowing depending on the condition of the soil, 20-50 tons per 1 ha. Instead of manure, various composts and green fertilizers can be applied. Application of 20 thousand tons of manure to the elds evenly: 300 tons of ammonium nitrate, 250 tons of superphosphate and 300 tons of potassium salt. The yield of corn cobs was determined in 4 variants with the application of fertilizers and a control without fertilizers: manure - 20 t / ha, green manure (green manure), N60P120K90, N60P120K90 + manure - 20 t / ha. In the control variant (without fertilizers), the yield of cobs was 75.3 c / ha. The highest indicator was recorded in the mixed variant with mineral and organic fertilizers - N60P120K80 + manure - 20 t / ha, amounted to 88.6 c / ha. Accordingly, this is higher than the control by 15.1 c / ha. The effectiveness of mineral fertilizers applied to corn on different types of soil was studied - mountain-forest brown, mountain-forest brown and chestnut chernozems of the Zakatala region. In the soils of chestnut chernozems the highest yield in cobs was recorded, amounted to 87.3 c / ha. This yield indicator is higher by 15.5 c / ha than in other mountain-forest brown, mountain-forest brown soil conditions. And also the growth and development of corn in 4 variants was determined. In the control variant the total growth of the plant on average amounted to 2.20 meters, the highest indicator was recorded in the variant N60P120K80 + manure - 20 t / ha - on average 3.70 meters. Accordingly, this is higher than the control by 1.5 meters. The use of fertilizers should be carried out with high agricultural technology, providing for a constant increase in soil fertility.

Keywords: soil, fertilizer, corn, growth, development, harvest.

Introduction

The favorable natural conditions of the Sheki-Zagatala regions have long contributed to the development of agriculture. The corn plant is very demanding of soil fertility and nutrients. Fertilizers give the greatest effect only with a high culture of agriculture, subject to proper and timely soil cultivation, and the implementation of a set of measures [2,5].

In different regions of our republic, depending on the predecessor plant, soil cultivation, planting dates and seeding rates for sowing corn are different. Sowing time depends on the soil and climatic conditions of the region, at a soil temperature of 10-120C, the third decade of April in mountainous and foothill areas. The seeding rate - per 1 ha, depending on the quality of the seeds and whether the harvest is planned for grain or green mass, varies from 18-22 kg [3].

Research Objet andMaterials

To grow corn, the following pre-sowing activities are carried out: site selection - it is necessary to take into account soil and climatic conditions, type and physical characteristics of the soil, possibilities of machinery movement, irrigation possibilities; eld plowing - winter and spring plowing, harrowing, cultivation; land preparation for sowing - clari cation of the planting scheme (70x70, 70x50, 70x30) depending on whether the harvest is planned for grain or green mass (silage); seed preparation before sowing - as a measure against diseases and pests, it is advisable to spray the seeds (with preparations such as ALLIANCE - 1.5-2.0 kg / ha); fertilization - soil before sowing or at the initial stages of plant development: organic fertilizer (manure) - 20-30 tons/ha, N - 150-200 kg/ha, P - 200-300 kg/ha, K - 100-150 kg/ha [1].

Post-sowing activities: cultivation - to a depth of 8-10 cm when 3-4 leaves appear, 5-6 cm when 7-8 leaves appear, thinning, harrowing is carried out provided that the height of the plant does not exceed 50-60 cm; soil fertilization - nitrogen fertilizers during the period of 3-4, 7-8 leaves of the development phase for the purpose of feeding; irrigation of corn depending on the weather conditions of the year, mainly 2-3 times during the stem development phase, during owering and wax maturity and measures are taken to combat weeds, diseases and pests [4].

Ensuring soil fertility depends on the fertilizers applied. The main fertilizers used are mineral, organic (manure, bird droppings, etc.) and green manure. Organic fertilizers - manure is the best fertilizer for corn. Manure is applied under deep autumn plowing depending on the soil condition, 20-50 tons per 1 ha. Instead of manure, various composts and green fertilizers can be applied. Application of 20 thousand tons of manure to the elds evenly: 300 tons of ammonium nitrate, 250 tons of superphosphate and 300 tons of potassium salt [6,8].

The purpose of using fertilizers is mainly to obtain a high yield, as well as to provide the soil with natural nutrients, to meet the needs of plants with high yield potential, to return to the soil the nutrients taken by plants from the soil or washed out of the arable soil layer suitable for agriculture, is to create good soil conditions for agriculture. [7].

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Results and Discussion

The study of the effect of fertilizers on soil fertility and corn yield was conducted in the Zakatala Zonal Experimental Station in the Danachi section under dryland conditions. The effectiveness of mineral fertilizers applied to corn on different types of soil - mountain-forest brown, mountain-forest brown and chestnut chernozems - was studied. To obtain a high and high-quality harvest, it is very important to ensure soil fertility. To ensure soil fertility, the population of our region mainly uses organic fertilizers. Bird excrement contains a higher percentage of dry matter and is distinguished by a relatively high phosphorus content.

Table 1. Composition of some organic fertilizers in %

№	Organic fertilizers	Water	N	P_2O_5	K_2O
1	Fresh goose droppings	76	0.56	0.55	0.94
2	Fresh duck droppings	56	1.00	1.45	0.63
3	Fresh chicken droppings	55	1.65	1.53	0.85
4	Cattle manure	74	0.50	0.20	0.62

As can be seen from Table 1, fresh chicken manure has the highest phosphorus content of 1.53%. The high mineral content of bird excrement and the low water content make it very valuable. But in private households, it is usually obtained in small quantities and mixed with manure from other animals or added to composts.

Table 2. Corn yield with different fertilization options

№	Options	Ear yield c/ha	Increase-c/ha	% increase
	Control (without fertilizers)	75.3	-	-
1	Manure - 20 t/ha	79,1	13,3	+4,9
2	Green manure (green manure)	81,6	3,8	+7,8
3	$N_{60}P_{120}K_{90}$	83.5	8,2	+9,9
4	$N_{60}P_{120}K_{90}$ + manure - 20 t/ha	88.6	13,3	+15,1

As can be seen from Table 2, the highest indicator was recorded in the mixed variant with mineral and organic fertilizers - N60P120K80 + manure - 20 t/ha, amounting to 88.6 c/ha. Accordingly, this is higher than the control by 15.1 c/ha.

Table 3. Ef ciency of mineral fertilizers applied to corn on different types of soil

Soils	Yield in centners/ha - variety Zakatalsky improved								
	Total on average	N	P	K	NP	NK	PK	NPK	
Mountain forest brown	75,9	75,8	72,2	71,3	77,9	77,3	77,5	79,5	
Mountain forest chestnut	71,8	70,9	71,4	71,1	73,1	71,7	71,3	73,1	
Chestnut black soils	87,3	87,3	87,5	87,6	87,4	86,7	87,1	87,9	15,5

As can be seen from table 3, the effectiveness of mineral fertilizers in the soils of chestnut chernozems is higher, compared to other soils (+ 15.5 /ha).

Table 4. Plant growth with different fertilizer options

№	Options	Height, meter	Increase - meter
	Control (without fertilizers)	2,20	
1	Manure - 20 t/ha	2,80	0,6
2	Green manure (green manure)	2,30	0,1
3	$N_{60}P_{120}K_{90}$	2,70	0,5
4	$N_{60}P_{120}K_{90}$ + manure - 20 t/ha	3,70	1,5

As can be seen from Table 4, the highest indicator was recorded in the mixed variant with mineral and organic fertilizers - N60P120K80 + manure - 20 t/ha, amounting to 3.70 meters. Accordingly, this is higher than the control by 1.5 meters.

From the above, we can conclude that to obtain a high and high-quality harvest, it is very important to ensure soil fertility. It is more expedient to conduct a soil analysis and restore the missing nutrients with organic and mineral fertilizers.

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Conclusion

Due to the development of both livestock and poultry farming in our region, not so much money is spent on obtaining organic fertilizers. To ensure soil fertility, the population of our region mainly uses organic fertilizers.

Reference

Abdullaeva N.M., So ev Kh.S. In uence of plowing factors on the productivity of corn plants in the dryland conditions of the Sheki-Zagatala region. Collection of scienti c papers of the Research Institute of Agriculture, Uchitel Publishing House, Volume XXIX, Baku, 2018, pp. 383-386.

Dunyamaliev S.A. Technology of growing corn plants in various soil and climatic conditions. Elite-Poligraf Publishing House, Baku, 2022, pp. 9-10.

Dunyamaliev S.A. The role of the corn plant in the crops of the republic. Elite-Poligraf Publishing House, Baku, 2022, pp. 8-9.

Gadzhimamedov I.M., Dunyamaliev S.A. Dynamics of phosphorus and potassium in the soil depending on the phases of development of corn varieties. Collection of scienti c papers of the Research Institute of Agriculture, Volume XXVIII, Uchitel Publishing House, Baku, 2017, pp. 410-416.

Kerimov Ya.G. Some physicochemical properties of alluvial-meadow soils of the Zagatala region of Azerbaijan / Abstracts of reports of the IV Republican Conference Intensi cation of agro-industrial production at the present stage . Baku, 1988, p. 55

Mammedov J.Sh. Ecological model of soil fertility in the dry subtropical zone of Azerbaijan. Proceedings of the All-Russian Society of Plant Protection, Baku, 2006. pp. 45-49.

Smotzok M., Bichoku Yu., Asadova N. Fertilizers and their ef cient use. AMDA/IFDC, Baku, 2003, pp. 6-7.

Yusifov M. Plant growing. Pravo Publishing House, Baku, 2011, pp. 61-64.

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AGROCHEMICAL COMPOSITION OF SOILS IN SHAKI-ZAGATALA REGION AND WAYS OF PRODUCING ECOLOGICALLY CLEAN HAZELNUT PRODUCTION

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Abstract

The article provides a comparative analysis of the agrochemical composition of rainfed lands in the Sheki-Zakatala region and the use of mineral and organic fertilizers for the production of environmentally friendly hazelnuts. The soil of the experimental site consists of brown mountain forest, brown mountain forest, chestnut and steppe soils. In the Sheki-Zagatala region, in addition to growing hazelnuts, livestock farming is also developed, so organic fertilizers are mainly used in this region. Manure contains all the nutrients necessary for plant nutrition: 0.5% nitrogen, 0.25% phosphorus, 0.5% potassium and 0.2% calcium, a certain amount of microelements - 0.15% magnesium, sulfur, boron and other elements. The amount of organic matter in fresh small cattle manure is 318 per 1000 parts, and nitrogen - 8.3 parts, which differs from others. The nutrient requirements of the hazelnut garden: NO3-20.0, P2 O5-25.0, K2 O-350, S-5.0, B-3.0, Mn-12-13, Cu-2.5, Zn-4.0, Co -1.0, Mo- 0.3, salts - 0.10%, organic matter-4.0, pH-5-7. For weak soils that do not meet the speci ed standards, it is recommended to apply 40-50 tons of manure and 3-5 tons of bird droppings. To obtain environmentally friendly products, in addition to agrotechnical measures carried out during the growing season, the rules of care implemented after the crop ripens are also important. Excessive application of mineral fertilizers to hazelnut orchards leads to the formation of a atoxin latent rot in the kernels after the crop has ripened. The crop should be dried until 6% moisture remains. Otherwise, mold fungi *Aspergillus avus* and *Aspergius parasticus* produce a toxic substance for humans - a atoxin, and these organisms not only pose a threat to human health, but also annually cause the destruction of most agricultural products.

Keywords: soil and climatic conditions, agrochemical analysis, nutrients, organic fertilizers, hazelnut garden, agrotechnical care.

Introduction

The normal course of growth and development of fruit plants depends on suf cient nutritional conditions. Since perennial plants are grown in the same place for a long time, they absorb nutrients from the soil and deplete it. In addition to water, oxygen, carbon dioxide, macro and microelements also participate in the nutrition of fruit plants. Nutrients that are important for plants are mainly nitrogen, phosphorus and potassium[3]. Nitrogen is the main regulator of fruit and plant life. Lack of phosphorus weakens the growth, slows down the formation of generative shoots. Potassium increases the resistance of the plant to drought and winter, strengthens the activity of enzymes, improves metabolism, and increases the vital activity of the body. In addition, the soil contains macroelements: calcium, magnesium, sulfur, iron, etc. microelements: boron, manganese, copper, zinc, molybdenum are present [6,9,11].

Reseach Objects and Materials

Fertilizers are organic and mineral substances that are applied to the soil and sometimes to the leaves (foliar feeding) to provide nutrients to plants. Fertilizers, rst of all, provide the plant with nutrients in a form that it can easily absorb. In addition, fertilizers improve the physical, chemical and biological properties of the soil, which leads to an increase in yield and an improvement in its quality. By fertilizing, the nutrients taken from the soil are returned to the soil along with the crop. Thus, soil fertility is restored [12].

Table 1. The degree of provision of soil with N, P2O5, K2O depending on the amount of nutrients (0-40cm; in the environment with pH 6.0 and higher)

№	Availability rate	P_2O_5 - mg/100g	K_2O- mg/100g	Easily hydrolyzed mg/100g
1	Very poor soil	<1,0	0-10	<3
2	Poor soil	<1,5	10-20	3-4
3	Average soil	1,5-3,0	20-30	4-5
4	Well supplied land	3,0-4,5	30-40	5-7
5	Highly supplied land	4,5-6,0	40-60	7-10
6	Highest secured land	>6,0	>60	>10

The soil of the experimental area is a sod, it consists of brown mountain-forest, brown mountain-forest, chestnut and steppe soils [13]. The water holding capacity of the soil is low. The response of plants to soil pH (acidity-alkalinity indicator) is different. Some plants grow well in weakly acidic, and some alkaline, mostly neutral soils. Therefore, it is important to determine the pH of the soil. Soil quality is determined by the amount of total humus and the depth of the humus layer [4,9,15]. After soil analysis, it is more appropriate to determine the required nutrients to ensure soil fertility.

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Table 2. Agrochemical analysis indicators of damya soils of Zagatala region

	The amount of harmful salts (dry residue) in %	Chlorine ion (Cl) in %	pH (court)	General nitrogen (N)	Humus in %	Exchangeable potassium (K_2O)	Active phosphorus (P_2O_5)	Calcium carbonate (CaCO3) in %
						mg in 1 kg of soil		
I Cut	0.113	0.019	6.67	0.146	1.880	70.3	16.4	0.8
I Cut	0.040	0.009	6.99	0.101	1.303	32.6	5.8	0.7
I Cut	0.040	0.009	7.38	0.084	1.089	19.6	10.2	0.8
II Cut	0.070	0.019	6.40	0.153	1.973	58.1	10.1	0.8
II Cut	0.040	0.009	7.43	0.063	0.815	17.1	6.8	0.8
II Cut	0.040	0.009	7.11	0.084	1.089	24.2	6.7	0.6
III Cut	0.102	0.009	6.10	0.198	0.553	95.3	16.6	1.0
III Cut	0.080	0.009	6.73	0.122	1.577	26.7	7.1	0.8
III Cut	0.060	0.019	7.35	0.082	1.059	25.7	6.1	0.8

The average pH in damya soils of Zagatala region varied from 6.10 to 7.43. This indicates that the eld has a weak-acidic and neutral property.

In the Sheki-Zagatala region, in addition to hazelnut cultivation, animal husbandry is also developed, so organic fertilizers are mainly used in this region. Organic fertilizers include: manure, manure juice, peat, compost, green fertilizers. Manure contains all nutrients required for plant nutrition: 0.5% nitrogen, 0.25% phosphorus, 0.5% potassium and 0.2% calcium, a certain amount of trace elements - 0.15% magnesium, sulfur, boron and other elements [1,14]. Compounds of organic fertilizers break down and increase the amount of humus in the soil, improve its structure, enrich it with carbon dioxide, and increase its buffering capacity. Organic fertilizers are absorbed by plants after complete mineralization. Since the mineralization process takes some time, it is recommended to apply organic fertilizers periodically rather than annually [8]. Manure is mainly applied under the plow, in which case its effect is strong in the rst year and beyond. From 10 to 50 tons per 1.0 ha is given, depending on the degree of decay, characteristics of the fertilized plant, soil and climate conditions.

Results and Discussions

The nutrients contained in manure, which is an organic fertilizer, are not inferior to mineral fertilizers. Thus, all macro and microelements necessary for the development of plants are present in manure. The amount of nutrients in the manure varies depending on the type of animal, the composition of the feed, and the storage conditions of the manure [5].

Table 3. Amount of nutrients in fresh manure of different animal species (in 1000 parts)

№	Animal species	are	Organic substances	Azote	Phosphorus	Potassium	other elements
1	Bovine cattle	775	203	4.5	2.3	5.0	10.2
2	Small cattle	646	318	8.3	2.3	6.7	18.7
3	Porse	713	254	5.8	2.8	5.3	19.1
4	Pig	724	250	4.5	1.9	6.0	13.6

As can be seen from the table, the amount of organic matter in the fresh manure of small-horned cattle was 318, and nitrogen was 8.3 parts, which was higher than others.

The gures obtained from the analysis of the soil and fruit trees are compared with the norm, and their need for fertilizer is calculated.

Table 4. Nutrient requirements of the soil taken from the hazelnut orchard

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№	Elements	Unit of measure	The norm	Actually	Comparison difference
1	NO_3	mg/kg	20.0	15.6	<4.4
2	P_2O_5	mg/kg	25.0	20.5	<4.5
3	K_2O	mg/kg	350	312	<38
4	S	mg/kg	5.0	3.6	<1.4
5	B	mg/kg	3.0	2.3	<0.7
6	Mn	mg/kg	12-13	15.2	>3.2
7	Cu	mg/kg	2.5	0.96	<1.54
8	Zn	mg/kg	4.0	2.15	<1.85
9	Co	mg/kg	1.0	0.67	<0.33
10	Mo	mg/kg	0.3	0.2	<0.1
11	∑ Salts	%	0.10	0.10	=
12	Organic substances	%	4.0	2.45	<1.55
13	pH		5-7	8.1	>2.1

As can be seen from the table, the amount of nutrients required for a hazelnut garden: NO3-20.0, P2 O5-25.0, K2O-350, S-5.0, B-3.0, Mn-12-13, Cu-2.5, Zn in mg/kg -4.0, Co-1.0, Mo- 0.3, Salts- 0.10%, organic matter-4.0, pH is between 5-7. Based on the results of the agrochemical analysis of the soil taken from the 1.0 ha hazelnut orchard in Parzivan area of Zagatala region, it can be said that the amount of nutrients in the soil taken from under the orchard is relatively low. In addition to nut farming, animal husbandry is also developed in our region, so organic fertilizers - manure and bird droppings are mainly used for fertilizing the soil, which makes it possible to obtain ecologically clean products. It is recommended to add 40-50 tons of animal manure and 3-5 tons of bird droppings to such soils.

Soil fertility is formed over many years. The degree of provision of nutrients in the soil, the regulation of fertilizer doses, the need for the fertilizer rate of orchards varies depending on a number of conditions. Of these, the soil and climate conditions where gardens are planted, soil fertility, the amount of nutrients, the density or sparseness of fruit trees, their age and, mainly, directly depend on the agrotechnical measures [7].

Table 5. Calendar plan of agrotechnical measures carried out during the season in hazelnut orchards

Agrotechnical measures	Months											
	I	II	III	IV	V	VI	VII		IX	X	XI	XII
Frost protection	■	■										■
Belting around the body			■									
Weeding					■	■	■	■				
Maintaining row spacing					■	■	■	■				
Pruning		■								■	■	
Green pruning						■	■	■				
Watering		■		■			■	■				
Soil fertilization - organic fertilizer		■								■	■	
Soil fertilization - mineral fertilizer			■			■					■	
Disease and pest control			■	■	■	■	■			■	■	

The quality and reliability of raw and processed agricultural products produced as food is extremely important. Excessive application of mineral fertilizers to hazelnut orchards causes the formation of a atoxin hidden rots in the kernels after the crop has ripened. In order to obtain ecologically clean products, it depends on the agrotechnical measures carried out during the vegetation period, as well as on the maintenance rules performed after the product has ripened. Thus, failure to follow normal agrotechnical care rules after the hazelnut harvest results in a decrease in quality. The product should be harvested only when it is fully biologically ripe, when it acquires its own speci c color (brown). After harvesting, hazelnuts should be stored in dry, clean, covered, well-ventilated warehouses. The height of the hazelnut stalk should not exceed 40-50 cm, and it should not be in contact with the ground during storage. As the freshly harvested grain product is moist, it is exposed to heat, and as a result, conditions are favorable for the spread of diseases and pests. To avoid this, the product should be mixed several times a day. Shelled hazelnut product should be dried naturally in the sun or in drying cabinets in processing facilities until 6% moisture remains and stored in dry conditions, but in jute bags. Otherwise, molds (*fungi*), which are often encountered in our daily life and can appear in almost all types of food products, have recently become a very serious research topic [3]. Processed molds can grow on both raw and processed products under appropriate conditions, causing a change in the quality of the product, as well as the creation of toxic substances that may pose a threat to human health. Mold fungi break down and change the composition of protein substances in hazelnuts, causing the product to rot and, as a result, produce toxins. *Aspergillus avus* and *Aspergius parasticus* in hazelnuts produce a atoxin, which is toxic to humans, and these organisms pose a threat to human health and cause the destruction of most agricultural products every year.

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Conclusion

To increase soil fertility, productivity, and quality, the soil is the strongest ecologically clean tool that affects soil formation. It is vital that quality rather than quantity is given priority for affordable food, peanuts, a key sustainable source of income for the population, to take a decent place in the world market.

Reference

1. Aliev A.P. Orgasmic Methods and Other Problems in Publishing, Agraraya Nauka Azerbaijan No. 1-2, Baku 2001, pp. 28-31

2. Alieva R. Agricultural Market and Food Safety Issues, Baku.2003. pp. 25-27

3. Babaev M.P. collection of History, Achievements and Perspectives of the Development of Azerbaijani Land science and Agrochemistry, Land and Agrochemistry. 16th Volume Science, Baku. 2004, pp. 5-30

4. Bayramova D.B, Cultivation and fertilization of peanut plants in Azerbaijan. Nurlan, Baku, 2000, pages 9-10.

5. Hacimammadov I.M., Talai J.M., Kosaev E.M. Agricultural analysis of soil, plants, and fertilizers. Teacher, Baku, 2016, pages 105-106.

6. Hasanov Z.M., Copernicus I.H., Agaveh F.A., Solomonova Y.V. What The Garden Should Know , MBM-R publication. 2009, pp. 267-272.

7. Huseynov M.C. Some Issues of Sustainable Development in the Field, and European Agricultural Science. 2005, pp. 28 31.

8. Mamedov D.S. Economic methodology in Azerbaijan. Trudy VOP, Baku, 2006. pp. 46-50.

9. Mammadova G.M, Jafarov A.B. Fertility property of the soil, Elm publishing house 2005,194p

10. Mohammadov G.S. Ecological Assessment of Azerbaijani Land, Elm, Baku 1998, p. 282.

11. Movsumov Z.R. Mohammadov M.I. Agrochemical Sciences of the Republic of Azerbaijan, Collection of Works by the Azerbaijani Society of Land Archaeologists, Volume VIII, Baku 2001, pp. 230-232.

12. Smotzok M., Bichoku U.S.A., Esadova N. Fertilizers and Their Effective Use. Published by AMDAS/IFDC, Baku, 2003, pages 37-38

13. Yusifov A.N., Mohammadov J.S., Mohammadova G.C., Huseynova A.S. The Role of Agronomic Rules and Gardeners in Gardening. Teacher , 2016. Pp. 236 239.

14. Zamanov P.B. Pochveno-Agro-Agro-Chemical History of The Origin of Life, by J. Agrohimia, 1980 No. 3, pp. 127-135.

15. Zamanov P.B. Pashayev R.A. New organic fertilizers. Azerbaijani Agricultural Scienti c Journal No. 1-2. 1998, pp. 1998. 78-79

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EFFECT OF CLIMATE CHANGES ON IRRIGATED SOILS

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Abstract

Recently, the climate changes in the world and Azerbaijan have been informed in the article. The investigations indicate that the average temperature of the world has increased by 0.8 degrees in the last 100 years. Studying the effects of global warming on soils based on the COP 29 strategy, an investigation of changes in the soils, especially their salinization and solonetzi cation is very important problem. According to the research it was determined that the temperature increase in Azerbaijan changed in the range of 0.2-1.5^{0}C in 1991-2012 compared to 1961-1990. The results show that the agricultural sector, water resources sector, coastal zones, energy sector, forest sector, tourism sector, and healthcare sector are sensitive to climate change in Azerbaijan. The long researches indicate that climate changes, incorrect irrigation of soils used under the sowing, not giving the water rate according to the plants needs and not ful lling other measures in time lead to soil salinization and indicate their negative effect on agricultural plants which are grown there. The diluvial salted soils spread in the Siyazan-Sumgait massive and on the basis of the changes that occurred in the same soils that are used under agricultural plants, it was determined that the obtained productivity decreased relatively. So, while the amount of the salt is <0.25%, the plant productivity becomes 25.82 c/h, the salt quantity is 0.25-0.50 % -the productivity is 2.47-c/h, when it is 0.5-1.0% -the productivity is 6.70 c/h, salinization is 1.0-1.5 % -productivity is 15.12 c/h, salinization is 1.5-2.0, productivity is 20.96 c/h.

Keywords: Global warming, climate change, temperature, ecology, salinity, productivity

Introduction

One of the global problems that worry the world at present is climate change and its disturbances are obvious. An average temperature increased 0.8 degrees on the climate changes in the earth according to the assessment report of the Intergovernmental Group of Experts in the last years. Azerbaijan has not been left out of the in uence of the global climate changes. The average annual temperatures increased to 0.4-1.3^{0}C in Azerbaijan. Against the background of climate changes, Azerbaijan has also been affected by extreme climate events such as oods, avalanches, storms, hurricanes, strong winds, heat, droughts, melting of glaciers, salinization, land degradation, deserti cation, reduction of precipitation and water resources, etc. The results of the different assessments indicate that the agricultural sector, water resources sector, coastal zones, energy sector, forest sector, tourism sector and healthcare sector in Azerbaijan are sensitive to the climate changes. The weakest areas for the climate changes are agricultural sector, water sector and coastal zones[7].It is known that the salinized soils spread in the foothill plains of the republic and it is available with the rich soil cover. The salinized soils mainly develop in the alluvial-accumulative plains, debris cones of the rivers, deluvial-foothill plains.

Research Object and Method

The soils in the Siyazan-Sumgait massive are a research object. The experimental areas have been selected and the soil sections have been applied by indicating coordinates, the required chemical analyses have been ful lled in soil samples in the Gilazi and Shurabad villages of the Khizi district. All the analyses were performed according to the widely used methods in the republic [2].

Results and Discussion

The plain zones of Azerbaijan occupy an important place in republic economy due to agricultural production. The carried out long researches show that incorrect irrigation of the soils under tillage, not giving the water norm according to the plants needs and not ful lling other measures in time lead to soils salinization and they negatively affect productivity of agricultural plants.

Recently, as a result of the performed investigations it was known that some ecological changes occurred in the soils under the agricultural crops under the in uence of anthropogenic effects. It was determined that incorrect utilization of the soils under agricultural crops as a result of the same change caused their salinization, and solonetzi cation, the productivity relatively reduced [11, p. 60-67].

One of the main problems of the world is an effect of climate changes on water resources. The level rise of the Caspian Sea, melting of glaciers, occurrence of hydrological events in rivers, and increase in temperature indicators can be cited as examples. The researches indicate that the imbalances were formed in the water regime of the rivers and a level of the ground-waters decreased [3, p.437-438] as a result of the global warming which creates dif culties in soil irrigation. Anomalous climate changes, the landslides in the west regions of the country, frequent ooding of the Kur and Araz rivers reveal the creation of new dangerous weather cyclones on earth. In 2010 salinization and deserti cation in the soils are created as a result of oodplain and oods. Deserti cation in the republic is approximately 40% and this is not due to climate changes. In the 90th years deforestation was one of the factors which affect deserti cation. According to the researches carried out in Azerbaijan, the temperature increase changed at 0.2-1.5^{0}C in 1991-2012 compared to 1961-1990 years. Azerbaijan is a highly sensitive country to the effects of the climate changes.

The Russian scientists Chesnokov Y.B. and others showed in their researches that the current changing climate condition is one of the factors which affects water-air regime of the ameliorated soils in Leningrad and they offered methods of the organizational-technical measures in order to prevent negative factors that affect work of the amelioration systems [119, p.24].

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The global warming increases natural disasters on the earth, negatively affects natural resources and the human s lifestyle. The last 100-year cosmic observations show that both the intensity and frequency of the thunderstorms and blizzards increased. A warm wind, hurricane, rainfalls strengthened, at the same time the number of ood events rose. A main factor in increase of all the natural disasters is climate changes[6].

At present the warming process is showing its effect in Azerbaijan as well as in the world. Erosion processes in the soils cause loss of fertility in soil cover, decrease of productivity in the cultivated agricultural plants and deterioration of the ecological ameliorative state in the soils. The climate changes affect the agriculture which is one of the production areas. Increase of the temperature accelerates mineralization of organic substances and this is a reason for strong decrease of humus in the soil. As a result, the soil fertility reduces and productivity of the agricultural crops strongly decreases. One of the main problems of the climate changes is soil salinization. One of the reasons of soil salinization is closeness of subsoil waters with high mineralization to the surface of the earth [8, p.18-36, 5, 139-142].

Taking into account the abovementioned issues, study of impact of the climate changes on soil in the Siyazan-Sumgait massive has been set as the main goal and it is an urgent problem of the day. The soil cover of the Siyazan-Sumgait massive is rather different and it is mainly represented with grey-cinnamonic (Calcic Cypsisols), grey (HaplicCalcisolos), takyr and solonchaks. The climate indicators, vegetation, the relief, different moisture condition (surface waters) affects formation and distribution of the soil. Grey-cinnamonic soils of the massif are characterized with depth salinization which is followed by high alkalinity near the soil surface and the soil is calcareous and strongly boils with chloride acid on the whole pro le [1, p.45-50].

N.R.Suleymanov determined that the natural heavy clayey soils of the Siyazan-Sumgait massif widespread in the plain part of the coastal zone. The productivity obtained from salinized soils is many times less than that of non-salinized soils [12, p.238-244]. Deluvial- formed salinized soils spread in the Siyazan-Sumqait massive. Beginning from 1.3-1.7 m depth for the massive soils, the appearance of layers of sand and gravel that is natural drainage is typical. The soils in the Siyazan-Sumgait massif are used under grain, but some small areas under orchard crops [10, p. 70,9, p.42].

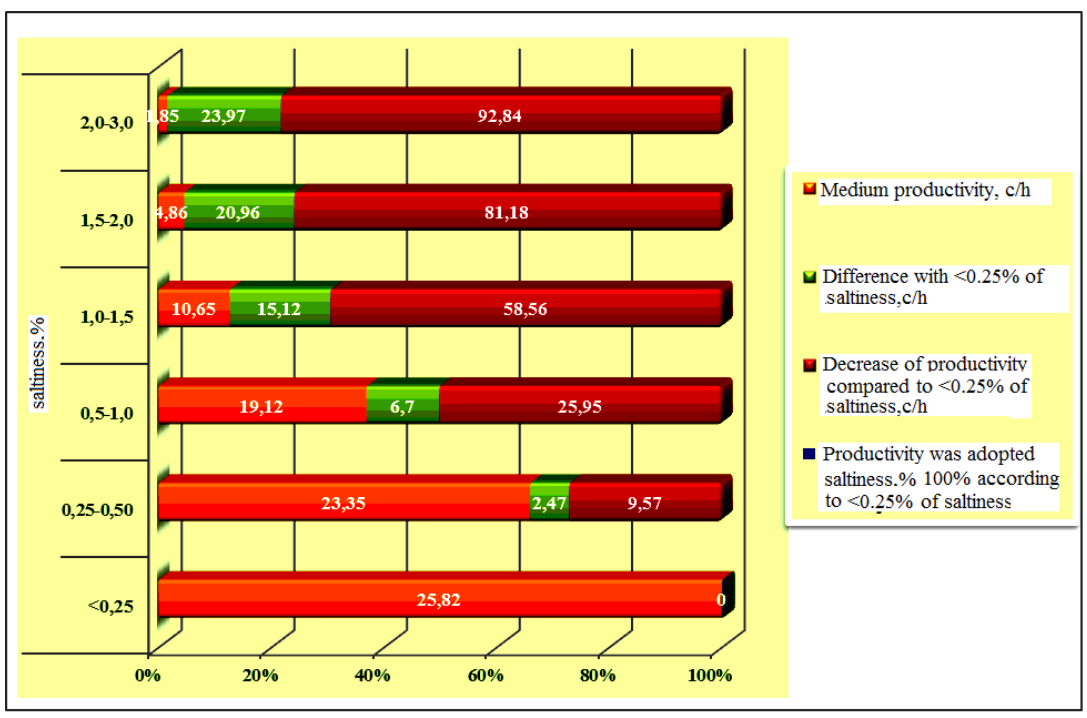
According to I.F.Figurovsky s information a climate of the Siyazan-Sumgait massive belongs to subtropical type and the climate is very drought, hot in summer, but it is characterized by the mild air condition in winter [4].The strong winds coming from north dominate in the massive. According to the information of the Siyazan meteorological station, an annual trend of precipitations differs with dry summer and relatively rainy autumn (37% of the annual rainfall).All these factors in uence the physicochemical properties that in uence changes in the productivity of agricultural plants.

Naturally, the climate changes affect the areas under grain crops in the research zones. It was determined that the productivity obtained on the basis of the changes relatively reduced. So, the plant productivity is 25.82 c/h while an amount of the salt is <0.25%, it is 2.47 c/h when the salt quantity is 0.25-0.50%, it is 6.70 c/h while the salt is 0.5-1.0%, 6.70 c/h while saltiness is 0.5-1.0%, it is 15.12 c/h when the saltiness is 1.0-1.5 %, but the productivity is 20.96 c/h while saltiness is 1.5-2.0 %. (Table 2).

Table 1. Centner/hectare and percent quantity (grain plant) of productivity decrease due to saltiness increase in the soil

	Indicators	Saltiness, %					
		<0,25	0,25-0,50	0,5-1,0	1,0-1,5	1,5-2,0	2,0-3,0
1	Average productivity, c/h	25,82	23,35	19,12	10,65	4,86	1,85
2	Difference with <0.25% of saltiness, c/h	There is no	2,47	6,70	15,12	20,96	23,97
3	Decrease of productivity compared to <0.25% of saltiness, c/h		9,57	25,95	58,56	81,18	92,84
Productivity was adopted 100% according to <0.25% of saltiness							

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Conclusion

The investigations show that changes have been observed in the irrigated soils under the agricultural crops. One of these reasons is incorrect realization of irrigation norms and at the same time the climatic changes occurred last times. The soils in the Siyazan-Sumgait massive exposed to salinization and solonetzi cation to a de nite degree, as a result the productivity obtained from grain plant reduced.

Acknowledgment

This research work was performed in the soils of the Siyazan-Sumgait massive and de nite consequences were obtained. So, increase of saltiness in the soils negatively affected the productivity of grain plant.

References

1. Abduyev M.P. Chemical-geographical characteristics of soils with delluvial form of salinity in the Siyazan-Sumgait massive. News of ANAS of Azerbaijan SSR, ser. Biological and medical sciences , Baku, 1961, 3, p. 45-50.

2. Arinushkina E.V. Management on chemical analysis of soils.M..MSU, 1970, p.483.

3. Ahmadova B.Y. Provision of water safety in contest of global climate changes of Azerbaijan . Materials of international scientific-practical conference Dedicated to 100 anniversary of Baku- Shollar water devices complex , Water resources, hydro-technical devices and environment Part II, Baku, 2017, p.437-438.

4. Figurovsky I.V. Climatic regionalization of Azerbaijan. Materials on regionalizationAzerb.SSR, issue 4, Baku, 2017. P. 437-438.

5. Jalilova L.Z., Mehdiyeva N.Z. Role of the climate change in soils salinization. Tendency of development of science and education. Reviewed scienti c journal.Samara, 72, part 2, 2021, p. 139-142.

6. https://azertag.az/xeber/qlobaliqlimdeyi meleriveyaratd problemler

7. https://eco.gov.az/az/hidrometeorologiya/iqlim-deyi meleri

8. Gurbanov E.A. Effects of climate changes (biodiversity, agriculture, human healthy, social-economical areas) Baku, Muallim publication., 2016, p.18-36.

9. Mehdiyeva N.Z. Modern state of the soils in the Siyazan-Sumgait massive.Institute of Soil Science and Agrochemistry of ANAS. Held among students, masters and doctoral students dedicated to Science Day (dissertators) Problems of the environment and strategy of its preservation: a look into the future .Scienti c-practical conference.Baku, 2020, p.42.

10. Mehdiyeva N.Z. Change of some indicators of soils in the research zone (on Siyazan-Sumgait zone). Ecology, amelioration and energetic of soils dedicated to the110th anniversary of Academician V.R.Volobuyev .Scienti c-practical conf. mater.Baku 2020, p.70.

11. Mustafayev M.G. Modern state of soils in Azerbaijan and scienti c bases of their improvement. Management with water resources in the conditions of globalization: col.conf.,dedicated to the 105th anniversary of prof. L.E. Tajibaev. Alma-Ata, Kazakhstan, 2021, p.60-67.

12. Suleymanov N.R.,Abbasova R.Y., Landscape-adapted soil-ecological method of natural solonchaks assimilation in the Siyazan-Sumgait massif. Works collection of ATJ., XVIII vol., Elm, 2009, p. 238-244.

13. Chesnokov Y.V., Gulyuk G.G., Yango Y.G., Petrushin A.F. On some scienti c-practical aspects of involving reclaimed agricultural soils into circulation.Effective development of ameliorative complex.Amelioration and water management 2, 2022, p.24.

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INFLUENCE OF SLOPE EXPOSITION ON THE PROPERTIES OF HAPLIC KASTANOZEMS IN THE LESSER CAUCASUS

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Abstract

Comparative geographical soil studies have been conducted in the reference research area located in the low-mountain zone of the northeastern part of the Lesser Caucasus, on Haplic Kastanozems (within the territory of the Dag Kesemen municipality of the Gazakh district). The study site is at elevations of 400-450 m above sea level and signi cantly fragmented with slopes and valley-shaped micro-depressions. Parent materials contain silty calcareous diluvial sediments. The vegetation is characterized by well-developed grass and shrubs. The climate is aridic with annual precipitation and average temperatures of 380-400 mm and 11.8-12.5 C, respectively. The soils of north-west faced shady slopes are characterized by optimal moisture regime consequently well-drained grasses vegetation and accumulative topsoil (AU=35-40 cm), high humus (2.8-3.5), and nitrogen content (0.34-0.38%), a high absorption capacity (30-37 meq.) and slightly alkaline soil environment (pH of 7.3-8.2). The leaching of carbonates from topsoil (AU=20-25 cm) and its accumulation ($CaCO_3$=6.4-9.0) in the middle part of the soil pro le is a typical soil-forming process. The density of soil is 1.15-1.18 and 1.42-1.48 gr/cm3 in topsoil (0-25 cm) and subsoil (50-80 cm) horizons, respectively. The biomass of surface grass is 6.8 t/ha while its root biomass is 17.2 t/ha., with ner texture(<0.01mm=48.9-60.1%;<0.001mm=22.6-28.0%). The soils on sunny south-east slopes are characterized by fragility to erosion, consequently, accumulative topsoil (AU=25-30 cm), decrease in humus (1.9-2.3), nitrogen content (0.15-0.18), absorption capacity (23.4-26.0 meq), surface biomass of grass (4.5 t/ha) and its root mass (12.3 t/ha), ner texture (<0.01mm=38.1-46.5%; <0.001mm=12.6-17.2%) and existence of carbonates ($CaCO_{3=}$12.4-17.1%) in the topsoil.

Keywords: Relief, slope exposition, Haplic Kastanozems, soil pro le, humus, biomass.

Introduction

The role of relief in soil forming and soil cover structure in the mountainous lands was particularly emphasized in the study examples from European and Russian soil scientists at the beginning of the last century. The relief was considered as the mirror of soil. The studies showed that not only elevation but also slope exposition plays an important role in the formation of diagnostic properties and soil cover structure in different climate-landscapes zones of the mountainous lands in Azerbaijan. On the basis of the preliminary results of our research conducted in recent years in separate landscape zones of the north-eastern part of the Lesser Caucasus, it was determined that the temperature regime in the soil is much higher as a result of more sunlight falling on the sunny slopes of the terrain than on the shaded slopes, has a profound effect on the formation of elementary soil areas and the erosion process. However, these important indicators are not properly taken into account in the determination of diagnostic indicators of regions and agricultural lands in mountainous areas and in the preparation of soil maps.

Research Object and Methodology

In the studies, the main signs indicating the relationship between the soil and the relief elements are not noticed properly. These relationships, especially the terrain that determines the suitability of farmland for agricultural use on different mountain slopes are important indicators. The study of these indicators creates useful opportunities for agricultural specialists, especially farmers, municipalities, and individual landowners, to make more ef cient use of land. The study aimed to study the in uence of slope exposition on diagnostic parameters and the formation of soil cover structures of Haplic Kastanozems in the northeast part of the Lesser Caucasus. Our comparative geographical soil studies have been conducted on Haplic Kastanozems within the territory of the Dagh Kesemen municipality of the Gazakh district (located in the low-mountain zone of the northeastern part of the Lesser Caucasus) in the reference research area . The study site is at elevations of 400-450 m above sea level and signi cantly fragmented with slopes and valley-shaped micro-depressions. The climate is aridic with annual precipitation and average temperatures of 380-400 mm and 11.8-12.5 C, respectively. Parent materials contain silty calcareous diluvial sediments. The vegetation is characterized by well-developed grass and shrubs. A site-speci c study area was selected in the area of the Haplic Kastanozems in the northeast part of the Lesser Caucasus. Soil surveys were conducted based on a geographical-comparative approach. The soil pits with 1.5 m depth were bored and georeferenced using GPS in shady north-west faced and sunny south-east faced slopes and the soil samples were collected from genetic horizons. The morphological properties of genetic horizons were described and the soil samples were tested for chemical analysis as accepted methods.

Results and discussion

In the topsoil of Haplic Kastanozems (AU=20-25 cm) humus content was much higher (2.8-3.5%), its movement to a depth of 45-50 cm (1.0-1.5%) is clearly noticeable. The reserve of humus is 58-82 t/ha in 0-20 cm and 106-130 t/ha in 0-50 cm. The amount of total nitrogen is also much higher (0.20-0.25%) and its reserve is 3.9-5.7 t/ha in the 0-20 cm layer and 7.5-9.8 t/ha in the half-meter layer. The topsoil (AU=20-25 cm) is completely washed out of carbonates and it is characterized ($CaCO_3$=6.4-9.0%) accumulation in medium-deep layers (0.7-1.5 m). This soil is also highly supplied with absorbed bases (AU=34.2-38.5 mg-eq). The absorption capacity is dominated by Ca cation and the Ca:Mg ratio varies between 1.6-2.3. The analysis results show that these soils have a relatively heavy granulometric composition. While the amount of physical clay (<0.01 mm) in the upper layers (AU+A/B) is 40.6-48.9%, silt particles (<0.001 mm) are 13.9-18.7%, in the middle layers, respectively, their quantity rises to 48.3-60.7; 17.5-28.0%. Moderate to severe erosion of Haplic Kastanozems on sunny slopes, signi cant reduction of the humus layer (AU=15-20 cm), structural disruption and dusty-clay-like character, relatively lightening of the granulometric content (<0.01mm=38, 1-47.9%; <0.001mm=16.9-18.7%), good formation of the carbonate illuvial layer (Bca), clear appearance of large soft carbonate grains and relatively close to the soil surface (35- 40 cm) etc. morphological signs are characteristic. The amount of humus in the topsoil (AU=15-20 cm) is 1.3-1.8%, and in the lower layers it decreases sharply (0.4-0.7%). The reserve of humus is also small and 28-32 t/ha in 0-20 cm; and in 0-5 cm it varies between 40-56 t/ha. These soils are also poorly supplied with total nitrogen (0.08-0.11%), and the reserve in the 0-20 cm layer is 1.8-2.1 t/ha. However, the pro le of Haplic Kastanozems formed on sunny slopes differs from the surface with carbonate (CaCO3=6.4-8.5%). The maximum amount of carbonates (CaCO3=9.5-17.1%) is noted in the middle layers.

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Table 1
The in uence of shady and sunny slopes on the diagnostic indicators of Haplic Kastanozems in the north-eastern part of the Lesser Caucasus

Soil pit №	Genetic horizons and depth, cm	Humus,%		C:N	$CaCO_3$	pH in water solution	Dry residue	Absorption capacity, meq			Particle sizes, %	
								Total	Ca»	Mg»	< 0,001mm	< 0,01 mm
1	2	3	4	5	6	7	8	9	10	11	12	13
Shady north-west faced slope												
30	AUv 0-22	3,52	0,25	7,5	Yox	7,3	0,106	37,6	28,9	9,3	13,80	40,60
	AUz 22-43	2,09	0,18	7,1	3,4	7,9	0,103	29,4	21,3	8,1	12,16	43,92
	B 43-75	0,85	t.olm	-	6,4	8,1	0,134	26,6	19,7	6,9	17,52	48,32
	BC 75-108	0,56	-	-	8,5	8,2	0,250	24,0	18,3	5,7	12,48	48,68
	C 108-136	0,32	-	-	7,7	8,0	0,493	22,7	17,5	5,2	9,36	22,68
34	AUv 0-20	2,82	0,23	6,1	Yox	7,5	0,128	34,1	27,3	6,8	18,88	47,92
	AUz 20-38	2,25	0,18	7,2	2,3	8,0	0,135	30,2	23,8	6,4	22,60	56,48
	B 38-73	1,46	0,11	7,4	4,2	8,2	0,148	26,5	21,0	5,5	28,04	60,12
	BC 73-105	0,83	t.olm	-	9,0	8,3	0,224	25,0	20,6	4,4	27,76	54,28
	C 105-140	0,45	-	-	8,2	8,2	0,346	21,8	18,4	3,4	12,68	34,28
Sunny south-east faced slope												
27	AY 0-13	1,88	0,19	5,6	6,4	7,9	0,383	24,3	20,2	4,1	16,92	38,08
	A/B 13-34	1,15	0,10	5,8	8,6	8,2	0,865	23,4	19,2	4,2	17,24	44,60
	B/C 34-62	0,73	t.olm	-	9,4	8,5	1,307	20,9	16,8	4,1	18,04	55,12
	Cca 62-85	0,40	-	-	7,7	8,2	1,188	18,5	15,1	3,5	12,68	34,28
45	AY 0-20	2,25	0,18	7,1	6,5	8,0	0,115	26,0	21,4	4,6	15,68	47,92
	A/B 20-36	1,43	0,11	7,4	14,9	8,3	0,122	25,3	19,3	6,0	12,60	46,48
	B 36-75	0,75	0,07	5,9	17,1	8,5	1,123	23,8	17,5	6,3	18,04	45,12
	B/C 36-75	t.olm	t.olm	-	11,5	8,4	0,328	20,0	16,2	3,8	17,76	34,18
	Cca 92-130	-	-	-	9,0	8,4	0,392	19,5	14,1	5,4	10,68	32,28

Conclusion

The comparative assessments showed that signi cant differences exist between the soils of shady and sunny slopes despite the same elevations.
The basic diagnostic indicators of Haplic Kastanozems formed on different slope expositions of mountainous areas have been determined. It is suggested to use shady north-west faced slopes under cereal-grain crops and sunny south-east faced slopes under hay elds. The salinization of the south-facing slopes is clearly visible from the surface of highly eroded soils. The amount of dry residue in the upper layers (AU=15-20cm) is 0.86%; at a depth of 60-85 cm, it increases to 1.31%.

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Reference

1. Aslanova R.H. (2005). Böyük Qafqazın dağ boz-qəhvəyi torpaqların diaqnostikasına kölgəli və günəşli yamacların təsiri. //ATC-nin əsarləri, X cild, I hissə, s. 159-166
2. Həsənov V.H., Xəlilova A.Ə. (2004). Alazan vadisi torpaq örtüyünün strukturasına və torpaqların diaqnostik göstəricilərinə relyef şəraitinin təsiri. Azərbaycan Aqrar Elmi jurnalı, № 1-3, s.52-55
3. Həsənov V.H., Aslanova R.H., İsmayılov B.N. (2015). Kiçik Qafqazın dağ-çəmən və dağ-meşə torpaqlarının morfogenetik diaqnostikasına torpaq örtüyü strukturlarının formalaşmasına müxtəlif baxarlı yamacların təsiri // Azərbaycan ET Əkinçilik İns-nun elmi əsərlərinin XXVI cildi, "Maarif" nəşriy., s. 433-442
4. Məmmədov Q.Ş. (2006). Azərbaycanın torpaq ehtiyatlarının istifadəsinin sosial-iqtisadi əsasları. Bakı, "Elm"
5. Nuriyev E.R. (2011). Göygöl Milli Parkının dağ-meşə qonur torpaqlarının morfogenetik diaqnostikasına müxtəlif yamacların təsiri. // Torpaqşünaslıq və Aqrokimya əsərlər toplusu, XIX cild, Bakı, "Elm", s. 202-207
6. Nuriyev E.R. (2011). Göygöl Milli Parkının dağ-çəmən torpaqlarının morfogenerik diaqnostikasına şimal və cənub baxarlı yamacların təsiri.// İSSN 2222-7882 Torpaq. və Aqrokimya jurnalı, XX cild, № 1, Bakı, "Elm", s. 106-113
7. Мамедова С.З., Гасанов В.Г., Нуриев Э.Р. (2012). Влияние экспозиции склонов на морфогенетическую диагностику горно-луговых и горно-лесных коричневых почв Национального Парка Гейгель Азербайджана. Материалы конф. посвящ. 85-летию Инс-та им. В.В.Докучаева, М., с. 142-146
8. Просолов Л.И. (1931). Генезис, география и картография почв. М.
9. Салаев М.Э. (1966). Почвы Малого Кавказа. Изд.АН Азб.ССР, Баку
10. Салаев М.Э. (1991). Диагностика и классификация почв Азербайджана. Баку, «Элм»

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SOIL BIODIVERSITY DETERMINATION IN UJAR USING REMOTE SENSING METHODS

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Abstract

Ujar District, located in the central part of Azerbaijan, is a region rich in soil biodiversity, which is crucial for ensuring ecosystem stability and sustainable agriculture. Preserving soil biodiversity is essential for effective land management practices and reducing the risk of degradation. The application of appropriate assessment and monitoring methods is therefore critical. In recent years, remote sensing (RS) technologies have begun playing an important role in this eld, as these methods provide extensive, high-precision, and frequently updated data over large areas.The primary goal of this study is to analyze and map the soil biodiversity of Ujar District through remote sensing technologies. To achieve this, multispectral and hyperspectral satellite images, LiDAR data, and drone footage have been used. These methods allow the assessment of soil organic matter content, moisture levels, vegetation diversity, and structure. The study includes the application of analytical approaches for describing and evaluating various indicators of soil biodiversity, alongside mapping processes supported by GIS software. Additionally, a current NDVI map of the area has been created using modern technologies. The data obtained from this study can be used to identify the current state of soil biodiversity in Ujar District and to implement concrete measures to ensure its long-term sustainability. Small amounts of 30 cm tall, green grass (750 kg/ha) could not be detected within a 75 cm tall, senesced grass stand (5000 kg/ha).

Keywords: Soil biodiversity, vegetation indices, soil mapping, NDVI, SAVI map

Introduction

Soil biodiversity is one of the key factors essential for the stability and productivity of natural ecosystems. Microorganisms, insects, and other organisms living in the soil play a crucial role in providing ecosystem services. They ensure ecosystem functionality through nutrient cycling, soil structure formation, water retention, and contributions to soil carbon cycling. Additionally, soil biodiversity is vital for enhancing agricultural productivity and maintaining ecological stability [1].

As in other elds, climate variability, soil erosion, intensive agriculture, and urbanization exert signi cant pressure on biodiversity. A decline in soil biodiversity can lead not only to the disruption of ecosystem services but also to reduced agricultural productivity and ecological balance in the region. In Ujar District, detailed information on the state of this biodiversity is limited. Although traditional soil studies provide in-depth insights, they often require substantial time and resources for large-scale assessments [2].

To address this issue, remote sensing technologies offer an innovative approach. Speci cally, spectral indices such as the Normalized Difference Vegetation Index (NDVI) and the Soil-Adjusted Vegetation Index (SAVI) can be used to indirectly study soil biodiversity and collect data over extensive areas [4]. The primary objective of this study is to assess the state of soil biodiversity in Ujar District and explore the application of remote sensing methods in this eld. Using NDVI and SAVI indices, the study aims to gather data on soil biodiversity, analyze the results, and propose recommendations for biodiversity management [5]. The use of remote sensing technologies for monitoring soil biodiversity presents a time- and resource-ef cient approach to addressing ecological issues. This research will provide new knowledge and methodological contributions to soil biodiversity monitoring not only for Ujar District but also for other regions in Azerbaijan. Furthermore, the results will offer a scienti c basis for developing strategies to conserve soil biodiversity and ensure sustainable soil management.

Research Object and Materials

This research focuses on examining soil biodiversity in Ujar District. Speci cally, the study investigates vegetation cover, spectral properties of the soil surface, and other ecological factors in uencing soil biodiversity in this area. The study primarily evaluates biodiversity indicators in agricultural lands.

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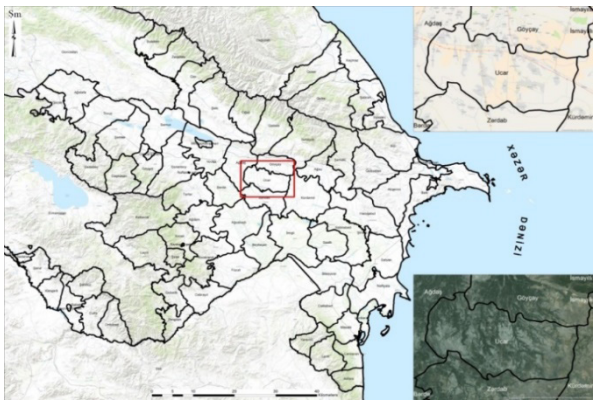


Figure 1. Study object Ujar District

Materials Used

The research utilized remote sensing technologies. The primary datasets include:

- Landsat 8 satellite imagery (2022),
- Spectral analyses for calculating NDVI and SAVI indices,
- Global Elevation Data (DEM) to account for topographic characteristics.

Study Area

The study area comprises Ujar District, focusing on agricultural soils. This region is characterized by at terrain and a subtropical climate, with a total area of 83,398 hectares. The vegetation in the area includes desert and semi-desert plants, salt-tolerant plants, aquatic vegetation, and agricultural crops. The diverse soil types make the area suitable for assessing different biodiversity indicators [6].

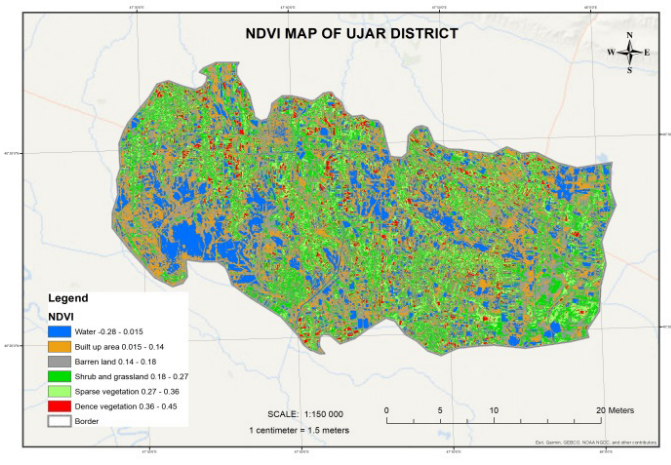
Methodology

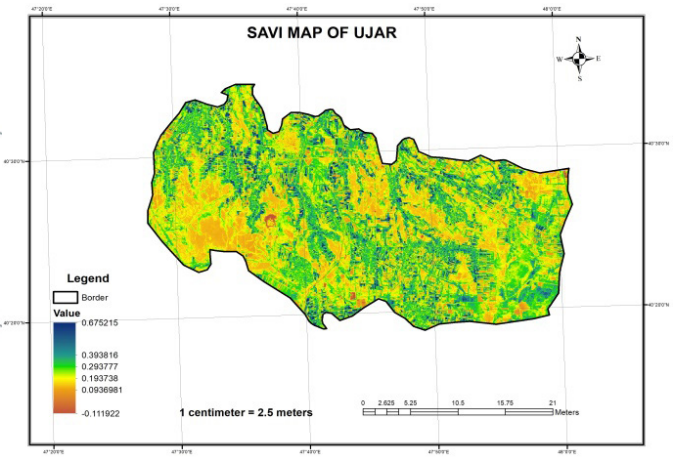
- Data Collection: Satellite imagery and existing geographic databases were collected, and NDVI and SAVI indices were calculated using ArcGIS software.
- Spectral Analysis: Spectral indicators re ecting soil biodiversity were analyzed based on satellite data from various points in the study area.

Results and Discussion

The study yielded the following key indicators of soil biodiversity in Ujar District:

1. NDVI Values: NDVI values, re ecting vegetation density and health, ranged from 0.35 to 0.72. Higher NDVI values were observed in areas with rich soil biodiversity, primarily in zones with minimal agricultural impact.
2. SAVI Values: The SAVI values con rmed the relationship between the soil surface and vegetation cover. Lower SAVI values were recorded in areas with intensive agricultural activity [4].
3. Topography and Biodiversity Relationship: While the at terrain did not negatively impact soil biodiversity, vegetation cover was weaker in areas with limited irrigation opportunities.
4. Anthropogenic Impacts: Soil biodiversity declines due to intensive farming and urbanization. Agricultural activities, in particular, contribute to reduced biodiversity indicators [3,5].





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Figure 2. NDVI and SAVI Map of Ujar District

The results indicate that soil biodiversity in Ujar District is strongly in uenced by climatic and anthropogenic factors. NDVI and SAVI analyses con rm the critical role of vegetation cover in preserving soil biodiversity. The hypothesis that intensive human activities diminish soil biodiversity is supported by the ndings.

Comparison with Previous Studies

This study aligns with previous research conducted in similar areas in Azerbaijan. For example, studies in southwestern regions explored the relationship between soil biodiversity, vegetation cover, and irrigation systems. However, in Ujar District, at terrain and environmental factors exert less in uence on the primary biodiversity indicators.

Importance of the Findings

These ndings offer valuable insights for developing potential strategies to preserve soil biodiversity and promote sustainable soil management in Ujar District. Monitoring soil biodiversity is essential not only for ecological sustainability but also for ensuring future agricultural productivity.

Conclusion

1. *Key Findings:*

The research demonstrated that NDVI and SAVI indices are effective tools for assessing soil biodiversity. Biodiversity in the area depends primarily on vegetation density and anthropogenic impacts.

2. *Answers to Research Questions/Objectives:*

The study con rmed that remote sensing technologies enable large-scale assessment of soil biodiversity.

3. *Practical Implications:*

More ecological approaches in agriculture, such as minimal soil tillage and ecosystem-based irrigation strategies, should be adopted to conserve soil biodiversity.

4. *Future Research Directions:*

Future studies could integrate ground-based data on soil microbiological diversity with remote sensing results.

5. *Final Statement:*

This research highlights the importance of remote sensing technologies as essential tools for studying soil biodiversity and provides a scienti c foundation for biodiversity conservation in Ujar District.

Acknowledgment

The study was carried out using different global open satellite systems.

References

1. Anderson, J. M., & Ingram, J. S. (1993). Tropical Soil Biology and Fertility: A Handbook of Methods. CAB International.
2. Bai, Z. G., Dent, D. L., Olsson, L., & Schaepman, M. E. (2008). Proxy global assessment of land degradation. *Soil Use and Management, 24*(3), 223-234.
3. FAO. (2020). State of Knowledge of Soil Biodiversity: Status, Challenges, and Potentialities. Rome: Food and Agriculture Organization of the United Nations.
4. Huete, A. R. (1988). A soil-adjusted vegetation index (SAVI). *Remote Sensing of Environment, 25*(3), 295-309.
5. Sayer, E. J., et al. (2017). Soil biodiversity: Science and solutions for agricultural sustainability. *Agriculture, Ecosystems & Environment, 249*, 116-132.
6. Az rbaycan Respublikas n n inzibati razi b lg s :m lumat toplusu.- Bak : Az rbaycan Respublikas Milli M clisinin n ri, 2013

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THE EFFECT OF DIFFERENT TYPES OF ORGANIC FERTILIZERS ON THE DEVELOPMENT OF CORN PLANT ADAINST THE BACKGROUND OF MINERAL FERTILIZERS IN THE IRRIGATED GRAY-MEADOW SOILS OF SHIRVAN

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Abstract

Corn is one of the plants that needs fertilizers. In this regard, fertilizing with organic fertilizers is very important. Thus, organic fertilizers enrich the soil with nutrients necessary for plant nutrition, improve its water-physical properties, agrochemical properties, enrich the soil with useful microorganisms and accelerate the entry of nutrients into the plant. It is from this point of view that it is very important to study the correct fertilization of the corn plant cultivated in the soil and climate conditions of the Shirvan zone. In the experiment, the determination of easily assimilated forms of nutrients in the soil of local organic fertilizers under the corn plant in Ujar Dayag station was studied. The preparation of local organic fertilizers using the wastes spread in the Shirvan zone and the effect of these fertilizers on the fertility of the soil under the corn plant in the conditions of the gray-meadow soils of Ujar were studied. Using Shirvan compost made from manure, bird droppings, water channel sludge, plant residues, residues from the processing of agricultural products, biohumus, biomax and local waste under the conditions of the gray-jamen soils of Ujar under the corn plant in 3 replicates according to the following scheme in 5 variants a eld experiment was conducted. The amount of forms of nutrients contained in organic fertilizers used by plants changes during the growing season. Thus, the most noticeable positive change was in the version where 5 tons of Biohumus was given per hectare.

Keywords: corn, fertilizer, organic, biohumus,

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DEVELOPMENT OF MEASURES TO COMBAT CLIMATE CHANGE

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Abstract

Climate change includes both global warming driven by greenhouse gases caused by anthropogenic emissions and large-scale changes in weather patterns as a result. Although there have been climate changes in the past, since the middle of the 20th century, humans have affected the Earth s climate system to an unprecedented degree and caused changes on a global scale. Thus, the twentieth century saw the strongest warming trend of the last millennium, with average temperatures rising by about 0.8 C. However, future temperature increases are expected to exceed this value by an increase of 0.1-2 C per decade. Climate change also affects food security, especially in areas that rely on rain-fed agriculture. The main greenhouse gases that cause climate change are carbon dioxide and methane. The main sources of methane emissions are agriculture and the oil and gas industry. One of the sectors most affected by the negative effects of climate change is agriculture. Evidence suggests that higher temperatures reduce agricultural productivity, as farmers respond to lower yields by increasing acreage throughout the crop year. As an example of the negative effects of climate change on agriculture, the events in African countries can be cited. For example, in 2007, a severe drought in Lesotho, one of the least developed countries in southern Africa, severely reduced productivity and increased food prices. As a result, 20% of the country s population needed food aid.

One of the ways to combat climate change is the transition to a green economy. Because the green economy plays an important role in reducing emissions. This economy aims to prevent the depletion of the planet s natural resources while ensuring economic development and job creation. The transition to a green economy has signi cant environmental bene ts - notably reductions in carbon emissions and pollution. In Germany, for example, policies promoting renewable energy have resulted in signi cant reductions in greenhouse gas emissions. This not only bene ts the country but also contributes to global efforts to combat climate change.

Keywords: climate change, carbon emission, environment, green economy, renewable energy

Introduction

Global climate change is one of the problems that concern the whole world today. Climate change includes both global warming driven by greenhouse gases caused by anthropogenic emissions and large-scale changes in weather patterns as a result. Although there have been climate changes in the past, since the middle of the 20th century, humans have affected the Earth s climate system to an unprecedented degree and caused changes on a global scale. Thus, the strongest warming trend of the last millennium was observed in the twentieth century, and the average temperature rose by about 0.8 C [2]. However, future temperature increases are expected to exceed this value by 0.1-2 C per decade, signi cantly altering biodiversity, agricultural production and food security. Mostly endemic species are subject to extinction. In addition, climate change affects food security, especially in areas based on rain-fed agriculture [1]. By reducing food waste, compensating food for insecure people, protecting biodiversity, making effective use of genetic resources and traditional ecological knowledge, we can reduce biodiversity loss and prvide food security.

Rising average global temperatures and extreme, unpredictable weather are the most common manifestations of climate change. The increase in the emission of greenhouse gases (CO2, methane and nitrous oxide) and deforestation due to the burning of coal and fossil fuels are the main factors of climate change. A marked increase in the frequency and intensity of natural disasters, rising sea levels, reduced productivity and loss of biodiversity are consequences of climate change. Climate change occurs as a result of natural factors and human activities. Due to climate change, species distribution has shifted to higher latitudes at an average rate of 11.0 m and 16.9 km per decade [3]. One of the changes observed in recent years is the increase in the frequency and intensity of extreme and unpredictable weather conditions and natural disasters. In previous decades, it was possible to accurately predict the annual weather pattern, including the onset and end of monsoons, and farmers could plan their cropping periods according to weather conditions. But in recent years, weather conditions change almost every year and farmers suffer huge losses. Similarly, the amount of annual rainfall and the locations associated with high and low rainfall can no longer be predicted with accuracy. Many areas associated with low rainfall have started to receive more rain, and areas traditionally associated with heavy rainfall are experiencing reduced rainfall.

In 2021, four key indicators of climate change greenhouse gas concentrations, sea level rise, ocean warming, and ocean acidi cation reached new record levels. This is another clear indication that human activity is causing planetary-scale changes to the land, oceans, and atmosphere. The key to solving this crisis is ending dependence on fossil fuel energy, which is the main cause of climate change [4]. Environmental destruction and global warming have seriously affected biodiversity. The quality of our water, air, soil deteriorates, plants and animals are destroyed. We need to nd a way to turn back the clock and reverse some of the damage we have done to biodiversity and ecosystems. One way to reduce global warming is to implement climate change solutions, such as solar panels, which are ideal for states like Florida.

In the last decade, there is a greater need to address problems such as climate change, biodiversity loss, water scarcity, etc. In 2015, countries around the world adopted the 2030 Agenda for Sustainable Development and its 17 Sustainable Development Goals. These goals recognize that global poverty eradication must go hand in hand with policies that promote economic growth, while addressing a range of social needs, including education, health, social protection and job creation, while combating environmental pollution and climate change. Thus, the sustainable development goals also create a real link between ecological and economic systems. They also reinforce the need for a transition to a green economy, a fundamental transformation towards more sustainable ways of production and consumption.

To avoid the worst effects of climate change, emissions must be almost halved by 2030 and reach zero emissions by 2050. To achieve this goal, we must end our dependence on fossil fuels and invest in clean, accessible, affordable, sustainable and reliable alternative energy sources. The abundant renewable energy sources around us such as the sun, wind, water, waste and the Earth s heat are naturally replenished and release virtually no greenhouse gases or pollutants into the atmosphere.

About 80 percent of the world s population lives in countries that are net importers of fossil fuels. Unlike fossil fuels, renewable energy sources are available in all countries and their potential has not yet been fully exploited. The International Renewable Energy Agency (IRENA) estimates that by 2050, 90 percent of the world s electricity could come from renewable sources. By providing a way out of import dependence, renewable energy allows countries to diversify their economies while boosting inclusive economic growth, job creation and poverty reduction efforts.

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Today, renewable energy is actually considered the cheapest energy supply in most regions of the world. Lower prices make renewable energy more attractive to everyone, including low- and middle-income countries, which will account for much of the additional demand for new electricity. By 2030, the purchase of cheap electricity from renewable sources will provide 65 percent of the world s electricity supply. This will decarbonize the energy sector by 90 percent by 2050, signi cantly reducing carbon emissions and helping to mitigate climate change. According to the World Health Organization (WHO), about 99 percent of the world s population breathes polluted air that threatens human health and is estimated to be the cause of more than 13 million deaths worldwide every year. Thus, switching to clean energy sources such as wind and solar helps to solve not only the problem of climate change but also the problems of air pollution.

Green economy plays an important role in reducing emissions. It also increases the potential to adapt to climate change and reduce waste and material consumption. The green economy aims to prevent the depletion of the planet s natural resources, while ensuring economic development and job creation. Renewable energy is the basis of the green economy. The transition to a green economy has signi cant environmental bene ts - notably the reduction of carbon emissions and pollution. In Germany, for example, policies promoting renewable energy have resulted in signi cant reductions in greenhouse gas emissions. This not only bene ts the country but also contributes to global efforts to combat climate change.

Renewable energy is energy that comes from natural sources and is recharged at a faster rate than it is consumed. Examples of such renewable sources are sunlight and winds. Renewable sources can provide large amounts of energy and are all around us. Unlike fossil fuels - coal, oil and gas - they are non-renewable resources and take hundreds of millions of years to form. When fossil fuels are burned to produce energy, harmful greenhouse gases such as carbon dioxide are released. Energy production from renewable sources has much lower emissions than burning fossil fuels. Switching from fossil fuels, which currently account for the majority of emissions, to renewable energy sources is key to combating the climate crisis.

Solar energy is the most abundant of all energy resources and can be used even in cloudy weather. The rate at which solar energy is captured by the Earth is about 10,000 times faster than the rate at which humanity consumes energy. Solar technologies can provide heating, cooling, natural light, electricity and fuel for a variety of applications. These technologies make it possible to convert sunlight into electricity using photovoltaic panels or mirrors that concentrate solar radiation. Although not all countries are equipped with solar energy to the same extent, each can contribute signi cantly to the energy mix through solar energy itself.

Wind energy harnesses the kinetic energy of moving air using large wind turbines located on land (onshore wind farms) or offshore or in fresh water (offshore/shore wind farms). Wind power has been used for thousands of years, but in the last few years, onshore and offshore wind technology has evolved to maximize the amount of electricity produced through taller turbines and larger rotating diameters. Although average wind speeds vary greatly by location, the global technical potential for wind energy exceeds global electricity production, and most regions of the world have suf cient capacity to develop signi cant numbers of wind farms. Strong winds occur in many parts of the world, but sometimes remote areas are best suited for wind power generation. Offshore wind energy has great potential.

Geothermal energy uses the heat energy available in the interior of the Earth. Heat is obtained from geothermal reservoirs by drilling or other methods. Reservoirs that are hot enough and permeable in nature are called hydrothermal reservoirs, and reservoirs that are hot enough and enhanced by hydraulic stimulation are called developed geothermal systems. Liquids of different temperatures appearing on the surface can be used to generate electricity. The technology for generating electricity from hydrothermal reservoirs is mature and reliable and has been in use for over 100 years.

Hydropower uses the energy of water moving from high altitudes to low altitudes. Such energy can be obtained by using reservoirs and rivers. Hydroelectric power stations located in reservoirs use the water resources located in them, and off-river hydroelectric power stations use the energy of the existing river ow. Hydropower reservoirs serve many purposes, often providing drinking and irrigation water, ood and drought control, navigation services, and power supply. Currently, hydropower is the largest source of renewable energy in the electricity sector. It generally depends on stable precipitation patterns and can be adversely affected by climate-induced droughts or changes in ecosystems that affect such patterns. The infrastructure required to generate hydropower can also negatively impact ecosystems. For this reason, many consider small hydropower plants to be a more environmentally friendly option, especially for people living in remote areas.

Bioenergy is derived from a variety of organic materials called biomass, such as wood, coal, manure and other organic fertilizers used to produce heat and electricity, and plants used to produce liquid biofuels. Most biomass is used for cooking, lighting and space heating in rural areas, and its main consumers are poorer populations in developing countries. Modern biomass systems include speci c plants or trees, agricultural and forestry residues, and various organic waste streams. Energy production by burning biomass creates greenhouse gas emissions, but at a lower rate than burning fossil fuels such as coal, oil or gas. However, bioenergy should only be used for limited purposes, given the potential negative environmental impacts associated with the massive expansion of forestry and bioenergy plantations and resulting deforestation and land-use changes.

In general, it can be concluded that the development of renewable energy has a signi cant potential to positively impact the environmental, social and economic aspects of society. However, it is important to consider the problems and challenges that may arise in this development path and try to solve them, taking into account the interests of all stakeholders.

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References

1. Adekoya et al., 2023 O. Adekoya, J.A. Oliyide, O.T. Kenku
2. Alam, M. J., Begum, I. A., Buysse, J., Rahman, S., & Van Huylenbroeck, G. (2011). Dynamic Modeling of Causal Relationship between Energy Consumption, CO2 Emissions and Economic Growth in India.
3. Alternative energy and ecology international scienti c journal No. 08 (148) 2014 TATA Scienti c and Technical Center, 2014
4. Carf , D., & Schilir , D. (2012). A Coopetitive Model for the Green Economy. Economic Modelling, 29(4), 1215-1219. http://dx.doi.org/10.1016/j.econmod.2012.04.005
5. Chapple, K. (2008). De ning the Green Economy: A Primer on Green Economic Development. Center for Community Innovation, Berkeley
6. J nicke, M. (2012). Green Growth : From a Growing Eco-Industry to Economic Sustainability. Energy Policy, 48(0), 13-21.
7. Sulich, A. ve Zema, T. (2018). Green jobs, a new measure of public management and sustainable development. European Journal of Environmental Sciences. 8(1), 69-75.
8. United Nations Environment Programme (UNEP) (2022). About green economy. https:// www.unep.org/explore-topics/greeneconomy/about-green-economy
9. United Nations Environment Programme (UNEP) (2023). Green industrial policy: Concept, policies, country experiences. https://www.unep.org/resources/report/green-industrial-policy-concept-policies-country-experiences
10. Walls M, Palmer K. Upstream pollution, downstream waste disposal, and the design of comprehensive environmental policies. J Environ Econ Manag. 2001;41:94 108.

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STUDY OF MUTATION AND CREATION OF MUTANT FORMS BY INFLUENCE OF GAMMA RAY ON COTTON SEEDS

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Abstract

The purpose of our research is to obtain new donor forms that differ genotypically from the initial form by the effect of gamma rays on the seeds of the cotton plant. Thus, the gamma-ray accelerates the metabolism, and physiological and biochemical processes in the seed cell, abortions occur with the breaking of the olfactory bers in the chromosomes, and new mutants are formed and created. The change in chromosomes has a dominant effect on the branching of the bush, the size of the cones, and the fact that it has many cones. Strange twists in the trunk, horns, and sterile, semi-sterile, sympodial branches falling into the fascia were the result of the gamma ray effect. In the M1 and M2 generations, the mutation variability was studied, individual selections with high economic value and high biomorphological and technological indicators were selected, planted in the eld experience crop of our Institute, and will be studied in the M3 generation in the direction of strengthening heredity and stabilization of traits.

Keywords: chromosome, cotton, fertility, mutation, physical mutagen, starting material.

Introduction

People provide themselves with favorable living conditions by changing the substances, objects and bodies of the natural environment. Man receives from nature what he needs, air, water, material goods, raw materials for industry, etc. As a result of the spontaneous use of this wealth for hundreds of years, the environment has undergone changes on a global scale. This inheritance has become even more acute in the era of modern scienti c and technical progress. Thus, the growth of the world s population; the constant increase in the Earth s surface, the application of new technologies in the energy, industrial, agricultural and transport sectors and the expansion of production have led to anthropogenic changes in world landscapes, the complexity and expansion of international economic relations, the strengthening of the interaction of these or other factors with the environment and the increase in the anthropogenic load (pressure) on the environment surrounding us [20].

As productive forces develop, the use of natural resource potential is constantly expanding, the degree of participation of the natural environment in the social production system also increases, which leads to a constant increase in various anthropogenic impacts on complexes and components.

The effect of physical mutagens on agricultural plants - namely, cotton seeds - creates the basis for the emergence of mutational variability, the creation of starting material with plastic and high economic value indicators [20].

Resistance to environmental factors, stress, disease, and drought begins with the acceleration of physiological and biochemical processes in the chromosomes-genotype due to the in uence of gamma rays, the development of a strong root system, the large size of the cones, the multi-branching of the trunk with strange twists, the large size of the leaves and the thickness of the leaf bases. Resistance is based on the survival of the strongest individual selections with a strong immune system and is formed as a result of selection [14].

Purpose of the study

The main purpose of experimental mutagenesis is to obtain mutational variability, mutants, that is, initial donor forms for selection, by exposing seeds of cotton varieties to gamma rays at different doses [5].

Research Object and Materials

In our study, three cotton varieties, Ganja-183, China-37, amphidiploid form, were used. In the study, the gamma irradiation source was the Co60 isotope at the Institute of Radiation Problems of the ANAS, Department of Science and Education. Seeds of all three cotton varieties were irradiated with the Co60 isotope in doses of 150 g, 300 g, and 450 g. As a control option, unirradiated seeds of these varieties were taken. After the seeds of the cotton varieties were irradiated, 100 seeds were sown in four replicates in the open eld at the Central Experimental Base of the Scienti c Research Institute of Plant Protection and Technical Plants in the second decade of April, with two seeds per nest, according to the 90x20 cm scheme.

In the study we conducted in the M1 generation in 2022, all phenological observations, including the duration of owering and ripening development phases, were recorded, and the rate of opening of the cones was also determined. During the study, the effect of gamma rays at different doses on the height and development of the cotton plant was studied by measuring 25 plants in each variant during the mass budding, owering, and ripening phases. Scattered, sterile, twisted trunk, and semi-sterile forms were more common. In the experiment conducted, raw cotton from 20 cones was collected from the I and II places of the II-V boll branches of 141 plants in each repetition in M1 and taken as individual samples. In the laboratory, the economically valuable indicators of the plants: ber yield, ber length, mass of raw cotton in a cone, etc. were analyzed and calculated.

In the M1 generation, more scattered, multi-branched, sterile and semi-sterile forms were formed. Gamma rays cause more chlorophyll mutations in leaves in plants.

In 2023, 141 individual selections of the M2 generation were sown in the experimental eld of the Institute s Central Base.

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The activation of ions in the cell under the in uence of physical mutagens causes changes in chromosomes - mutations. Forms with a new genotype appear. The hereditary variations that arise at this time affect all morphological and physiological functions of the organism [11]. In terms of morphological structure, it has manifested itself in such signs as strange twists in the stem, horns, thick and large leaves, wide and tall stem, strong root system, multi-branching and multi-cone formation. Physiological functions are characterized by the plant s resistance to disease and drought. The excess number of chromosomes and the acceleration of chemical-physiological processes have a positive effect on all signs of the plant [1]. Sometimes mutations have a negative effect on the vitality of living organisms, causing their death (lethal) [12]. In this case, the plant dies while still in the embryo, the coccus system does not form, chlorophyll does not develop, and it perishes. Some mutations also cause complete sterility and semi-sterility.

When a mutation occurs in the structure of genes, the traits and properties they control also change. Sometimes a mutation occurring in a gene has a dominant effect not only on one trait of the organism but also on other traits - the branching of the bush, and the size of the cone [4].

Results and Discussion

Gamma rays cause cellular damage in cotton plants, so the process of plant regeneration occurs on different days at different doses. Thus, at a dose of 450 g, sprouts appear irregularly and are delayed by 3-5 days. In ornamental plants, the energy of the seed decreased, the number of damaged sprouts increased, and one of the cotyledons was reduced. In damaged plants, the root system was not formed, and the sprouts died at the end of the vegetation.

Table1. Germination percentage and plant viability due to the effect of gamma rays on cotton seeds.

Variants	Origin	Number of seeds sown	Germination ability		The vitality of plants	
			in numbers	in %	in numbers	in %
1	Ganja-183 control	200	174	87	147	73.5
2	Ganja-183 150 g	200	139	69.5	103	51.5
3	Ganja-183 300 g	200	130	65.0	52	26.0
4	Ganja-183 450 g	200	70	35.0	29	14.5
5	China-37 control	200	166	83.0	149	74.5
6	China -37 150 g	200	132	66.0	105	52.5
7	China -37 300 g	200	125	62.5	46	23.0
8	China -37 450 g	200	61	30.5	18	9.0
9	Amphidiploid control	200	166	83.0	153	76.5
10	Amphidiploid 150 g	200	100	50.0	101	50.5
11	Amphidiploid 300 g	200	87	43.5	32	16.0
12	Amphidiploid 450 g	200	68	43.5	18	9.0

Although the seeds sown at a dose of 300 g developed sparsely and poorly in all three varieties, more splitting occurred.

The dose of 150 g had a stimulating effect on the plants.

The plant density of the Ganja-183 variety was normal, at a dose of 300 g, 8-cone, thick and large leaves, large cones, a strong root system, 5-lobed cones, horns on the stem, and strange twisting were observed. The effect of gamma rays also revealed the following signs in the M2 generation: fast-growing, even cone, 8-cone, elongated and oval-shaped cones, split stem, large in orescence, thick and deep slices, heart-shaped, large and small cones, and scattered bushes were obtained. Plants of the Chin-37 variety irradiated at a dose of 450 g were fast-growing and productive in M1 and M2. There are even 68-92 cones on one bush. The ber length and ber yield of plants irradiated at a dose of 450 g for the China-37 variety were high.

Table 2. Economic value indicators of selected modi ed plants in M2.

Variants	Origin	Fiber output, %	Fiber length, mm	Mass of a cone
1.	Ganja-183 control	37.0	34.2	5.5
2.	Ganja-183 150 g	34.0	35.4	5.2
3.	Ganja-183 300 g	37.0	35.0	6.2
4.	Ganja-183 450 g	38.6	40.0	5.4
5.	China-37 control	44.0	36.1	5.9
6.	China -37 150 g	41.0	37.0	5.1
7.	China -37 300 g	38.5	36.2	6.5
8.	China -37 450 g	40.0	35.1	5.7
9.	Amphidiploid conrol	39.2	35.2	6.4
10.	Amphidiploid 150 g	37.4	38.0	6.2
11.	Amphidiploid 300 g	36.0	35.8	5.3
12.	Amphidiploid 450 g	37.6	39.0	5.1

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Table 3. Technological performance index of the top 26 individual samples.

№	Spot No.	Variety name	Fiber strength, gg	Line density, mtex	Relative breaking length, gg\tex	Staple length, mm
1	56	Ganja-183,450	5.6	189(5294)	29.6	34\35
2	68	Amphidiploid,450	4.5	187(5351)	24.1	32\33
3	78	Amphidiploid,450	4.7	186(5378)	25.3	33\34
4	79	Ganja-183,450	4.4	165(6057)	26.7	31\32
5	90	China-37,450	4.8	148(6764)	32.5	34\35
6	176	Amphidiploid,450	3.9	161(6214)	24.2	31\32
7	207	China-37,300	5.4	188(5315)	28.7	34\35
8	210	China-37,450	4.8	187(5350)	25.7	34\35
9	234	China-37,450	5.3	209(4780)	25.3	31\32
10	275	China-37,450	4.6	173(5763)	26.5	35\36
11	277	China-37,450	4.2	183(5475)	23.0	32\33
12	295	China-37,450	4.4	185(5407)	23.8	34\35
13	297	China-37,450	3.9	194(5145)	20.1	30\31
14	298	China-37,450	4.7	173(5795)	27.2	32\33
15	304	China-37,450	4.3	185(5400)	23.2	34\35
16	306	China-37,450	4.7	190(5268)	24.8	32\33
17	329	Amphidiploid,300	3.8	184(5434)	20.6	31\32
18	344	Amphidiploid,450	3.4	200(5003)	17.0	32\33
19	361	Amphidiploid,450	4.3	181(5523)	23.7	34\35
20	364	Amphidiploid,450	4.2	177(5663)	23.8	33\34
21	368	Amphidiploid,450	4.9	174(5745)	28.1	34\35
22	370	Amphidiploid,450	4.3	204(5638)	24.2	32\33
23	377	Amphidiploid,450	4.5	168(5962)	26.8	32\33
24	379	Amphidiploid,450	3.5	168(5943)	20.8	34\35
25	382	Amphidiploid,450	3.9	161(6214)	24.2	34\35
26	407	Ganja-183,150	5.0	184(5432)	27.2	28\29

Plants sown on the amphidiploid variety developed more densely and well. These plants are tall and late-maturing and are not productive. Plants sown at a dose of 150 and 300 g are sterile and semi-sterile, and 8-cone bearing is more noticeable.

Conclusion

In 2023, 413 individual samples were collected in the M2 generation, their morphological indicators - vegetation period, plant height, the number of cones and sympodial branches on the bush were determined, and economic valuable indicators: ber yield, ber length, the mass of raw cotton in one cone, etc. were calculated in laboratory conditions. The best ones were selected for high ber yield, ber length, and product mass, and their indices were analyzed.

Plants with a compact form, zero- rst and pyramidal type branching, early-maturing, and high-yielding forms were selected, being of particular interest for practical selection.

In 2024, the inheritance of traits of plants modi ed in the M2 generation to M3 will be studied, and forms with complex traits and high economic value indicators will be selected.

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References

1. Əsədov Ş.İ., Qazıyeva S.M. Qamma şüasının təsirindən pambıqda fenotipik dəyişkənliklərin öyrənilməsi "Azərbaycan Aqrar Elmi", 2007, № 1-3, səh.113-115
2. Həsənov S.P. Müxtəlif dozalarda şüalandırılmış pamidor toxumlarından alınan pomidorun saxlanması "Azərbaycan Aqrar Elmi" 2009. № 3-4. səh. 83-84
3. Qazıyeva S.M. Qamma şüasının səpin qabağı pambıq bitkisinin toxumlarına təsirinin öyrənilməsi, "AzETPİ-nin əsərlər məcmuəsi" 77-ci cild, 2009-cu il, səh. 17-20
4. Mahmudov T.Q., Sadıxova L.C., Eldarov S.İ. pambığın mutant formaları və onların seleksiya əhəmiyyəti "AzETPİ-nin elmi əsərləri" 77-ci cild, 2009-cu il, səh. 6-8
5. Tağıyev Ə.Ə. Mutasiya seleksiyanın səmərəliliyinin artırılması məqsədilə mutantların hibridləşdirmədə istifadəsi "AMEA-nın Gəncə Regional Elm Mərkəzi" xəbərlər məcmuəsi, 2012-ci il, № 49, səh. 32-35
6. Джаббаров Х. Скороспелый карликовый мутант // Хлопководство, 1978г, № 8, стр. 30
7. Həsənov S.P. Müxtəlif dozalarda şüalandırılmış pomidor toxumlarından alınan pomidorun saxlanması. // Azərbaycan Aqrar Elmi, Bakı, 2009, № 3-4, s. 83-84.
8. İsmayılova X. Pambıq sortlarının təsərrüfat qiymətli və morfoloji əlamətlərinin öyrənilməsi. / Azərbaycanda Pambıqçılığın innovativ inkişafı: nailiyyətlər, perspektivlər. ADAU-nun 100 illik yubileyinə həsr olunmuş emi-praktik konfransın materialları, 2019, s. 103-105.
9. Kazımov N.N., Tağıyev Ə.Ə. Pambığın yaradıcı seleksiya axtarışlarının məhsuldar nəticələri. // Azərbaycan Aqrar Elmi, Bakı, 2015, № 4, s. 43-45.
10. Qazıyeva S.M. Qamma şüasının səpin qabağı pambıq bitkisinin toxumlarına təsirinin öyrənilməsi. // AzETPİ-nin əsərlər məcmuəsi, 2009, № 77, s. 17-20.
11. Rzayeva İ.İ., Quliyev Ə.Ə. Fiziki mutagenez üsulu ilə pambığın G. hirsutum L. növünə aid yeni formaların alınması və öyrənilməsi. / Biomüxtəlifliyin genetik ehtiyatlarına həsr olunmuş I Beynəlxalq Elmi Konfransı, Bakı, 2006, s. 119-120.
12. Sadıxova L.C., Məmmədov F.X., Qəhrəmanov F.K. Fiziki mutagenin pambıq toxumuna təsirinin öyrənilməsi. // AzETPİ-nin əsərlər məcmuəsi, 2004, № 74, s. 15-17.
13. Tağıyev Ə.Ə. Mutasiya seleksiyasının səmərəliliyinin artırılması məqsədilə mutantların hibridləşdirmədə istifadəsi. // AMEA-nın Gəncə Regional Elm Mərkəzinin Xəbərlər Məcmuəsi, 2012, № 49, s. 32-35.
14. Tağıyev Ə.Ə., Rzayeva İ.İ., Fiziki mutagenezin təsiri ilə pambığın biomorfoloji və təsərrüfat qiymətli əlamətlərinin dəyişməsinin öyrənilməsi. // AzETPİ-nin əsərlər məcmuəsi, 2004, № 74, s. 36-41.
15. Бекмухаммедова А.А., Бобохужаева Ш.У., Жалова К.Б., Абдукаримова Ш.С., Авазметова И.О. Роль генотипа в экспериментальном мутагенезе на биоразнообразие и генетическая коллекция хлопчатника G. hirsutumL. Биотехнологические приемы в сохранении биоразнообразия и селекции растений. Сборник статей Международной научной конференции, Минск: 18-20 августа, 2014, с. 53-55.
16. Guvercin R.Ş. Bazı pamuk (Gossypium hirsutum L.) genotiplerinin lif verimi ve erkencilik yönünden elbistan koşullarına uyum yetenekleri ve korrelyasyon katsayılarının belirlenmesi. Harran Tarım ve qida bilimleri Dergisi (2018) 22 (1); 73-87.
17. Küçüktaban F., Çoban M., Çiçek S., Yazıcı L. İpek 607 pamuk (G. hirsutum L.) çeşidinde farklı qamma işini (Cobalt 60) dozlarının M_2 popülyasionunda lif kalite özellikler üzerine etkisi. Tarla Bitkileri Araştırma Enstitüsü Dergisiç 2016ç 25 (özel sayı – 2); 106-111.
18. Odabaşıoğlu C., Gopur O. Çırçır işletmelerinin pamuk lif kalitesinde Bakış açılarş Harra Tarım ve Gida Bilimleri Dergisi (2017), 21 (1); 53-61.
19. Şerife Balçı, Volkan Mehmet Çinar, Aydin Ünay. A study on Genetic Advance and Heritability for Quantitative Traits in Cotton (Gossypium hirsutum L.). // ADÜ Ziraat DCRC, 2020, 17 (1); 01-04.
20. Kazımov N.N., Tağıyev Ə.Ə. Pambığın yaradıcı seleksiya axtarışlarının məhsuldar nəticələri. // Azərbaycan Aqrar Elmi, Bakı, 2015, № 4, s. 43-45.

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SOIL FERTILITY: ESSENTIAL PRACTICES FOR LONG-TERM PRODUCTIVITY

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Abstract

The primary objective of this research is to investigate strategies for enhancing soil fertility and preserving it in agricultural settings. Soil fertility, de ned as the capacity to supply essential nutrients, moisture, and air, is a key determinant of plant growth and productivity. Over time, improper agricultural practices have led to a decline in natural soil fertility, making it necessary to explore methods for restoration and maintenance. This study examines the use of integrated soil management techniques to reverse soil degradation and increase productivity. The research employs a combination of agro-technical methods, agrochemical applications, reclamation measures, phytosanitary practices, and erosion control strategies. Field trials were conducted on soils with diminished fertility to assess the impact of these interventions. The ndings indicate that the implementation of these combined practices signi - cantly improves soil structure, nutrient availability, and organic matter content, particularly humus. Humus, which comprises 85-90% of the soil s organic matter, plays a crucial role in maintaining soil fertility, improving soil color, and enhancing microbial activity. It was observed that the preservation of plant residues during harvest and proper soil cultivation practices contribute to the formation of humus and activate microbiological processes, leading to increased soil productivity.

The study concludes that integrated soil management practices not only restore degraded soils but also contribute to sustainable agricultural production by maintaining soil fertility in the long term. This research offers critical insights for policymakers and agricultural practitioners, emphasizing the need for consistent soil preservation efforts to ensure food security and environmental sustainability.

Keywords: Agroecosystem sustainability, soil nutrient optimization, productivity enhancement strategies, soil fertility restoration, integrated soil management

Introduction

Soil, possessing the property of fertility, is a fundamental component of agricultural production and serves as a vital resource for sustaining human life. Through its use as a production medium, human activities directly in uence its properties, fertility, and formation processes. Practices such as afforestation, deforestation, crop cultivation, irrigation, and drainage signi cantly alter the natural vegetation cover and soil moisture regimes. Similarly, interventions like soil tillage, fertilizer application, and chemical reclamation (e.g., liming and gypsum treatment) further affect the soil, transforming it into both a labor object and a labor product.

While soil s role as an essential resource in agriculture is well established, the long-term impacts of human interventions particularly the excessive use of synthetic fertilizers pose signi cant challenges to sustainable soil management. Current research highlights concerns about the accumulation of toxic substances in soil, reduced biological activity, and declining fertility. However, there is limited understanding of how these practices affect the broader ecosystem and human health, especially in the context of evolving agricultural systems and sustainability goals.

Research Objectives

This study aims to analyze the impacts of synthetic fertilizer use on soil productivity, biological activity, and fertility while exploring the cascading effects on human health and environmental sustainability. It also seeks to propose alternative, sustainable soil management practices to mitigate these adverse outcomes.

Understanding the long-term consequences of synthetic fertilizer use is crucial for developing sustainable agricultural practices that balance productivity with ecological health. This research will contribute to the broader knowledge of soil management, providing insights for policymakers, farmers, and researchers to promote agricultural resilience and sustainability while safeguarding human health and environmental well-being.

Research Object and Materials

This research focuses on the declining soil fertility in Azerbaijan, emphasizing the ecological implications of current agricultural practices. The primary objective is to investigate the effects of synthetic fertilizers and pesticides on soil degradation and to propose sustainable alternatives, including the adoption of organic fertilizers and improved land management strategies. The study also addresses broader environmental concerns linked to soil health, such as deserti cation and biodiversity loss, to align with sustainable development and environmental protection goals. The research relies on an extensive set of materials to assess soil fertility and its contributing factors. Key materials include:

- Soil Samples: Collected from diverse regions of Azerbaijan, representing lowland, hilly, and arid zones, to analyze physical, chemical, and biological properties.

- Organic Fertilizer Studies: Experimental applications of manure, compost, green manure, and cover crops to evaluate their effectiveness in restoring soil quality.

- Agricultural Data: Historical and current data on fertilizer and pesticide use in Azerbaijan, obtained from local agricultural agencies.

- Climate and Environmental Reports: Information on salinization, erosion, and deserti cation trends from environmental monitoring stations.

- GIS and Remote Sensing Tools: Satellite imagery and mapping tools to visualize and quantify land degradation patterns across the country.

Study Area

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The study spans several key agricultural and environmentally sensitive zones in Azerbaijan:

- Lowland Areas: Regions signi cantly affected by salinization and deserti cation processes, where unsustainable irrigation practices exacerbate soil degradation.

- Erosion-Prone Regions: Hilly and mountainous areas where water and wind erosion are reducing the thickness and quality of the arable soil layer.

- Arid and Semi-Arid Zones: Areas experiencing deserti cation due to prolonged droughts, overgrazing, and inappropriate agricultural practices.

- Productive Agricultural Regions: Fertile lands currently at risk of degradation due to heavy reliance on synthetic fertilizers and pesticides.

This geographical scope ensures that the study captures a holistic view of soil fertility challenges, providing actionable insights for different environmental contexts within Azerbaijan.

The importance of eliminating synthetic fertilizers and pesticides stems from their long-term adverse effects on soil health and the environment. Synthetic inputs often disrupt the natural balance of soil ecosystems, leading to compaction, nutrient depletion, and accumulation of harmful residues. Over time, this not only reduces crop productivity but also contributes to water pollution, loss of soil biodiversity, and climate change impacts due to greenhouse gas emissions.

Transitioning to organic alternatives, such as manure, compost, and green manure, is essential to replenish soil nutrients and restore structure. Organic fertilizers improve soil organic matter content, enhance microbial activity, and promote natural nutrient cycles. When coupled with sustainable practices like crop rotation and cover cropping, these measures can mitigate the degradation processes, including erosion, salinization, and deserti cation. Given the severe challenges facing Azerbaijan s soils, urgent action is required. Integrated land management strategies, informed by scienti c research and local knowledge, and are needed to halt degradation, rehabilitate affected areas, and ensure food security and environmental sustainability for future generations.

Results and Discussion

The study examined the effects of compost and biohumus on soil structure, moisture retention, and productivity. Key ndings include:

- Soils treated with compost and biohumus showed a signi cant improvement in texture, with enhanced moisture retention and better soil aeration.

- Biohumus-treated soils exhibited increased microbial activity, leading to a greater proliferation of bene cial microorganisms.

- Fertility tests revealed that soils enriched with compost and biohumus had higher levels of essential nutrients, leading to more stable and productive crop yields.

- The application of biohumus, produced by California earthworms, improved soil structure signi cantly, with noticeable improvements in soil color and texture.

The results suggest that the use of compost and biohumus is highly effective in improving soil fertility and structure. The signi cant increase in bene cial microbial activity observed in biohumus-treated soils supports the hypothesis that biohumus enriches soil quality by enhancing microbial life, which is essential for maintaining healthy, fertile soils. The increase in moisture retention observed is particularly important for regions where water conservation is critical. This aligns with the broader understanding that organic matter plays a vital role in soil health by improving water-holding capacity and nutrient availability.The enhancement in crop yields, observed through improved soil conditions, suggests that these practices can contribute to sustainable agricultural practices. This nding is consistent with previous research, which emphasized the importance of organic soil amendments in enhancing agricultural productivity and sustainability.

The ndings of this study align with previous research on the bene ts of organic amendments for soil health. Similar studies have demonstrated that compost and biohumus contribute to improved soil fertility and moisture retention. However, this study adds to the literature by speci cally focusing on the role of California earthworms in producing biohumus and their impact on soil productivity in regions with lower organic matter. Unlike previous research that focused on compost alone, this study highlights the added bene ts of biohumus, particularly in enhancing soil microbial diversity and nutrient availability.

The implications of these ndings are signi cant for sustainable agricultural practices. The positive effects of compost and biohumus on soil fertility underscore the importance of organic soil amendments in modern agriculture. This study provides a strong case for the wider adoption of biohumus as a key component of soil management, particularly in regions with poor, gray soils. By improving soil structure, regulating pH levels, and enhancing nutrient availability, compost and biohumus could play a critical role in increasing agricultural productivity and mitigating the effects of climate change.

Furthermore, the reclamation of saline soils through the use of drainage systems highlights the need for a more holistic approach to soil management. While compost and biohumus can improve soil health, additional reclamation efforts may be necessary in areas with high salinity, reinforcing the need for integrated solutions to soil degradation issues. These ndings emphasize the importance of sustainable practices in ensuring long-term agricultural productivity and environmental conservation.

Conclusion

This article highlights the vital role of irrigation systems in enhancing agricultural productivity, particularly in arid regions where water scarcity is a major challenge. The use of ef cient technologies, such as drip irrigation, has proven to be effective in increasing crop yield, improving soil moisture, and preventing soil salinization. Additionally, timely agronomic practices, including summer plowing, are crucial for optimizing soil conditions, reducing costs, and boosting productivity in the following seasons.

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The study con rms that irrigation, particularly drip irrigation, is an essential tool in boosting agricultural productivity in arid areas. The results emphasize the importance of implementing new technologies and practices, such as timely plowing and soil preparation, to enhance the sustainability and ef ciency of agricultural systems in regions prone to water scarcity.

The ndings suggest that farmers in arid regions should adopt advanced irrigation techniques like drip irrigation to conserve water and prevent soil salinization. Additionally, timely agronomic practices, such as summer plowing, should be encouraged to reduce costs, improve soil health, and increase crop yields. These measures will not only contribute to higher productivity but also promote long-term sustainability in the agriculture sector.

A signi cant portion of the land in our country is located in arid regions. In these areas, irrigation plays a crucial role in enhancing agricultural productivity, as it can increase the yield of crops by 2-3 times. By providing the necessary water supply, irrigation systems help improve soil moisture, supporting the growth of crops and ensuring higher agricultural output.

In this area, the use of new technologies is essential. The most effective of these is the drip irrigation system. This system not only helps to address water scarcity but also promotes the healthy development of plants and prevents soil salinization by ensuring that the soil s composition remains unchanged. The development of agriculture should involve a comprehensive set of measures.

Timely and proper execution of agronomic practices in the cultivation of agricultural crops, as well as the immediate preparation of the soil for the next planting after harvest, signi cantly increases productivity. Delaying plowing after harvesting can lead to reduced moisture content in the soil, the formation of large clumps during plowing, and an increase in soil cultivation operations, all of which lower both productivity and economic ef ciency. Furthermore, summer plowing has signi cant importance in reducing farmers costs during the cultivation period and boosting crop yields in the subsequent season. Summer plowing improves soil structure, reduces costs for weed and pest control, and enriches the soil with organic fertilizer.

By adopting these practices, farmers can achieve higher yields, reduce operational costs, and contribute to sustainable agricultural practices, addressing the challenges of water scarcity and climate change in arid regions.

Future research should explore the effects of different intercropping combinations, including variations in vegetable crops, corn, soybeans, and fast-growing cotton varieties, on soil health and crop productivity. Additionally, further investigation into the role of phytotoxic substances, which accumulate in the soil when the same crop is grown repeatedly, could provide deeper insights into how these substances impact soil fertility and plant growth over time. Studies should also examine the long-term effects of crop rotation on soil structure, nutrient cycling, and the sustainability of different cropping systems. This will help re ne strategies for optimizing land use and maximizing agricultural productivity while maintaining soil health.

Research and best practices demonstrate that land cultivated with alfalfa for two consecutive years can yield higher and better-quality cotton in the following year. Alfalfa s ability to accumulate up to 300 kilograms of nitrogen per hectare over two years sometimes even more signi cantly enhances soil fertility. Furthermore, its root system improves the soil s agro-physical properties, leading to better soil structure and moisture retention, which bene ts subsequent crops. Additionally, in soils prone to salinization, the roots of alfalfa serve as bio-drainage, helping to mitigate the impacts of salt build-up, making it an ideal predecessor for cotton and other cereal and cereal-legume crops.

Overall, this study highlights the importance of crop rotation and the use of alfalfa as a precursor to cotton cultivation. By understanding how speci c crops interact with soil nutrients and water, this research contributes to the development of sustainable agricultural practices. Continued exploration of intercropping systems and soil management strategies will be crucial in ensuring long-term agricultural productivity and resilience to environmental challenges.

Acknowledgment

This comprehensive research on agricultural practices in arid regions of Azerbaijan has been conducted to provide an in-depth understanding of the signi cance of irrigation systems, particularly drip irrigation, and agronomic practices like summer plowing and crop rotation. Through these efforts, we aim to improve agricultural productivity, ensure sustainable farming, and reduce the negative impacts of soil salinization and water scarcity in our country.

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References

1. Elgnamry W., Elashkar W. Simpli ed textural classi cation traiangles. Soil sci. Soc. America, proc., 1962, 6, 45 .
2. Richter Jorg. Der Boden als Reaktor: Modelle ir Prozesse in Boden. Stuttgart: Enke 1986, XI, 239 p.
3. Ross P.J. A computer program for tting non-linear regression models to data by least squares. Melbourne, 1971, 24 .
4. Colwell J.D. A comparison of designs of eld experiments for the National Soils fertility project. Melbourne, 1971, 18 .
5. Feddes R.A. Water, heat and crop growth. Wageninden. Veenman Zonen, 1971, 184 p.
6. Fried, Maurice and Broeshart, Haus. The soil-plant system in relation to inorganic nutrition. New-York - London: Acad. Press, 1967, X, 358 .
7. Gibson J., Sullivan Batten, James W. Soils. Their nature, Classes, distribution, uses, and care. Univ. of Alabama press, cop. 1970, XVII, 296 .
8. Kirknam, Don and Powers Wilbur Louis. Advanced soil physics. - New-york, 1972, XV, 534 p.
9. Kelley W. Transaction II internat. Congress of soil sciens, Oxford, 1953, 14p.
10. Thompson, Lonis Milton, Troch Frederick R. Soils and soil fertility. - New-York: Mc.Graw-Hill, cop. 1978, XI, 516 .
11. Plaster, Edward J. Soils science and management - Al- bany (N. -Y.) Delmar, 1985, XVI, 454 p.
12. Man A.A. the climatic and soil. The Emplere jom. of Exper agricult, v.1, 1933, N 3, 15 p.

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FROM PALM OIL CERTIFICATION TO ENVIRONMENTAL PROTECTION

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Abstract

Increasing global concern about sustainability in palm oil supply chains has forced producing countries to establish policies to meet sustainable production in palm oil industry. Some international private companies created RSPO scheme as a certi cation body in 2004 while Indonesian Government launched Ministry of Agriculture Regulation for ISPO in 2011, which was revised twice in 2015 and 2020. The objective of the certi cations are to ensure that the products marketed at international markets are produced in a sustainable way, from economic, social, and environmental aspects. However, smallholders found many problems in meeting all requirements for obtaining the certi cation. In 2022, Indonesian oil palm smallholders that already have RSPO/ISPO certi cates were only less than 10 percent. The objective of this study are to measure the adoption of certi cation standards by oil palm smallholders, to analyze barriers found by smallholders to meet requirement for RSPO/ISPO certi cate, to nd alternative solutions, and to develop strategy to accelerate the process of certi cation. Six group of smallholders in three districts were examined in the study. Data were analyzed using qualitative and quantitative approaches to explain the problems and nd best solutions. The results show that legality issues are the most important challenges for oil palm smallholders to obtain the certi cate.

Keywords: palm oil, certi cation, sustainability, deforestation-free

Introduction

Climate change has become a global concern since the 1980s because of its negative impacts on the sustainability of human life and natural ecosystems. Climate change is a long-term change in temperature and weather patterns that occurs naturally, such as through variations in the solar cycle. However, climate change is increasingly accelerating due to the increase Green House Gases (GHG) from human activities, which cover the earth s atmosphere, trapping solar energy in the earth, thus increasing the earth s temperature. The impacts of climate change include longer droughts, water scarcity, forest and land res, melting polar ice, rising sea levels and major oods. Deforestation and forest degradation contribute to climate change. Its accounts for 11% of greenhouse gases (Masson-Delmotte et al., 2022). Deforestation and forest degradation are drivers of global warming and loss of biodiversity Deforestation and forest degradation are occurring at an alarming rate. Over 420 million hectares of forest (10% of the world s remaining forests) were lost worldwide between 1990 and 2020 (European Parliament, 2023). Deforestation has been accelerated since the introduction of oil palm plantations and the palm oil industry in Indonesia. Since 2001, world demand for palm oil has increased rapidly as a raw material for various industrial products, which has resulted in palm oil prices. The increase in demand for palm oil has led to an increase in demand for palm fruit which has been responded to by growers throuh the expansion of oil palm plantations. In 2002, the area of oil palm plantations in Indonesia was recorded at 4.7 million hectares, consisting of 1.6 million hectares of smallholder plantations, 0.6 million hectares of state-owned plantations, and 2.5 million hectares of private company plantations. In 2024, the area of oil palm plantations will reach 16.8 million hectares, consisting of 6.4 million hectares of smallholder plantations, 0.6 million hectares of state-owned plantations and 8.8 million hectares of private company plantations (Directorate General of Estate Crops, 2023).The land allocated and suitable for oil palm plantations is 9.7 million hectares, while the area of oil palm plantations currently reaches 16.8 million hectares. There are about 7.1 million hectares detected outside the area allocated for oil palm plantations. Productive mineral lands have been completely used by oil palm plantations, so that some smallholders have expanded their plantations into forest areas and peatlands. In 2023, oil palm plantations detected in forest and peatland areas reach 3.4 million hectares.

The expansion of oil palm plantations causes very serious deforestation and forest degradation. Various criticisms have been expressed by various parties, from governments of consumer countries to non-governmental organizations. The Roundtable on Sustainable Palm Oil (RSPO) was founded by international private institutions in 2004 to encourage sustainable palm oil production to reduce the negative impacts of palm oil production. The Indonesian government has also issued various laws and regulations prohibiting the expansion of oil palm plantations in forest and peat areas. In 2011 the Indonesian Government also established regulations regarding Indonesian Sustainable Palm Oil System. Efforts to manage oil palm sustainably without destroying forests do not seem to have shown the results as expected.

The palm oil industry, a signi cant sector in global agriculture, is associated with various issues, including environmental, social, and economic concerns. Environmental Issues including deforestation, greenhouse gas emissions, peatland destruction, and water pollution. Large area of tropical rainforest has been deforested to develop oil palm plantation (Angelsen, 1995; Ansari et al., 2007; Carlson et al., 2012)uncertain estimates, and potential political biases. Second, a simple framework based on a theory of land rent capture is developed to explain agricultural expansion. The framework is applied in the study of recent changes in shifting cultivators adaptations in a lowland rainforest area in Sumatra, Indonesia. Increased rubber planting and expansion into primary forest are seen as a response to increased rubber pro tability and (expected, leading to loss of biodiversity and destruction of habitats for endangered species like orangutans, tigers, elephants, and rhenos (Danielsen et al., 2008; Edwards et al., 2014; Koh & Wilcove, 2008; Swarna Nantha & Tisdell, 2009) ISBN : 1367-9430 , author :[{ dropping-particle : , family : Edwards , given : F A , non-dropping-particle : , parse-names :false, suf x : },{ dropping-particle : , family : Edwards , given : D P , non-dropping-particle : , parse-names :false, suf x : },{ dropping-particle : , family : Larsen , given : T H , non-dropping-particle : , parse-names :false, suf x : },{ dropping-particle : , family : Hsu , given : W W , non-dropping-particle : , parse-names :false, suf x : },{ dropping-particle : , family : Benedick , given : S , non-dropping-particle : , parse-names :false, suf x : },{ dropping-particle : , family : Chung , given : A , non-dropping-particle : , parse-names :false, suffix : },{ dropping-particle : V , family : Khen , given : C , non-dropping-particle : , parse-names :false, suffix : },{ dropping-particle : , family : Wilcove , given : D S , non-dropping-particle : , parse-names :false, suf x : },{ dropping-particle : , family : Hamer , given : K C , non-dropping-parti-

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cle : , parse-names :false, suf x : }], container-title : Anim. Conserv. , id : ITEM-1 , issue : 2 , issued :{ date-parts :[[2014]]}, note : ht tp://www.ncbi.nlm.nih.gov/pmc/articles/PMC4372061/pdf/acv0017-0163.pdf , page : 163-173 , title : Does logging and forest conversion to oil palm agriculture alter functional diversity in a biodiversity hotspot? , type : article-journal , volume : 17 }, uris :[http://www.mendeley.com/documents/?uuid=02dbd95d-8d14-4fb9-a723-044e331a5d7d]},{ id : ITEM-2 , itemData :{ DOI : 10.1111/j.1523-1739.2008 .01096.x , author :[{ dropping-particle : , family : Danielsen , given : Finn , non-dropping-particle : , parse-names :false, suf x : },{ - dropping-particle : , family : Beukema , given : Hendrien , non-dropping-particle : , parse-names :false, suf x : },{ dropping-particle : , family : Burgess , given : Neil D , non-dropping-particle : , parse-names :false, suf x : },{ dropping-particle : , family : Parish , given : Faizal , non-dropping-particle : , parse-names :false, suf x : },{ dropping-particle : , family : Bruhl , given : Carsten A , non-dropping-particle : , parse-names :false, suf x : },{ dropping-particle : , family : Donald , given : Paul F , non-dropping-particle : , parse-names :false, suffix : },{ dropping-particle : , family : Murdiyarso , given : Daniel , non-dropping-particle : , parse-names :false, suf x : },{ dropping-particle : , family : Phalan , given : Ben , non-dropping-particle : , parse-names :- false, suf x : },{ dropping-particle : , family : Reijnders , given : Lucas , non-dropping-particle : , parse-names :false, suf x : },{ - dropping-particle : , family : Struebig , given : Matthew , non-dropping-particle : , parse-names :false, suf x : },{ dropping-particle : , family : Fitzherbert , given : Emily B , non-dropping-particle : , parse-names :false, suf x : }], container-title : Conservation Biology , id : ITEM-2 , issue : 2 , issued :{ date-parts :[[2008]]}, page : 348-358 , title : Biofuel plantations on forested lands: double jeopardy for biodiversity and climate , type : article-journal , volume : 23 }, uris :[http://www.mendeley.com/documents/?uuid=d-cd082c4-85cc-4d7c-b227-4dbbb5bcf335]},{ id : ITEM-3 , itemData :{ DOI : 10.1111/j.1755-263X.2008.00011.x , ISBN : 1755-263X , a-bstract : Oil palm is one of the world s most rapidly expanding equatorial crops. The two largest oil palm producing countries Indonesia and Malaysia are located in Southeast Asia, a region with numerous endemic, forest dwelling species. Oil palm producers have asserted that forests are not being cleared to grow oil palm. Our analysis of land cover data compiled by the United Nations Food and Agriculture Organization suggests that during the period 1990 2005, 55% 59% of oil palm expansion in Malaysia, and at least 56% of that in Indonesia occurred at the expense of forests. Using data on bird and butter y diversity in Malaysia s forests and croplands, we argue that conversion of either primary or secondary (logged. The clearing of forest which was often by burning releases signi cant amounts of carbon dioxide and other greenhouse gases into the atmosphere, contributing to climate change (Carlson et al., 2013; Smith et al., 2007) . As most of mineral lands have been cultivated for oil palm plantation, new plantation are established on peatlands which are signi cant carbon sinks (Fairhurst & McLaughlin, 2009; von Uexkull & Mutert, 1994; World Resources Institute (WRI), 2010). Draining and burning these lands for cultivation releases massive amount of carbon dioxide (Priadjati, 2002; Rowell & Moore, 2000; Suyanto, 2007).

This research is focused on nding out the obstacles faced by smallholders in implementing palm oil plantation certi cation which aims to encourage sustainable palm oil production without destroying forest areas.

Research Objectives

This study aims to measure the adoption of certi cation standards by oil palm smallholders, to analyze barriers found by smallholders to meet requirement of RSPO/ISPO certi cate, to nd alternative solutions, and to develop strategy to accelerate the process of certi cation.

Signi cance

Understanding problems faced by oil palm smallholders to meet the standards of certi cation is essential to enhance government policies to promote sustainability in oil palm production process and eventually mitigate negative effects to climate change.

Research Object and Materials

This study focuses on oil palm smallholders in Riau Province, Indonesia, where oil palm smallholder plantations are the largest in Indonesia. There are two types of smallholders, i.e., schemed smallholders (the plasma) and independent smallholders.

Data collection was carried out using a structured questionnaire and in-depth interviews with each respondent. Physical observations of oil palm plantations are also carried out to see conditions in the eld. Focus Group Discussions (FGD) were conducted with stakeholders in each district to obtain an overview and opinions of the parties to obtain data and information for SWOT analysis to develop a strategy to accelerate the adoption of certi cation standards. The data required in this research includes data on the general condition of the research area, sample pro le, plantation performance, the implementation of ISPO standards, SWOT data of smallholders and smallholder organizations, and other supporting data.

This research was conducted in Riau Province by selecting three districts that have the largest smallholder oil palm plantations. The selection of study locations in the three districts also took into account the existence of two groups of smallholders, i.e., smallholders who have not yet and those who have received ISPO certi cates. Determination of the sample in this research was carried out in two stages. First, choose three districts that have all types of groups to be studied, then select group of smallholders for organized farmers and select individual non-organized farmers. In each selected group, 30 respondents were taken. Thus, the total research sample was 180 respondents.

Results and Discussion

The average age of respondents was 48 years with a minimum age of 20 years and a maximum age of 73 years. Some of the smallholders are ex-plasma smallholders who previously participated in the PIR-Transmigration program in the early 1980s. Some oil palm plantations are still managed by the rst farmers who are now elderly and some are managed by the second-generation farmers or their children. In terms of age, the majority of farmers are still of productive age and are able to cultivate oil palm plants for the next 20-25 years. Farmers have an average of 8.5 years of education or junior high school level. The educational level of farmers varies between 0 and 16 years. The average farmer s farming experience is 18.4 years (minimum 3 years and maximum 42 years). The average household member is 2.4 people (minimum 0 person and maximum 7 persons).

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There are smallholders that have farmer organization and manage their oil palm plantations in a group. Each farmer in the group initially has two hectares of oil palm plantations and the group has partnership with mill company. However, after one cycle of plantations some of the farmer organization continue working with their partner while other stop continuing their partnership. In the second cycle some smallholders have expanded their land and many of the have more than four hectares. Without partnership the mill company, farmers do not get any technical support in operating their plantation. Independent Smallholders are self-supporting plantations that are managed by the smallholder individually without receiving funding and technical support for cultivation. The area of the cultivated plantations varies between one to tens of hectares. The limited knowledge of farmers means that oil palm plantation management is still conventional.

Implementation of Indonesian Sustainable Palm Oil (ISPO) Certi cation

The level of implementation of ISPO standards varies among oil palm smallholder groups/organizations. The highest level of achievement was found in KUD Tinera Jaya with a score of 2.91, while the lowest was in the independent smallholders of Batas Village with a score of 1.03. All groups have low scores on Principles 3 and 5. Principle 3 is environmental management, natural resources, and biodiversity. The locations of respondents plantations are generally ex-transmigration locations which are not included in forest areas. They are not very much related to environmental issues. This location has developed so rapidly that it is rare to nd protected plants or animals. Principle 5 relates to continuous business improvement. The small business scale does not allow smallholders to carry out new innovations. The income generated from oil palm plantations is only to meet the needs of the farmer s family so that smallholders do not dare to take risks to make changes to their oil palm plantations. Sustainable business by replanting oil palm plants is also not easy for smallholders to do. Continuous business improvement is only possible at the smallholders organizational level. This research found that independent oil palm smallholders in Batas Village had not been able to ful ll the requirements with a score of 1.03. The results of this research found that almost all smallholders who have received ISPO receive technical and nancial assistance from their partner companies. There are almost no independent plantations that obtain ISPO certi cation independently.

Table 3. Implementation of ISPO certi cation principles

Smallholders Organization	P1	P2	P3	P4	P 5	ISPO Principles
KUD Tinera Jaya	2.53	3.00	3.00	3.00	3.00	2.91
Gapoktan Manunggal Sakti	2.62	2.88	1.75	2.50	2.00	2.35
Gapoktan Pandan Jaya	2.62	2.88	1.75	2.50	2.00	2.35
Kebun Swadaya Desa Batas	1.09	1.05	1.00	1.00	1.00	1.03
PPSKS Rambah Hilir	2.62	2.39	2.00	2.75	2.00	2.35
PPSKS Pelalawan-Siak	1.92	2.83	2.00	2.50	2.00	2.25

Source: survey data (2023)

Note:
1. Score 2,32-3,00 Ful lled
2. Score 1,66-2,31 Currently in the processing process
3. Score 1,00-1,65 Not ful lled

Challenges for Smallholders to meet ISPO Standard

The problems faced by smallholders vary depending on the smallholders condition when applying for ISPO certi cation. Plasma plantations according to ISPO certi cation regulations are carried out by nucleus companies. Plasma plantations are built by nucleus companies with nucleus plantation standards. All plasma plantation documents usually provided by the nucleus company. Nucleus company support, both technical and nancial, makes plasma plantations well-prepared to apply for ISPO certi cation. Ex-plasma plantations also have better opportunities compared to independent smallholder plantations to meet the standards of ISPO. They have already an organization and experience in managing oil palm plantations. However, it is not uncommon for plasma plantation organizations to be disconnected from the company after the contract is terminated. Several cases showed that some ex-plasma cooperatives were closed. The smallholders work individually, both operating the plantation and marketing the fruits. Independent smallholders have the more problems because there are no operational standards on oil palm maintenance practices and plantation management that can be used as a reference by the smallholders. Plantation operational activities are carried out according to the capabilities of each smallholder. The obstacles found in this research are the ful llment of documents in the First and Second Principles such as land legality, plantation business registration, environmental management statement, plantation mapping, smallholder organizations, and good agricultural practices. Apart from that, the most extreme condition is if the location of the plantation is in a forest or peatland area where cultivation is not permitted. Plantations located in forest and/or peatland areas cannot be processed to obtain an ISPO certi cate at all.Land legality problems are often encountered in independent plantations while there are ex-plasma smallholder plantations that is bought and sold without changing the name to the new owner of the plantation. Independent smallholder plantation land is private land owned by purchase, inheritance from parents, customary land, or borrowing. The legality of independent smallholder plantations is often not accompanied by clear documents such as land certi cates, sale and purchase document, and other valid proof of ownership. Documents regarding the land must be shown. Land ownership that are in the process of certi cation, its processed document must also be shown. The name of the land certi cate holder must correspond to the name of the certi cate unit. The area in land certi cate cannot be greater than in the business registration document. The operational area must be in accordance with the existing land certi cate.

Smallholders plantation must refer to the provincial spatial planning. The land in the location permit is in accordance with the Regional Spatial Planning and the location of the plantation does not overlap with other permits that previously existed for the land rights. The legality of plantation land is very important to avoid land disputes and other disputes. In some locations this document is issued by the National Land Agency (BPN), but in others it is implemented by the PUPR Service.

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The Plantation Business Registration Certi cate for Cultivation is an obstacle faced by many smallholders in the ISPO certi cation process, both pure independent, ex-plasma and plasma plantations. Plasma smallholders, even though they are part of the nucleus company s plantations, must have the business registration document. Partner companies usually facilitate the creation of the document collectively. Problems often occur in ex-plasma and independent smallholder plantations which have to manage the documents by themselves. The business registration document has supporting requirements that must be completed, such as land certi cate documents, land mapping according to provincial spatial planning, information on seed sources, land size and FFB production. In several districts, smallholders are required to have a Taxpayer Identi cation Number. The completeness of these supporting documents will in uence the creation of the business registration document. The institutions that make business registration document vary according to the provisions of the District Government, such as the Estate Crops Agency, Forestry and Environment Agency, and the Integrated Services Of ce. Findings in the eld show that the agencies issuing the business registration document do not have adequate of cers to issue the document. It is not possible to issue the business registration document in large quantities in a short time.

The Statement of Environmental Management is an environmental legality document. In large companies, this environmental document is called AMDAL. In plasma plantations, the SPPL document is included in the AMDAL. Ex-plasma and pure self-supporting plantations are required to have SPPL documents. In several local governments, the relevant agencies ask for requirements such as a certi cate of not being in forest and peat areas. Managing SPPL by pure independent smallholders is not easy because most of the smallholders do not have adequate knowledge regarding environmental issues. In some districts, processing SPPL documents even takes more than one year.

Smallholders are required to become members of smallholders organizations such as cooperatives, KUDs, associations, gapoktan, or smallholder groups. This requirement is an obstacle for ex-plasma independent plantations whose cooperatives have been dissolved after the end of the cooperation contract with the nucleus company. Some of the ex-plasma independent smallholders took the initiative to establish smallholder groups, gapoktan, or associations. However, most prefer to manage their oil palm plantations individually. Pure self-supporting plantations do not have any smallholder organizations at all. Observations in the eld show that it is dif cult to initiate the formation of smallholders organizations in pure independent plantations. Minimal socialization coupled with a lack of information and knowledge among smallholders is an obstacle in the formation of smallholder organizations.

Plantation management and cultivation techniques in pure independent plantations are still considered traditional, especially plantations with an area of less than two hectares. Oil palm plants do not come from quality seeds/seedlings. Plant maintenance and the use of minimal production factors cause plantation productivity to be very low. In pure independent plantations, plantation productivity is even less than 12 tons of FFB per hectare per year. Plants that are more than 10 years old make smallholders reluctant to rejuvenate their oil palm plants. Household needs that must be met force smallholders to accept what is.

Alternative Solution for Accelerating ISPO Implementation

Solutions to ISPO problems must be carried out with a comprehensive approach. ISPO socialization must be carried out optimally and in an integrated manner to reach smallholders in rural and remote areas. Synchronization and harmonization of related institutions must be built with good cooperation. Documents that must be provided, such as land ownership certi cates, legality of plantation businesses, legality of environmental permits, mapping according to spatial planning, smallholder organizations, suppliers of seeds and other inputs and other related institutions need to be coordinated so that the ow of document processing can be carried out effectively and ef ciently. Institutions that issue documents should be pro-active in socializing the document processing process, what the processing procedures are, what the requirements are, how much the processing costs are, and what actions must be taken if the requirements are not suf cient. The institution s ability to issue documents needs to be improved. The large number of smallholders and the 2025 deadline for ISPO certi cate ownership require greater human resources. Incentives for owning an ISPO certi cate should be provided to encourage smallholders to participate in implementing and obtaining an ISPO certi cate. The bene ts of ISPO certi cation must be clearly explained to oil palm smallholders, including the risks that accompany it. The bene ts of ISPO must be higher than the costs incurred to obtain an ISPO certi cate. A strategy to accelerate ISPO implementation needs to be developed to be able to implement ISPO standards effectively and ef ciently.

These ndings highlight the need to understand the limitation of smallholders and local government agency in the process of certi cation. Transfer information and technology should be done to accelerate the process of certi cation for oil palm smallholders.

Conclusion

This study shows that understanding the principle and criteria of certi cation and the capacity of local government to process and issue legal documents are the main key factor in uencing the success in the certi cation program. The implementation of certi cation principles and criteria for oil palm plantations is in the ful lled category for the organized oil palm smallholders. However, individual non-organized smallholders still face problems to meet the standard of certi cation particularly land legality, business legality, and environmental legality documents. The capacity of government to issue the requirement documents for certi cation must be enhanced to meet large number of farmers. In short term, certi cation should be done for the smallholders plantations located outside forest and peatland areas and in long term, there will not be any oil palm plantation activity in forest and peatland areas. Data collection on independent smallholder oil palm plantations is not yet optimal. Independent smallholders do not yet have a smallholders organization. Smallholders do not yet have plantation business legalities. Some of the oil palm plantation land is indicated to be in non-cultivated forest and/or peat areas. Increasing the capacity of institutions in issuing ISPO requirement documents and prioritizing smallholders plantations located outside forest areas to obtain ISPO certi cates are strategies that can be implemented to increase ISPO implementation until 2025.Future studies should explore the capacity of smallholders and the performance of local government to provide the requirement documents for certi cation.

This study contributes to the growing knowledge of managing oil palm plantations to be sustainable in production, halt deforestation, and minimize forest degradation.

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References

Angelsen, A. (1995). Shifting cultivation and deforestation : A study from Indonesia. World Development, 23(10), 1713 1729. https://doi.org/doi: 10.1016/0305-750X(95)00070-S

Ansari, F., Bhartata, A., Hudata, A., Kurniawan, P. M., & Rianda, E. (2007). Indonesian Tropical Deforestation. In APRIL and APP case studies. Erasmus Universiteit Rotterdam.

Badan Pusat Statistik Provinsi Riau. (2024). PROVINSI RIAU DALAM ANGKA 2024. Badan Pusat Statistik Provinsi Riau.

Carlson, K. M., Curran, L. M., Pittman, A. M., Marion Adeney, K. M., Carlson, L. M., Curran, A. M., Pittman, L. M., Marion Adeney, G. P., Curran, S. N., Asner, K. M., & Trigg, K. M. (2013). Carbon emissions from forest conversion by Kalimantan oil palm plantations. Nature Climate Change, 3(3), 283 287. https://doi.org/10.1038/nclimate1702

Carlson, K. M., Curran, L. M., Ratnasari, D., Pittman, A. M., Soares-Filho, B. S., Asner, G. P., Trigg, S. N., Gaveau, D. A., Lawrence, D., & Rodrigues, H. O. (2012). Committed carbon emissions, deforestation, and community land conversion from oil palm plantation expansion in West Kalimantan, Indonesia. In Committed carbon emissions, deforestation, and community land conversion from oil palm plantation expansion in West Kalimantan, Indonesia (Vol. 109, pp. 7559 7564). National Academy of Sciences.

Danielsen, F., Beukema, H., Burgess, N. D., Parish, F., Bruhl, C. A., Donald, P. F., Murdiyarso, D., Phalan, B., Reijnders, L., Struebig, M., & Fitzherbert, E. B. (2008). Biofuel plantations on forested lands: double jeopardy for biodiversity and climate. Conservation Biology, 23(2), 348 358. https://doi.org/10.1111/j.1523-1739.2008.01096.x

Directorate General of Estate Crops. (2023). Statistics of Estate Crops Volume I 2022-2024. Directorate General of Estate Crops, Ministry of Agriculture, Republic of Indonesia.

Edwards, F. A., Edwards, D. P., Larsen, T. H., Hsu, W. W., Benedick, S., Chung, A., Khen, C. V, Wilcove, D. S., & Hamer, K. C. (2014). Does logging and forest conversion to oil palm agriculture alter functional diversity in a biodiversity hotspot? Anim. Conserv., 17(2), 163 173. https://doi.org/10.1111/acv.12074

European Parliament. (2023). No TREGULATION (EU) 2023/1115 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 31 May 2023 on the making available on the Union market and the export from the Union of certain commodities and products associated with deforestation and forest degradation a. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32023R1115

Fairhurst, T., & McLaughlin, D. (2009). Sustainable Oil Palm Development on Degraded Land in Kalimantan. World Wildlife Fund. http://www.worldwildlife.org/what/globalmarkets/agriculture/WWFBinaryitem16231.pdf

Koh, L. P., & Wilcove, D. S. (2008). Is oil palm agriculture really destroying tropical biodiversity? Conservation Letters, 1(2), 60 64. https://doi.org/10.1111/j.1755-263X.2008.00011.x Masson-Delmotte, V., P rtner, H. O., Skea, J., Slade, R., Ferrat, M., Neogi, S., Pereira, J. P., Kissick, K., Buend a, E. C., Connors, S., Haughey, E., Pathak, M., Vyas, P., Belkacemi, M., Zhai, P., Roberts, D., Shukla, P. R., van Diemen, R., Luz, S., Malley, J. (2022). Climate Change and Land: An IPCC Special Report on climate change, deserti cation, land degradation, sustainable land management, food security, and greenhouse gas uxes in terrestrial ecosystems. In Climate Change and Land: An IPCC Special Report on climate change, deserti cation, land degradation, sustainable land management, food security, and greenhouse gas uxes in terrestrial ecosystems. https://doi.org/10.1017/9781009157988

Priadjati, A. (2002). Dipterocarpaceae: forest res and forest recovery [Wageningen University]. http://edepot.wur.nl/121355

Rowell, A., & Moore, P. F. (2000). Global review of forest res. WWF International & The World Concervation Union (IUCN).

Smith, P. D., Martino, D., Cai, Z., Gwary, D., Janzen, H., Kumar, P., McCarl, B., Ogle, S., O Mara, F., Rice, C., Scholes, B., Sirotenko, O., Metz, B., Davidson, O. R., Bosch, P. R., Dave, R., & Meyer, L. A. (2007). Agriculture. In Climate Change 2007: Mitigation, Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (pp. 497 540). Cambridge University Press.

Suyanto, S. (2007). Underlying cause of re: different form of land tenure con icts in Sumatera. Mitig Adapt Strat GLob Change, 12, 67 74.

Swarna Nantha, H., & Tisdell, C. (2009). The orangutan oil palm con ict: economic constraints and opportunities for conservation. Biodiversity and Conservation, 18(2), 487 502. https://doi.org/10.1007/s10531-008-9512-3

von Uexkull, H. R., & Mutert, E. W. (1994). Rehabilitation and Lasting Improvement of Degraded Land in Indonesia. Giessener Beitrge Zur Entwicklungsforschung Reihe1 (Symposien) Band 21, 47 65.

World Resources Institute (WRI). (2010). Degraded Land, Sustainable Palm Oil, and Indonesia s Future. http://www.wri.org/stories/2010/07/degraded-land-sustainable-palm-oil-and-indonesias-future

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THE ROOTS AND RISKS OF ECO-TERRORISM

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Abstract

Eco-terrorism involves acts of violence or sabotage carried out in the name of environmental protection, often driven by the belief that traditional advocacy methods are inadequate. Individuals motivated by concerns over climate change, habitat destruction, and animal rights may resort to illegal actions that undermine legitimate environmental efforts. To combat eco-terrorism, a comprehensive approach is necessary. Initiating education and awareness campaigns can enlighten the public about environmental challenges while promoting non-violent activism as a more impactful way to drive change. Encouraging open dialogue among environmentalists, industry representatives, and policymakers can help address underlying grievances, fostering collaboration and understanding. It is also crucial to strengthen legislation that protects both environmentalists and natural resources, alongside supporting peaceful protests and community organizing.Tackling the root causes that push individuals toward eco-terrorism such as poverty, disenfranchisement, and limited access to resources can reduce the allure of radical actions. By fostering community engagement and sustainable practices, we can cultivate a collective sense of responsibility for environmental stewardship. Eco-terrorism emerges from profound frustration with environmental degradation, compelling individuals to resort to radical actions in the absence of effective advocacy. Understanding the roots of eco-terrorism is crucial for addressing the motivations behind such acts and preventing them from undermining legitimate environmental movements. The risks associated with eco-terrorism extend beyond physical harm; they can also damage public perception of environmental causes and provoke severe governmental backlash.

Keywords: eco-terrorism, legislation, collaboration, sustainability, war.

Introduction

Eco-terrorism, characterized by the use of violence or sabotage to advance environmental or animal rights causes, poses a signi cant challenge to achieving sustainability. While the motivations may stem from a desire to protect the environment, such actions often produce unintended consequences that can detract from broader conservation goals. Ecological war refers to the deliberate use of environmental destruction as a strategy in warfare or con ict, where the natural landscape becomes a target for achieving military or political goals. This includes tactics such as deforestation, pollution, and habitat degradation, which can cause signi cant and often irreversible harm to ecosystems [Gleick, 1993]. Terrorism can have signi cant negative impacts on the environment by damaging infrastructure and releasing pollutants into the air, disrupting productivity, and undermining resource management [Bildirici, et al 2022]. A recent study highlights that the indirect effects of terrorism on the environment can persist longer than the direct effects. [Farhani,2023]. An earlier study noted that regional and global environmental issues create conditions conducive to con ict. It categorized security threats arising from environmental problems into four areas: (i) resources as strategic objectives, (ii) attacks on resources, (iii) resources as military assets, and (iv) disruptions to environmental services [Gleick, 1991]. The primary motivation behind this research is to investigate the relationship between environmental quality-considered fundamental human rights and political and economic activities in these developing nations. The ndings may lead to policy recommendations aimed at fostering a more sustainable environment, which is critical for countries heavily impacted by terrorism [Garsous, 2017].

Results and Discussion

Deforestation and Land Degradation

Agricultural expansion and urban development have resulted in deforestation, which contributes to habitat loss and biodiversity decline. Unlike sudden events such as earthquakes, forest degradation occurs gradually, often taking a signi cant amount of time before its effects become apparent, indicating that the decline of the forest happens over an extended period [Grandon et al, 2018]. Eroded soils can result in devastating mudslides. When signi cant amounts of soil wash into nearby streams and rivers, they can clog waterways, damaging hydroelectric facilities and irrigation systems. In some regions, soil erosion due to deforestation creates challenges for agriculture and leads to a loss of reliable electricity [Cook, 2018]. Most deforestation occurs in rainforests, which host over 50% of the world s plant and animal species. If current rates of rainforest burning and destruction continue, thousands of species could be lost each year, and vital crops such as wheat, chocolate, and coffee may disappear, potentially doubling the effects of climate change [Gimah et al , 2019]. Animal agriculture is a signi cant driver of deforestation today. The ongoing destruction of forests jeopardizes biodiversity, reduces carbon absorption, ampli es the impact of natural disasters, and disrupts the water cycle [Bodo et al, 2019].

Pollution

Industrial activities, particularly in the oil and gas sectors, have led to signi cant environmental degradation. The Caspian Sea has been affected by oil spills and waste discharge, impacting marine ecosystems. Plastic pollution from large cities impacts nearby rural communities through the interconnectedness of air, water, and soil. Rural areas often face challenges from unmanaged land lls, illegal dumping, and open burning practices13 [Emmerik and Schwarz, 2020]. Both domestic, agricultural, and industrial activities contribute to macro- and microplastic pollution (particles smaller than 5 mm) in freshwater bodies, alongside regular organic contaminants. However, data on plastic pollution in rural lakes, rivers, and agricultural soils is limited [Mihai and Grozavu, 2019].

The illegal trade of plastic waste poses an additional risk to the environment and rural communities, particularly in importing countries from Eastern Europe, Turkey, Southeast Asia, and Africa, especially following China s ban on plastic waste imports [Du et al,2021]. This review paper aims to provide a comprehensive analysis of plastic pollution in rural communities, focusing on key areas such as: (i) the effects of plastic pollution on rural populations, (ii) plastic pollution originating from rural areas, (iii) the evolution of waste management practices in low- and middle-income countries in relation to the Sustainable Development Goals (SDGs), and (iv) opportunities for a circular economy to mitigate plastic pollution in rural settings [Reyna Bensusan, et al, 2020].

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Global Roots and Risks of Ecoterrorism

Ecoterrorism, de ned as the use of violence or sabotage to promote environmental or animal rights causes, has emerged as a signi cant global concern. Its roots can often be traced back to a strong commitment to environmental activism, where individuals feel compelled to take radical action in response to perceived threats to nature. Many who engage in ecoterrorism are motivated by deep ideological beliefs that prioritize ecological integrity and animal welfare over human interests. Terrorism is a constant and fearful phenomenon, as America has learned to its recent and terrible cost, and like the nine-headed hydra of ancient mythology, as soon as one group or method is terminated, more spring up to take its place. Environmental terrorism adds a new dimension to this phenomenon, identifying the target as a natural resource or environmental feature. The purposeful destruction of a natural resource can now cause more deaths, property damage, political chaos, and other adverse effects than it would have in any previous decade. The choice of environmental resources as targets or tools of terrorism is consistent with both the increasing lethality of terrorism and the growing environmental awareness on the part of the public [Chalecki, 2002].

Research Object and Materials

Eco-terrorism, de ned as the use of violence or sabotage to promote environmental or animal rights causes, is not widely recognized as a signi cant issue in Azerbaijan. However, the country faces several serious environmental challenges that have sparked activism and increased awareness about ecological degradation. One major concern is the impact of Azerbaijan s oil and gas industry. The country s heavy dependence on fossil fuels has resulted in considerable environmental harm, including pollution of land and water resources. Activists have raised alarms about the ecological repercussions of drilling and extraction activities, emphasizing the urgent need for more sustainable practices in this vital sector.

Deforestation is another signi cant issue, often driven by agricultural expansion and urban development. This loss of forest cover threatens biodiversity and disrupts local ecosystems, prompting activists to advocate for improved land management and conservation initiatives. Ongoing land degradation and habitat loss in the affected areas. Although the notion of eco-terrorism is not a prominent concern in Azerbaijan, the country faces signi cant environmental challenges that require attention and action. Understanding these dynamics is essential for fostering effective advocacy and promoting sustainable development in the region.

LEGISLATION AND COLLABORATION IN ADDRESSING ENVIRONMENTAL ISSUES IN AZERBAIJAN

Collaboration between governmental bodies, NGOs, and local communities is essential to strengthen environmental governance. By fostering partnerships, stakeholders can share knowledge, resources, and best practices for effective environmental management. International cooperation also plays a vital role in enhancing Azerbaijan s environmental efforts. Engaging with global environmental organizations can provide access to funding, expertise, and technology needed to address pressing issues like pollution and deforestation. Public participation is another key element in developing effective environmental policies. Involving local communities in decision-making processes can ensure that legislation re ects the needs and priorities of those most affected by environmental degradation [Aliyev, 2019]. Education and awareness campaigns are necessary to inform citizens about their rights and responsibilities regarding environmental protection. Empowered communities are more likely to collaborate with authorities in implementing sustainable practices. Strengthening legislation and fostering collaboration among various stakeholders will be essential for Azerbaijan to effectively tackle its environmental challenges. By prioritizing these approaches, the country can work towards a more sustainable future for its ecosystems and communities [Mammadov, 2020].

Conclusion

Eco-terrorism represents a complex challenge rooted in passionate environmental activism and deep ideological beliefs. While it often arises from a genuine concern for ecological integrity, the risks associated with such extreme measures can be detrimental to both the environmental movement and societal progress. In Azerbaijan, concerns about the ecological impacts of the oil and gas industry, deforestation, and pollution can create a fertile ground for radical activism. Public backlash against eco-terrorism can alienate potential allies and undermine the credibility of the broader environmental movement. Individuals involved in ecoterrorism face substantial legal consequences, including arrest and imprisonment, which can deter peaceful activism.

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References

1. Aliyev, R. (2019). Environmental Legislation in Azerbaijan: Challenges and Opportunities. *Journal of Environmental Protection and Sustainable Development*, 4(2), 55 67.

2. Bildirici, M.E., Lousada, S., & Y lmaz Gen , S. (2022). Terrorism, Freshwater, and environmental pollution: evidence of Afghanistan, Burkina Faso, Iraq, Arab Republic of Egypt, Cameroon, Mali, Mozambique, Niger, Nigeria, Somalia, Syrian Arab Republic, and Pakistan. *Water* (Basel), 14(17), 2684.

3.Bodo, T., & Gimah, B.G. (2019). Curbing human activities that degrade the environment: the relevance of environmental adult education. *Earth & Environmental Science Research and Review*, 2(5), 1-7.

4.Chalecki, E.L. (2002). A new vigilance: Identifying and reducing the risks of environmental terrorism. *Global Environmental Politics*, 2(1), 46 64. https://doi.org/10.1162/152638002317261463

5.Cook, M. (2018). Four consequences of deforestation. *Sciencing*. Sciencing.com/four-consequences-deforestation-7622html (Retrieved 10 December, 2019).https://doi.org/10.30564/jgr.v4i2.3059,Vol 2,ISS 4.45-54

6.Du, L., Xu, H., & Zuo, J. (2021). Status quo of illegal dumping research: Way forward. *J. Environ. Manag.*, 290, 112601. https://doi.org/10.1016/j.jenvman.2021.112601

7.Farhani, R. (2023). The dynamic links between renewable energy and environmental quality in an insecure situation [Internet]. *Afr. Rev.*, 15, 83 101. [cited 2023 Nov 17], https://brill.com/view/journals/bafr/15/1/article-p83_5.xml.

8.Garsous, G., & Ko zluk, T. (2017). Foreign Direct Investment and the Pollution Haven Hypothesis Evidence from Listed Firms [Internet], *OECD*, Report No.: 1379.

9.Gleick, P.H. (1991). Environment and security: the clear connections. *Bull. At. Sci.*, 47(3), 16 21.

10.Gleick, P.H. (1993). Water and con ict: Freshwater resources and international security. *International Security*, 18(1), 79 112. https://doi.org/10.2307/2538989

11.Gimah, B.G., & Bodo, T. (2019). Creation of Awareness through Environmental Adult Education as a solution to the Problem of Habitat Loss in Ogoni, Rivers State, Nigeria. *International Journal of Advanced Research and Publications*, 3(1), 22-28.

12.Mihai, F.-C., & Grozavu, A. (2019). Role of Waste Collection Ef ciency in Providing a Cleaner Rural Environment. *Sustainability*, 11, 6855. https://doi.org/10.3390/su11236855.

13.Mammadov, A. (2020). The Role of NGOs in Environmental Protection in Azerbaijan. *Azerbaijan Journal of Environmental Sciences*, 5(1), 12 24.

14.Reyna-Bensusan, N., Wilson, D.C., Davy, P.M., Fuller, G.W., Fowler, G.D., & Smith, S.R. (2020). Experimental measurements of black carbon emission factors to estimate the global impact of uncontrolled burning of waste. *Atmospheric Environ.* 20,v V.213.,p. 629-639

15.Togola, A., Yusifova, M.M., Sadigova, N.A., Jafarzadeh, S.A. (2019). Anthropogenic impacts on Ajinohur Arid forests of Azerbaijan., *Acta Botanica Sibirica, 9,* p.1125-1140

16.Van Emmerik, T., & Schwarz, A. (2020). Plastic debris in rivers. *Wiley Interdiscip. Rev. Water*, 7(1), e1398.

17.Vasquez-Grandon, A., Donoso, P.J., & Gerding, V. (2018). Forest degradation: when is a forest degraded? *Forest*, 9.Forests 2018, 9(11), 726; https://doi.org/10.3390/f9110726

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CSR COMMUNICATION TO EMPOWER COMMUNITIES AGAINST FOREST FIRES

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Abstract:

Forest and land res are still a major issue in Indonesia, especially in Riau Province, where they have a negative in uence on economic productivity, environmental stability, and public health. These problems still exist despite the implementation of corporate social responsibility (CSR) programs and government regulations. This research investigates the strategic role of CSR communication by PT Kilang Pertamina Internasional RU II in empowering communities to prevent and manage forest res. The study aims to analyze the effectiveness of CSR communication in building community resilience and promoting sustainable environmental practices. Using a mixed-methods approach, data were collected through surveys and interviews involving 145 community members actively participating in CSR programs, selected through purposive sampling. Quantitative data were analyzed using descriptive statistics, while qualitative insights were processed with Huberman and Miles interactive model. The ndings demonstrate that CSR communication signi cantly enhances community awareness, participation, and preparedness in preventing forest res. The study also emphasizes how crucial it is to build enduring relationships between communities and businesses in order to successfully address environmental issues. Through the provision of an organized framework for business initiatives aimed at environmental stewardship, this research adds to the conversation on CSR communication. The study offers practical insights for stakeholders, emphasizing the potential of CSR communication to drive meaningful and sustainable community action in high-risk regions. The ndings contribute to the global discourse on CSR by demonstrating the transformative potential of localized innovations, such as the Nozzle Gambut, in addressing environmental challenges while fostering economic resilience

Keywords: CSR communication,Community empowerment, Forest and land re prevention, Environmental awareness, Corporate responsibility, Riau Indonesia

Introduction

In Indonesias Riau Province Forest and land res have been a problem leading to public health concerns, like respiratory illnesses such as ISPA and causing damage, to the economy and the environment sustainability is jeopardized as well by these disasters It is crucial that we address this issue with urgency by implementing long lasting solutions to protect ecosystems and communities The Indonesian government has put in place rules to stop forest and land res, like Law No 18 of 2013 on the Prevention and Eradicating Forest Destruction and Forestry Law No 41 of 1999 which include punishments such as jail time and signi cant nes for those for setting forests on re; however, the number and size of res are still, on the rise despite these efforts. For instance, in 2023 the land that was burned in Bukit Batut Subdistrict in Riaut Province increased to 2 632 hectares which s an increase from the previous year where it was, at 1 219 hectares as reported by detiksumut in 2023.

In a context Corporate Social Responsibility (CSR) program have proven to be tools, in addressing environmental crises as demonstrated in areas such as Southeast Asia and South America (source; Jangir, 2024). PT Kilang Pertamina Internasional RU II situated in Sungai Pakning, Bukit Batu Subdistrict, Bengkalis Regency functions, as a part of PT Pertamina (Persero)s Re nery & Petrochemical Subholding company. As an oil re nery business, it has shown a dedication to dealing with issues. One of its main projects is a CSR program designed to empower local communities in preventing and handling forest and land res sustainably, showcasing its dedication to both environmental conservation and community advancement.

PT Kilang Pertamina Internasional RU II s CSR program includes 145 residents from 17 nearby villages around its operating area. Through the training and resources this program offers, community members can improve their ability to recognize dangers, prevent accidents, and handle re situations. The two primary goals are environmental preservation and enhancing the economic health of local communities.

Despite continuous attempts, the rising incidence of res highlights substantial de ciencies in the ef ciency of corporate communication and community involvement. This underscores the need for communication strategies that are more strategic, collaborative, and customized to improve the effectiveness of community empowerment efforts. Despite most studies concentrating on the nancial effects of CSR, there is a signi cant lack of insight into its strategic importance in addressing environmental risks and promoting community resilience.

The objective of this study is to examine how PT Kilang Pertamina RU II utilizes CSR communication to combat forest and land res. The main goals involve assessing CSR communication effectiveness, performing a communication audit, and creating a corporate communication model for community empowerment. This study aims to offer fresh perspectives on the strategic importance of corporate communication in conserving the environment. Furthermore, the results are anticipated to provide long-lasting remedies for other environmental issues like climate change and the preservation of ecosystems.

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Research Design and Methodology

This study focuses on the community in Sungai Pakning, located in Bukit Batu Subdistrict, Bengkalis Regency, Riau Province, Indonesia. The primary respondents consist of 145 individuals from 17 villages within the operational area of PT Kilang Pertamina Internasional RU II. Through their active participation in Corporate Social Responsibility (CSR) initiatives, these people help communities prevent and manage land and forest res. As a result, they are the primary focus for assessing how well the business s CSR communication tactics work. A mixed-methods approach was employed to fully understand the effectiveness of CSR communication. In order to generate accurate and legitimate data, researchers use mixed methods, which combine quantitative and qualitative techniques (Creswell, 2007). Similarly, Johnson and Onwuegbuzie (2024) de ne mixed methods as a paradigm for research that blends qualitative and quantitative techniques for data collection and analysis. This approach enables researchers to derive richer insights from statistical measurements and contextual interpretations.

In order to collect quantitative data for this study, 145 participants were given structured surveys to complete. These surveys were designed to assess the level of community awareness, participation, and preparedness for managing forest and land res. Meanwhile, qualitative data was gathered through in-depth interviews with key stakeholders, including community leaders and business representatives. Investigating the nuances of CSR communication strategies and their effects on environmental management and community empowerment was the aim of the interviews.

To choose respondents who were actively involved in the CSR initiatives, purposeful sampling was used, guaranteeing that the information gathered was representative and pertinent. While Huberman and Miles interactive model was used to analyze qualitative data, descriptive statistics were used to analyze quantitative data in order to nd trends and patterns.This model involves three key stages: data reduction, data display, and conclusion drawing, allowing researchers to uncover key themes and detailed insights.

To obtain thorough insights into the dynamics of CSR implementation, in-depth interviews lasting 30 to 45 minutes were held with corporate representatives and community leaders. Key topics covered in these interviews included the community s active participation in CSR programs, how well their involvement prevented land and forest res, and the company s strategic methods for promoting cooperation and tackling environmental issues. The discussions also sought to identify potential barriers to effective communication and participation, providing a nuanced understanding of how these initiatives align with both community needs and corporate objectives for sustainable environmental management.

The research was conducted in Sungai Pakning, a region within the operational area of PT Kilang Pertamina Internasional RU II, chosen for its high vulnerability to forest and land res. This susceptibility to peatland res, coupled with its strategic importance as an operational hub for the company, makes Sungai Pakning an ideal case study location for assessing the impact of CSR communication on community empowerment. By focusing on this critical region, the study offers valuable insights into how CSR initiatives can address environmental challenges at the local level. Furthermore, the ndings provide broader implications for designing and implementing effective CSR programs in other areas facing similar ecological risks, emphasizing the potential for replicability and scalability.

Results and Discussion

The CSR initiatives of PT Kilang Pertamina Internasional RU II in Sungai Pakning have yielded notable achievements in empowering communities and addressing forest and land res. Giving 100 members of the Masyarakat Peduli Api (MPA) extensive training programs has been crucial in giving them the abilities and information required for ef cient re response and prevention. These yearly training sessions promote a proactive approach to reducing the risk of re by incorporating exercises to build capacity and practical re ghting techniques.

An innovative highlight of the program is the introduction of the Nozzle Gambut, a re ghting tool designed speci cally for peatland res. This tool has revolutionized re mitigation by reducing the time required for extinguishing res from 72 hours to just 24 hours per hectare, achieving a threefold increase in ef ciency. The tool s dual capability to address surface and underground res has been pivotal in preventing the spread of res in peat-rich areas. This advancement not only enhances the safety of re management operations but also minimizes environmental damage caused by prolonged re incidents.

On the economic front, the program transformed re-prone peatlands into productive agricultural zones through the introduction of zero-waste pineapple farming techniques. The initiative, which involved more than 500 farmers in ve villages, addressed the underlying causes of land misuse that frequently result in res in addition to establishing sustainable livelihoods. Farmers received training in sustainable farming methods that strike a balance between environmental preservation and productivity, guaranteeing long-term advantages for the ecosystem and the community.

The inclusion of technological innovations like the FERIN fertilizer injector further streamlined agricultural processes, doubling the ef ciency of fertilization activities. This innovation enabled farmers to save time and resources, allowing them to focus on other aspects of their farming activities. Additionally, the production of derivative products such as pineapple ber crafts and organic fertilizers added signi cant value to the agricultural outputs, creating diversi ed income streams for participants. These initiatives empowered farmers to leverage every part of the pineapple plant, embodying the zero-waste philosophy.

Collectively, these results demonstrate the strategic alignment of PT Kilang Pertamina s CSR efforts with community empowerment and environmental stewardship. The dual focus on economic development and re mitigation showcases a holistic approach to addressing the socio-environmental challenges in Sungai Pakning. By fostering self-reliance, the program has set a benchmark for sustainable CSR practices, offering a replicable model for other regions facing similar challenges.

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Table 1. Impact of CSR Training and Tools on Fire Mitigation

Indicator	Before Program	After Program	Improvement
Firefighting time per hectare	72 hours	24 hours	3 times faster
MPA members trained	10 (2017)	100 (2021)	10 times increase
Fire incidents per year	Frequently uncontrolled	Contained within 2-3 days	Reduced fire duration
Tools availability	Manual methods only	*Nozzle Gambut*, hydrant wells	Increased efficiency

Source: Research results

Table 1 highlights the transformative effects of CSR training programs and tools in improving re mitigation efforts in Sungai Pakning. The Nozzle Gambut, a specialized tool for addressing peatland res, has signi cantly cut down re ghting time from 72 hours to just 24 hours per hectare, making the process three times more ef cient. Moreover, the number of trained members in the Masyarakat Peduli Api (MPA) increased remarkably from just 10 participants in 2017 to 100 participants in 2021, demonstrating the program s success in building community capacity and preparedness. These enhancements have also contributed to quicker containment of re incidents, which are now controlled within 2-3 days. Additionally, the community has transitioned from using manual methods to more advanced re ghting equipment, improving their overall responsiveness to emergencies.

Discussion:

The ndings of this study are consistent with its objectives, showcasing the effectiveness of CSR initiatives in integrating environmental conservation with economic empowerment. The results demonstrate how PT Kilang Pertamina Internasional RU II s CSR program has successfully adopted a holistic approach to addressing forest and land re challenges while simultaneously fostering sustainable community development. This aligns with the broader principles of corporate social responsibility, where organizations are encouraged to incorporate environmental and social objectives into their operational strategies (Carroll & Shabana, 2010).

The emphasis on multi-faceted approaches, as seen in this program, re ects ndings by Sutra and Aban (2021), which argue that peatland management requires diverse interventions to address ecological, economic, and social challenges effectively. The innovative techniques introduced, such as the Nozzle Gambut and zero-waste farming practices, illustrate the program s adaptability and potential replicability in other regions prone to similar environmental risks. This supports previous research indicating that targeted innovations in technology and community engagement are critical in managing peatland ecosystems sustainably (Paunescu, 2014).

Furthermore, the inclusion of economic development in the CSR program shows how effective CSR can be as a tool for community empowerment. As suggested by Porter and Kramer (2011), the program is an example of shared value, which is the process of turning re-prone peatlands into productive agricultural zones. This strategy demonstrates how companies can address urgent societal issues like poverty and environmental degradation while also generating economic bene ts. The community s resilience is increased and their dependence on environmentally damaging practices is decreased thanks to the varied revenue streams produced by pineapple farming and derivative products.

The program s emphasis on peatland conservation tackles carbon sequestration, a pressing worldwide issue. According to Joosten (2009), peatlands are known to store enormous amounts of carbon, and when they degrade, they release a lot of greenhouse gases. By protecting and restoring these areas, PT Kilang Pertamina s efforts directly address climate change and are in line with global objectives like the Sustainable Development Goals (SDGs) of the UN, especially SDG 13 on climate action. These efforts exemplify how localized CSR activities can have broader global implications.

Moreover, the community-centric focus of the program resonates with participatory communication theories, which emphasize the importance of engaging stakeholders in problem-solving processes (Servaes & Malikhao, 2005). The Masyarakat Peduli Api (MPA) and nearby farmers actively participate in the program, guaranteeing that its tactics are socially and contextually appropriate. Community members ownership is encouraged by this participatory approach, which is essential for environmental conservation projects to be sustainable over the long run.

The alignment of business objectives with community needs also demonstrates how CSR has changed from being a philanthropic endeavor to a strategic business function. As highlighted by Visser (2010), modern CSR integrates corporate goals with societal expectations, creating value for both. PT Kilang Pertamina s ability to align its CSR activities with the community s economic and environmental needs sets a benchmark for sustainable CSR practices in high-risk regions like Sungai Pakning. The innovative use of tools such as the Nozzle Gambut highlights how localized CSR programs can inspire global applications in regions facing similar ecological risks.

Conclusion

This study highlights the effectiveness of CSR initiatives by PT Kilang Pertamina Internasional RU II in addressing forest and land res while empowering communities in Sungai Pakning. The training of 100 Masyarakat Peduli Api (MPA) members and the introduction of innovations like the Nozzle Gambut signi cantly enhanced the capacity for re prevention and mitigation. Additionally, the transformation of peatlands into productive agricultural zones through zero-waste pineapple farming demonstrates the program s success in integrating environmental conservation with economic development.

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The ndings align with the study s objectives, showing that CSR can effectively address socio-environmental challenges through innovative and community-centered approaches. By combining local knowledge with technological solutions, the program has successfully reduced re risks, improved livelihoods, and preserved carbon-rich peatlands.

Practically, this program provides a replicable model for regions facing similar environmental challenges. Businesses can draw from its success to design CSR initiatives that foster community empowerment while addressing global environmental issues. Future research could focus on the long-term impacts of such programs on community resilience and their broader contributions to climate action.

In conclusion, PT Kilang Pertamina s CSR program demonstrates the transformative potential of strategic corporate-community collaboration. This initiative serves as a benchmark for sustainable CSR practices, proving that businesses can simultaneously achieve environmental, social, and economic goals.

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Reference

Creswell, J. W., Plano Clark, V. L. (2007). Designing and conducting mixed-methods research. Sage Publications.

Diesendorf, M. (2000). Sustainability and sustainable development. Sydney, Australia: Allen & Unwin.

Johnson, R. B., Onwuegbuzie, A. J. (2004). Mixed Methods Research: A Research Paradigm Whose Time Has Come. Educational Researcher, 33(7), 14 26.

Sahir, S. (2021). Metodologi penelitian. Jakarta, Indonesia: KBM Indonesia. Journal Article

Alpi, K. M., & Evans, J. J. (2019). Distinguishing case study as a research method from case reports as a publication type. Journal of the Medical Library Association, 107(1), 1 5. https://doi.org/10.5195/jmla.2019.615.

Bires, Z., & Raj, S. (2019). Determinants of environmental conservation in Lake Tana biosphere. Heliyon, 5(7), e02064. https://doi.org/10.1016/j.heliyon.2019.e02064.

Birth, G., Illia, L., Lurati, F., & Zamparini, A. (2008). Communicating CSR: Practices among Switzerland s top 300 companies. Corporate Communications: An International Journal, 13(2), 182-196. https://doi.org/10.1108/13563280810869644

Chaudhri, V. (2014). Corporate social responsibility and the communication imperative: Perspectives from CSR managers. International Journal of Business Communication, 22(2), 1-24. https://doi.org/10.1177/2329488414525469.

Christis, J., & Wang, Y. (2021). Communicating environmental CSR towards consumers: The impact of message content, message style and praise tactics. Sustainability, 13(7). https://doi.org/10.3390/su13073947.

Christis, J., & Wang, Y. (2021). Communicating environmental CSR towards consumers: The impact of message content, message style and praise tactics. Sustainability, 13(7). https://doi.org/10.3390/su13073947.

Fosu, E., Fosu, F., Akyina, N., & Asiedu, D. (2024). Do environmental CSR practices promote corporate social performance? The mediating role of green innovation and corporate image. Clean Responsible Consumption, 12, Article 100036.

Ho, S. S., Tan, W., Goh, T. J., & Tandoc, E. (2022). Communicating the future of energy use: Qualitative insights into the efforts of environmental groups in Indonesia, Malaysia, and Singapore. Environmental Communication, 16(1), 75-88. https://doi.org/10.1080/17524032.2021.1980547.

Moreno, A., & Capriotti, P. (2009). Communicating CSR, citizenship, and sustainability on the web. Journal of Communication Management, 13(2), 157-175. https://doi.org/10.1108/13632540910951768.

Nasution, B. & Rasyid, A. (2019). Analyzing communication between government and community in the ow of cross-border goods in the regency of Meranti Island. International Journal of Research In Social Sciences, 31(1). http://www.ijsk.org/wp-content/uploads/2019/07/IJRSS_Vol31_P3_July19_Belli_Nasution.pdf.

Ohashi, M., Kameda, A., Kozan, O., Kawasaki, M., Iriana, W., Tonokura, K., Naito, D., & Ueda, K. (2021). Correlation of publication frequency of newspaper articles with environment and public health issues in re-prone peatland regions of Riau in Sumatra, Indonesia. Humanities and Social Sciences Communications, 8(1), Article 307. https://doi.org/10.1057/s41599-021-00994-5.

Rashid, Y., Rashid, A., Warraich, M. A., Sabir, S. S., & Waseem, A. (2019). Case study method: A step-by-step guide for business researchers. International Journal of Qualitative Methods, 18, 1 13. https://doi.org/10.1177/1609406919862424.

Rathobei, K. E., Ran ngen, H., & Lindman, . (2024). Exploring broad value creation in mining - Corporate social responsibility and stakeholder management in practice. The Extractive Industries and Society, 17(January). https://doi.org/10.1016/j.exis.2023.01.004.

Shao, J., Mahmood, A., & Han, H. (2021). Unleashing the potential role of CSR and altruistic values to foster pro-environmental behavior

ISBN: 978-9952-8545-1-0 https://doi.org/10.30546/19023.978-9952-8545-1-0.2025.0756

by hotel employees. International Journal of Environmental Research and Public Health, 18(24), 13155. https://doi.org/10.3390/ijerph182413155.

Vlibeigi, M., Sarhangi, E., & Karevani, N. (2021). Local environmental conservation activities as a key factor for social interaction (Case study: Bagh-Shater local community). Journal of Population and Social Studies, 29, 32 46. https://doi.org/10.25133/JPSSv29n1.004.

Conference Materials

Palm Oil Agribusiness Strategic Policy Institute [PASPI]. (2017). Proses reforestasi dan perbaikan ekologi melalui perkebunan sawit di Provinsi Riau. Monitor, 3(8), 689-696.

Rosilawati, Y., & Dewi, A. (2021). Empowering communities for resolving the environmental crisis in forest and land res in Riau Province. E3S Web of Conferences, 232, 02005. https://doi.org/10.1051/e3sconf/202123202005

Government Document

Government of Indonesia. (1999). Law of the Republic of Indonesia Number 41 of 1999 on Forestry. Jakarta: State Gazette of the Republic of Indonesia Year 1999 Number 167. Retrieved from https://peraturan.bpk.go.id/Home/Details/45357/uu-no-41-tahun-1999.

Government of Indonesia. (2013). Law of the Republic of Indonesia Number 18 of 2013 on the Prevention and Eradication of Forest Destruction. Jakarta: State Gazette of the Republic of Indonesia Year 2013 Number 130. Retrieved from https://peraturan.bpk.go.id/Home/Details/38613/uu-no-18-tahun-2013.

Website

detiksumut, 2.632 Ha Lahan Terbakar di Riau Sepanjang 2023 selengkapnya https://www.detik.com/sumut/berita/d-7120071/2-632-ha-lahan-terbakar-di-riau-sepanjang-2023.

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SOILS OF LANKARAN-ASTARA ECONOMIC REGION OF AZERBAIJAN

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Abstract

The aim of the research is to obtain new information about the genesis, current status, diagnostic features and properties of the soils and to compile a soil map at a scale of 1: 200 000 of the Lankaran-Astara economic region of Azerbaijan. Using the methods of GIS technologies and Remote Sensing, the distribution areas of the main soil taxonomic units have been updated and diagnostic databases have been created. As a result of the scienti c analysis,the legend of the soil map is compiled. Soils of the Lankaran-Astara economic region of Azerbaijan were the objects of the study. Field experiments (relief, vegetation, laying of soil pro les, their description, selection of soil samples, and establishment of a preliminary classi cation name of the soils) and physicochemical analyzes of soil samples (humus and total nitrogen content, ratio of C:N in soil organic matter, soil pH, cation exchange capacity, grain-size analysis, water extract composition) were carried out by standard methods. For the rst time V.V. Dokuchaev studied the soils ofLankaran region in 1900. The rst information characterizing, although schematically, the soils of the entire Lankaranregion is in the work of V.V. Akimtseva. S.I. Tyuremnov (1927), S.A. Zakharov (1926,1927), B.A. Klopotovsky(1928), M.N. Sabashvili (1931), L.N. Gorodetsky and G.M. Aleksidze (1932), I.V. Tyurin (1932), M.E. Salayev (1934),A.S. Preobrazhensky (1931-1935), G.A. Seyidov (1937), A.A. Zavalishin (1937), V.V. Linnikov (1938), V.P. Smirnov-Loginov (1939), B.I. Filosov (1940), N.N. Lebedev (1941), R.V. Kovalev, K.G. Teimurov, E.F. Sharifov, K.A.Alekperov (1938-1941) explored the soils of different parts of the Lankaran region for different purposes.

The following soil types are common in Lankaran: Mountain-forest brown soils, Mountain-forest yellow-brown soils, Mountain-forest cinnamonic soils, Cultivated mountain grey-cinnamonic, Mountain-forest yellow (pseudopodzolized) soils, Gleyey-yellow (pseudo podzolic) soils, Meadow-cinnamonic soils, Irrigated meadow-cinnamonic soils, Meadow-grey soils, Irrigated alluvial-meadow soils, Irrigated meadow-boggy soils, Boggy soils.

Keywords: soil classi cation, soil type, digital soil mapping, remote sensing.

Introduction

In accordance with the Decree of the President of the Republic of Azerbaijan No. 1386 dated July 7, 2021, the new division of economic regions in the Republic of Azerbaijan was approved [7]. According to the new division, 14 economic regions had been separated.

Lankaran-Astara economic region borders the Caspian Sea to the east, and Iran to the west and south. Lankaran-Astara economic region includes Jalilabad, Astara, Lerik, Lankaran, Masalli and Yardimli administrative regions. Its area is 6.14 thousand km . Lankaran plain and Talysh mountains are the main orographic units. 26% of the territory of the economic district is covered with forests. The region has a humid subtropical climate and differs from other economic regions of the country due to its natural conditions [6].

For the rst time, V.V. Dokuchaev studied the soils of Lankaran region in 1900. He paid attention to the very signi cant features of soil formation in Lankaran region: the severity of the swamp process in the lowland soils, the podzol formation process in the soils of the foothills, the development of rather coarse yellowish-brown forest loams on bedrock on the slopes of low mountains, and, nally, the extremely low accumulation of humus substances in forest soils.

The rst information characterizing, although schematically, the soils of the entire Lankaran region is in the work of V.V. Akimtseva. S.I. Tyuremnov (1927), S.A. Zakharov (1926,1927), B.A. Klopotovsky (1928), M.N. Sabashvili (1931), L.N. Gorodetsky and G.M. Aleksidze (1932), I.V. Tyurin (1932), M.E. Salayev (1934), A.S. Preobrazhensky (1931-1935), G.A. Seyidov (1937), A.A. Zavalishin (1937), V.V. Linnikov (1938), V.P. Smirnov-Loginov (1939), B.I. Filosov (1940), N.N. Lebedev (1941), R.V. Kovalev, K.G. Teimurov, E.F. Sharifov, K.A. Alekperov (1938-1941) explored the soils of different parts of the Lankaran region for different purposes.

Until the 1950s, the soil of the Lankaran region was studied insuf ciently. The available information on the nature of the soil cover did not provide the necessary material for the classi cation of soils. The Lankaran region stands out for its great originality of natural conditions. Subtropical cultures developed here, especially tea.

All these studies have not yet provided suf cient material to establish the genetic characteristics of the Lankaran region soils. In this regard, in 1949-1956. extensive comprehensive soil surveys were carried out research. A comprehensive expedition was carried out to study the soil and climatic conditions. The leader of the expedition was R.V. Kovalev[2].

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Material and Methods

The sediments of the complex third period of the Paleogene are typical for the Lankaran zone. In such a complex of sedimentary rocks in the Lankaran area, there are complex magmatic derivatives - effusive (volcanic) and intrusive (lling of magma between the earth s crust).

The soil-forming rocks of the plain area represent the primary and collapsed modern sediments of deluvial, proluvial and alluvial. They are characterized by a variegated granulometric composition, a relatively light granulometric composition in the sediments of river cones and a heavier granulometric composition in the lower elements of the relief.

The climate of Lankaran zone is subtropical. This type of climate is characterized by high humidity in the spring-autumn period, and insuf cient humidity in the summer. The average relative humidity reaches 81-83% and decreases in summer. The average annual temperature is 14.4-14.7%. The average annual precipitation is 500-600 mm, reaching 1400 mm in the northern part. More than 10^0 temperatures total 4000-4400.

Natural water resources are very scarce. Arti cial irrigation is needed. The hydrographic network of Lankaran zone is quite developed. Larger rivers are Lankaranchay and Vilashchay. Small rivers are fed by atmospheric precipitation.

Lankaran zone is characterized by rich ora and variety of vegetation. In particular, this area is distinguished by its relict and endemic plants from the Tertiary period[5].

Azerbaijani soils have always been at the forefront of the former Union in terms of study and research. The creation of soil classi- cation in Azerbaijan was started by SA Zakharov (1927). Soil classi cation were improved by V.P.Smirnov-Loginov, N.A.Dimo, L.N.Noin, V.R.Volobuyev and others. The Azerbaijan soils classi cation was prepared by a genetic-pro le principle. The basic unit of soil classi cation was soil type.Later, national staff in the eld of soil science were grown. Soil classi cation were developed by M.E.Salayev, Sh.G.Hasanov, M.P. Babayev, Ch.M.Jafarova and others scientists [2].

There were many soil classi cation systems in the world. Each country has its own approach and ideas. However, soil scientists around the world need a single language to understand and communicate with each other.The World Reference Base (WRB) is an international system for classi cation of soils.

The laying of soil sections, the morphological description of the soil pro le, and the establishment of the preliminary classi cation name of the soil in the eld were carried out according to the Guidelines for Soil Description (2006) [3]. The samples were taken according to genetic horizons, physical and chemical properties were determined (humus, gross nitrogen, C:N ratio, soil reaction, cation exchange capacity, particle size distribution, composition of complete water extract) (Arinushkina, 1970; Mineev, 1989)[1]. Based on the morphological description of soils and their physical and chemical properties, the names meadow-boggy soils are given according to the International soil classi cation based on the World reference base (WRB) 2015 (IUSS Working Group WRB, 2015) [4].

Results and Discussion

In the last 10 years, extensive soil research has been conducted in Lankaran-Astara economic region, their physical and chemical properties have been studied, soil names have been clari ed, and national and international classi cations have been given. Thus, 12 soil types are distinguished Lankaran-Astara economic region. The soil map at a scale of 1: 200 000 of the Lankaran-Astara economic region of Azerbaijanhas been compiled.

The WRB diagnostic criteria were applied to soils in Lankaran-Astara economic region. Taking into account their morphological features and analytical data, diagnostic horizons were identi ed. The accompanying processes were diagnosed by the presence of gleying, the degree of humus, cation exchange capacity, granulometric composition, carbonate content and etc. The soils under investigation were classi ed according to the Azerbaijan soil taxonomy and correlated with the FAO/ UNESCO Legend of World Reference Base (WRB) system. These two systems are commonly used in Azerbaijan for soil classi cation and mapping.

Mountain-forest brown soils-Phaeozems,

Mountain-forest yellow-brown soils-Stagnic Luvisols,

Mountain-forest cinnamonic soils-Cambisols,

Cultivated mountain grey-cinnamonic-Kastanozems,

Mountain-forest yellow (pseudopodzolized) soils- Acrisols,

Gleyey-yellow (pseudo podzolic) soils-Luvisols, Lixisols,

Meadow-cinnamonic soils GleyicKastanozems,

Irrigated meadow-cinnamonic soils IrragriGleyic Kastanozems,

Meadow-grey soils -Calcisols,

Irrigated alluvial-meadow soils-Gleyic Fluvisols,

Irrigated meadow-boggy soils-Irragri Gleysols,

Boggy soils-Gleysols

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Conclusion

The soil cover of the Lankaran-Astara economic region has been studied.12 soil types were distinguished in the Lankaran-Astara economic region. These soils were classi ed according to the Azerbaijan soil taxonomy and correlated with the FAO/ UNESCO Legend of World Reference Base (WRB) system. T

Reference

1. Arinushkina E.V., 1970. Manual for Chemical Analysis of Soils. Moscow State University, Moscow. 487 p.
2. Babayev M.P., Ismayilov A.I., Huseynova S.M. The place of the zheltozem-gley soils of Azerbaijan in the International System WRB // The Journal of Soils and Environment , Vol. 3, 1, 2020, https://doi.org/10.31251/pos.v3i1.112
3. FAO. 2006. Guidelines for soil description. 4th edition. Rome.97 p.
4. FAO. 2015 World reference base for soil resources 2014/International soil classi cation system for naming soils and creating legends for soil maps Update 2015. 192 p.
5. Kovalev R.V. 1966, The soils of the Lankaran region. Baku, Academy of Sciences of the Azerbaijan Republic, 371 p. (in Russian)
6. https://az.wikipedia.org/wiki/L nk ran-Astara_iqtisadi_rayonu
7. https://osmanemin.wordpress.com/2022/06/06/azerbaycanin-iqtisadi-rayonlari-yeni/

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STUDY OF THE MICROELEMENT IODINE (I) IN SOILS FORMED UNDER CITRUS AND SUBTROPICAL PLANTS

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Abstract

One of the most important environmental issues of our time is the development of a strategy for protecting and increasing soil fertility. Natural iodine de ciency, which in some regions of Azerbaijan provokes diseases, aggravates the consequences of short-lived radioactive isotopes of this element entering the food chain. As a result the disruption of the ecological balance, the ecosystem changes, and when heavy metals, including microelements (Pb, Cd, Zn, J, Ni), considered hazardous to the environment, are distributed around, 90% of them accumulate in the soil. The microelements Mn, Mo, Cu, Zn, Co, B, J, which play a key role in the development of living organisms, were determined. The amount of microelements in the studied soils uctuates within the range of n 10^{-3}-10^{-8}%. We consider it appropriate to provide information on the amount of iodine, considering that the microelement iodine under subtropical and citrus plants has not been studied on a large scale. According to the results of the analysis conducted with *Citrus reticulata* on 0.5 hectares and *Feijoa* on 1.2 hectares, was found that *Citrus reticulata* has a very small amount of iodine. On the contrary, the *Feijoa* plant is rich in iodine. The results show that, despite growing in the same soil and climatic conditions, the needs of plants for microelements are not the same. This feature is explained by the selective ability of plants. The amount of the studied microelement iodine in yellow-pseudopodzolic clay soils is suf cient; its average amount in the soil does not exceed Clark, accumulates in the upper layer and gradually decreases in the lower layers.

Keywords: microelements, amount of iodine, heavy metals, citrus plants, biological diversity

Introduction

The leading role in natural soil formation played by lithological and geomorphological conditions: typical yellow soils are con ned to redeposited yellow-colored weathering crusts of gentle slopes, residual carbonate soils are con ned to residual weathering crusts of sedimentary rocks. On at surfaces of marine terraces under conditions of excessive atmospheric and additional allochthonous humidi cation, eluvial-surface-gley yellow earth soils are formed on rocks of two groups - gley and yellow-deluvium [1,2]. Most of the listed soils have well-de ned signs of anthropogenic impact, including in natural pro les under introduced trees and shrubs. Based on the genetic characteristics of yellow soils and following the principles of the international classi cation of soils, it is proposed to divide the yellow soil type of the structural-metamorphic soils department into subtypes of typical and residual-carbonate, eluvial-surface-gley on yellow-colored deluvium - to distinguish as a type of eluvial-metamorphic soils in the same department, with subtypes of gleyic or concretionary. The mineralogical composition of the ne fractions of the Lankaran yellow soils differentiated by pro le. In the upper part, relatively hard clastogenic minerals accumulate, in the lower part mixed-layer minerals with a high proportion of smectites, which determines the duality of the modern functioning of the soil layer; its upper part pedogenic-climatogenic, the lower - lithogenic-metamorphic. The diagnostic horizon of yellow soils has a set of features, the main ones being: dull yellow color, lack of a speci c structure, viscosity in wet and cracking in dry conditions, increased content of silt fraction, and high acidity. That formed because of structural transformations of the mineral mass with the predominance of smectite among clay minerals, mainly in summer with short strong drying of the soil, which is con rmed by the features of microstructures and forms of optically oriented clays. Signs of anthropogenic impact are unstable: the results of mechanical disturbances are erased both in the upper part of the yellow soil pro le due to high biological activity and eluvial processes, and in the lower part, due to structural rearrangements of the swelling smectite phase. As a result, nature-like pro les of yellow soils with artifacts in the soil mass are formed.

As a result the disruption of the ecological balance, the ecosystem changes, and when heavy metals, including microelements (Pb, Cd, Zn, J, Ni), considered hazardous to the environment, are distributed around, 90% of them accumulate in the soil [3]. The microelements Mn, Mo, Cu, Zn, Co, B, J, which play a key role in the development of living organisms, were determined. The amount of microelements in the studied soils uctuates within the range of n 10^{-3}-10^{-8}%. We consider it appropriate to provide information on the amount of iodine, considering that the microelement iodine under subtropical and citrus plants has not been studied on a large scale.

Research Object and Materials. Laboratory analyzes were carried out according to generally accepted rules [4,5]. Field studies were conducted in the summer period 2021 2023 near populated areas. The soils formed under *Citrus reticulata* and *Feijoa* plants of the humid subtropical zone were chosen as the object of study. Laboratory analyses were carried out according to generally accepted rules. *Feijoa* is ranked high in decorative gardening that was promoted by its beautiful silvery leaves and unusual bright crimson-red owers with white-pink eshy petals. *Feijoa* perfectly ts in a humid climate of Lankaran where aregrown70 80-year old plants, which are one of,oldest in country (g.1).

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Fig. 1. A. Ripe fruits B. root mass of *Citrus reticulata*; C. Root mass D. Ripe fruits of *Feijoa* (by autors in 2021-2023 years)

Results and Discussion

The discussed material characterizes the parameters of the biotic cycle of the main plant nutrition elements in plantations where the restoration of native forest types occurs through derivative birch forests. The parameters analyzed are the reserve of elements in the phytomass and the main exchange ows of consumption from the soil [6].

According to the results of the analysis conducted with *Citrus reticulata* on 0.5 hectares and *Feijoa* on 1.2 hectares, was found that *Citrus reticulata* has a very small amount of iodine (g. 2;3). On the contrary, the *Feijoa* plant is rich in iodine. The results show that, despite growing in the same soil and climatic conditions, the needs of plants for microelements are not the same (g. 4;5). This feature is explained by the selective ability of plants. The amount of the studied microelement iodine in yellow-pseudopodzolic clay soils is suf cient; its average amount in the soil does not exceed Clark, accumulates in the upper layer and gradually decreases in the lower layers (g. 6).

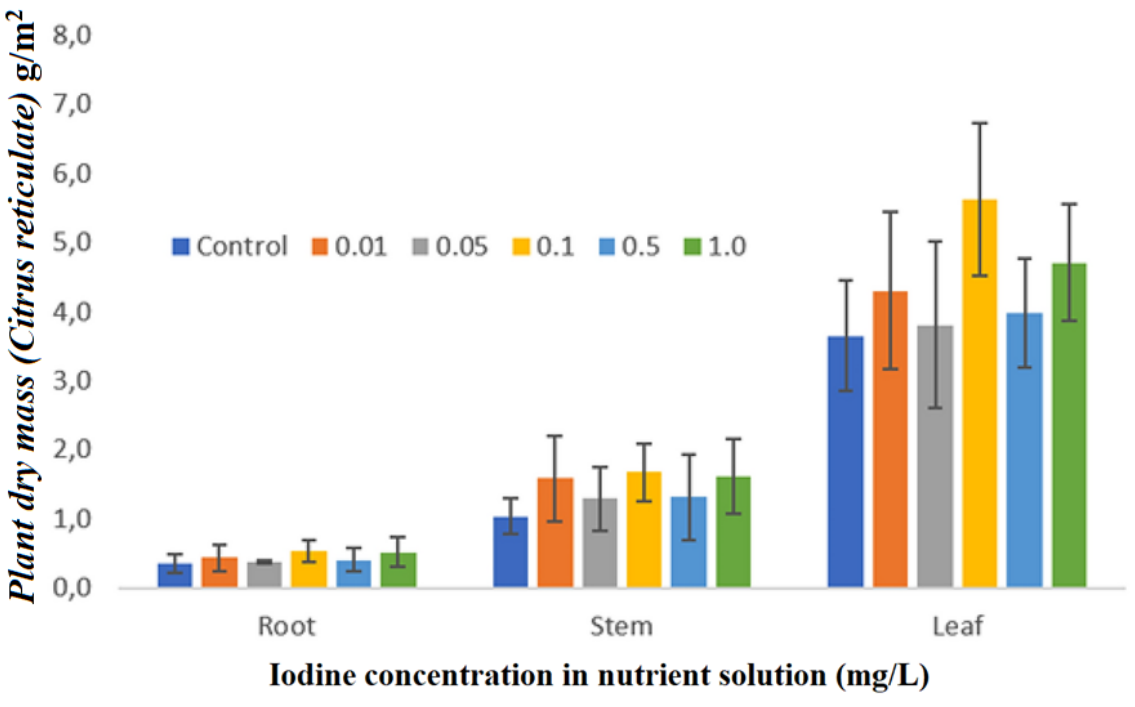


Fig. 2. Mean dry mass of roots, stems, and leaves of *Citrus reticulata* cultivated in nutrient solutions containing species (2021-2023 years)

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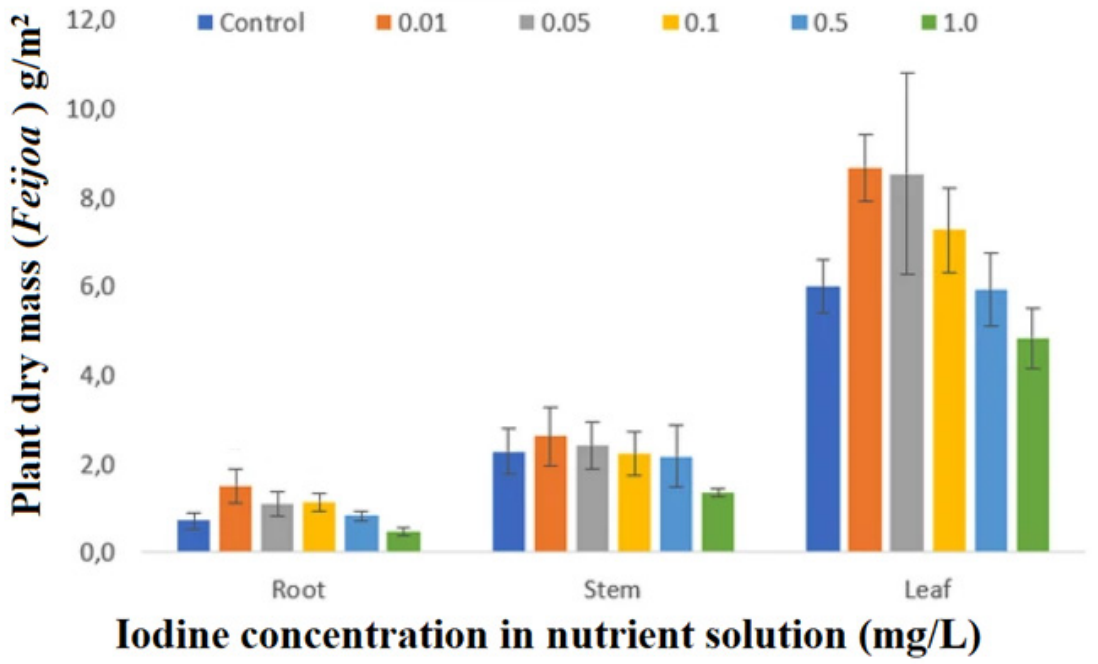


Fig. 3. Mean dry mass of roots, stems, and leaves of *Feijoa* cultivated in nutrient solutions containing species (2021-2023 years)

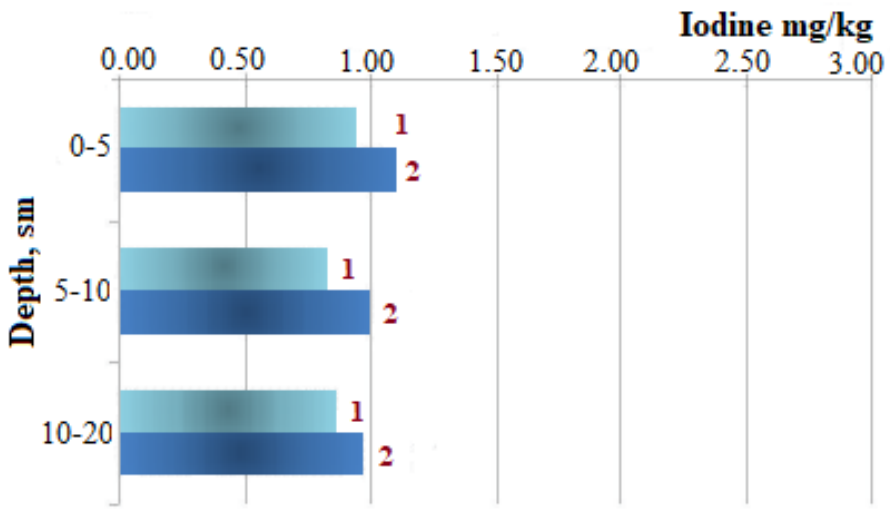


Fig. 4. Iodine content under natural cenoses soils (1) and (2) under *Citrus reticulata* plant soils

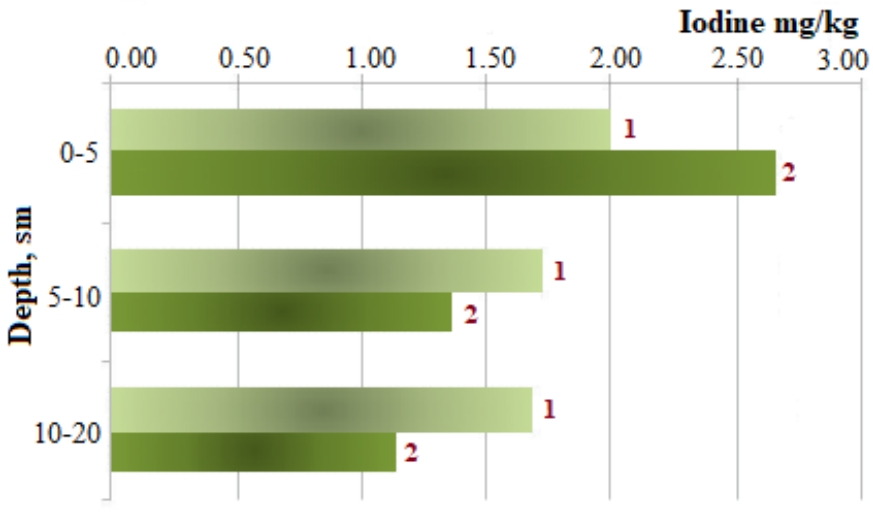


Fig. 5. Iodine content under *Forbs* (1) and (2) *Feijoa* soils

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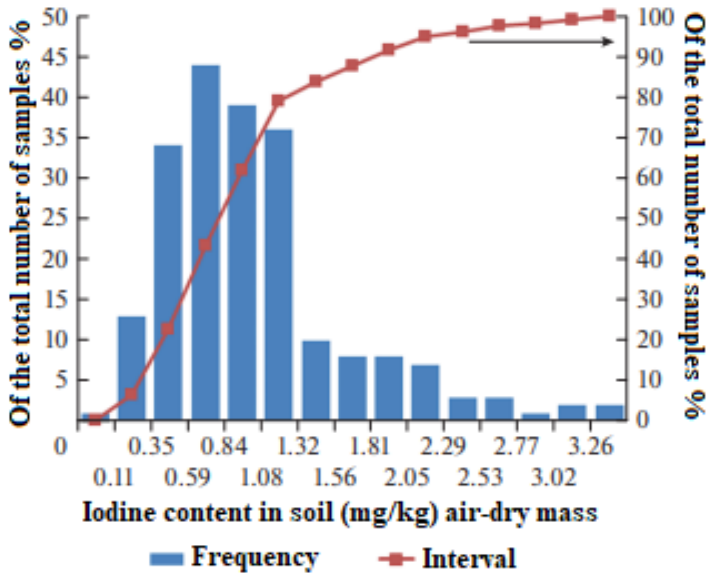


Fig. 6. Histogram of iodine content distribution in the arable soil layer (0 20 cm) (n = 211)

The abscissa axis shows the upper limits of the iodine concentration intervals

Conclusion

Feijoa does not synthesize iodine, but accumulates it. This means that the berries grown in regions where the soil and air are rich in iodine will contain the most of the microelement. Studies have shown that, in terms of dry matter, 100 g of berries can contain from 8 mg to 35 mg of iodine. Soil analysis under *Feijoa* and *Citrus reticulata* showed that there are signi cant differences in the content of macro- and micro-elements between varieties, suggesting that these differences may be due to differences in the genetic composition of different varieties.

Recommendations

The presented results suggest the prospects for further genetic studies of yellow soils, as well as the establishment of their geoecological signi cance for the landscapes of the coastal zone of the Caspian Sea.

Con ict of interest

The authors declare that they have no con ict of interest in relation to this research, whether nancial, personal, authorship or otherwise, that could affect the research and its results presented in this paper.

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References

1. The State of the World s Forests 2020. Forests, biodiversity and people. Book (series). Rome, Italy. FAO and UNEP publisher. 2019. 214 p. DOI: 10.4060/ca8642en https://www.fao.org/state-of-forests/en/
2. Ahmad F, Uddin MM, Goparaju L (2018). Agroforestry suitability mapping of India: geospatial approach based on FAO guidelines. Agrofor. Syst. https://doi.org/10.1007/s1045 7-018-0233-7
3. Smeriglio A., Denaro M., De Francesco C., Cornara L., Barreca D., Bellocco E., Ginestra G., Mandalari G., Trombetta D. (2019). Feijoa Fruit Peel: Micro-morphological Features, Evaluation of Phytochemical Pro le, and Biological Properties of Its Essential Oil.Antioxidants (Basel). 19;8(8). . 320. https://doi.org/10.3390/antiox8080320
4. Solomon, J. (2014). Red list of the endemic plants of the Caucasus: Armenia, Azerbaijan, Gerogia, Iran, Russia, and Turkey /J. Solomon, T. Shulkina, G. Schatz US: Missouri Botanical Garden Press. 451 p
5. Rowell, D. L. (1999). Soil Science: Methods & Applications, 1st Edition. Longman Scienti c & Technical; Wiley, Harlow publ. 1994. UK, London. 368 p. https://doi.org/10.4324/9781315844855
6. Huseynova, S. M., Ismayilov, A. I., Babayev, M. P., Jafarov, A. M. (2024). Taxonomic attribution of the haplic gleysols of the Azerbaijan Republic in world reference base for soil resources, *International Journal of Advances in Applied Sciences (IJAAS),* vol. 13, no. 1, 116-122. ISSN: 2252-8814, https://doi.org/10.11591/ijaas.v13.i1.pp116-122 https://ijaas.iaescore.com/index.php/IJAAS/article/view/20948

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ECO-CHEM CAL STUDY OF ABSHERON LAKES,WHOSE NATURAL STATE HAS BEEN DISTURBED BY TECHNOGENESIS

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Summary: There are about 800 natural lakes in our republic, of which about 100 are located on the Absheron Peninsula. This area is the richest region in our republic with lakes. The lakes cover 2.5% of the peninsula s area, which is 0.35% for the republic and 2% worldwide. For the eco-chemical study of the Absheron lakes, the natural state of which has been disturbed by technogenesis, water samples were taken from the Boyukshor, Masazir, Mirzeledi, Kurdakhani, Girmizi, Khojahasan, Gumyatag, Zigh, Bulbula, and Gala lakes and various physico-chemical parameters (amount of cations and anions) were determined. The chemical composition of these lakes was determined according to the macrocomponents of the water mass.

Keywords: Absheron lakes, physicochemical parameters, degree of mineralization, a system of Gala, Zigh, Red, and Gu lakes.

Introduction

The lakes of the Absheron peninsula are located in different parts of the region, near human settlements and farms, and differ in size, direction and degree of anthropogenic loading. These include Buyukshor, Kurdakhani, Bulbula, Mahammadli, Zabrat, Khojahasan, Gala, Lokbatan, Ganligol, Binagadi, Ramana, Red and Gu lake systems, Zigh, Pirallahi, Puta, Dashgil, etc. belongs to. Some of these lakes have their coastal zone or entire lake dried up, while others receive waste water, increasing their water mass and area, damaging the surrounding buildings and communications. Lakes with increased water volume due to climate changes are already relatively dry in the summer season, atmospheric precipitation has become secondary in the structure of their water balance, and the main source of nutrition has been sewage ows. Since the water mass is polluted and mineralization rates are reduced, salt does not settle on the shores and bottom of the lakes. But during the natural regime, table salt (NaCl) was collected from most of the mentioned lakes. As the gas exchange between the water surface and the atmosphere becomes dif cult in the lakes, the amount of oxygen dissolved in the water decreases sharply and amounts to 2-4 mg/dm3. As a result of lack of oxygen and the incomplete completion of the oxidation process, it creates fertile conditions for the formation of hydrogen sul de (H2S) gas in the lower parts of the water mass. Since the nutritional status of lakes has changed, their dimensions, physical indicators, degree of mineralization, chemical composition, characteristics of bottom sediments and the world of hydrobionts have undergone transformation. During the development of lakes in their natural state, their water mass and bottom sediments (depending on the geochemical composition of the rocks that make up the lake and food sources) contained a speci c amount of trace elements, but with anthropogenic loading, their quantity and diversity increase to a certain extent [1-2].

The objective of the study is to determine the amount of physical parameters (the amount of cations and anions), phenols, and surface-active substances taken from lakes such as Bigshore, Massachusetts, Mirzay, Kurdistan, Red, Hokkaido, Gumyataq, Zig, Bulbul, and Gala Lakes.

Research Object and Methodology

In 2023 and 2024, water samples were taken from Buyukshor, Masaz r, Mirzeladi, Kurdakhani, Q rm z , Khojahasan, Gumyatag, Z gh, Bulbula, Gala lakes and various physicochemical parameters (the amount of cations and anions) were determined. The chemical composition of these lakes according to the macrocomponents of the water mass is shown in table 1. Also, the amount of phenols and surfactants, dissolved oxygen in the water of these lakes was determined. The value of pH was determined in the collected lake water samples [3-4]. The obtained results are given in table 2.

Results and Discussion

It can be seen from Table 1 that the lakes mainly belong to sodium group of chloride and partly sulfate class. Except for Masaz r and Mirzeladi lakes, which are located in close to natural conditions, the degree of mineralization of most of them has decreased many times. The main reason for the decrease in the amount of salt dissolved in the water mass of closed lakes is explained by the low degree of mineralization of waste water discharged there.

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Table 1. Chemical composition of lake waters , g/dm^3

Name of lake	Ca	Mg	Na+K	HCO_3	Cl	SO_4
Boyukshor	0,04	0,10	8,86	0,86	12,3	0,92
Masazir	0,62	0,32	144,1	0,33	226,8	1,76
Mirzaladi	1,0	1,20	115,1	3,35	159,2	19,2
Kurdekhani	1,0	2,42	33,0	0,30	48,7	9,62
Red	0,62	2,90	33,9	0,70	61,2	0,31
Khojasan	0,10	0,06	0,72	0,03	0,96	0,45
Gumyataq	0,04	0,04	0,20	0,10	0,19	0,32
Zig	1,45	0,77	35,5	0,35	58,0	1,74
Bulbule	0,15	0,11	1,88	0,67	1,28	2,30
Gala	1,53	1,70	33,8	0,39	52,0	3,28

Table 2 Physico-chemical indicators of lake water samples

Name of lake	Physical indicators						Pollutants, mg/l	
	pH	Electrical	Turbitidy,		Dissolved oxygen		Phenol	Synthetic surfactants
						%		
Gumyataq lake	8.5	0.878	55.0	19.0	7.8	84.0	0.0012	0.001
Yasamal lake	7.8	0.957	68.0	14.0	7.6	82.0	0.001	0.06
Bulbule lake	8.4	1.667	120	10	5.0	57.0	0.001	0.36
Zig lake	8.1	94.4	95	14	2.7	30.0	0.0025	1.77
Kurdekhani lake	7.0	5.00	68	15	6.0	61.0	0.003	0.072
Boyukshor lake	8.9	50.8	163	8	7.0	80.0	0.002	2.6
Red lake	8.1	2.56	6.63	25.0	7.8	85.0	0.0024	0.22
Khojasan	8.0	5.05	20.8	19.0	4.6	52.0	0.002	0.13
Masazir lake	7.8	228.0	214	8	2.0	21.0	0.0015	1.25

It can be seen from Table 2 that the amount of harmful substance phenol in Yasamal, Bulbula and Masaz r lakes exceeds the permissible concentration limit [3]. The value of pH in Buyukshorlake is higher than others. The amount of surface-active substances in Masaz r, Buyukshor and Z gh lakes repeatedly exceeds the limit of concentration [6]. The total cod concentration in Gumyatag Lake is 4.3 mg-eq/l, Yasamal Lake is 5.9 mg-eq/l, Bulbula Lake is 9.0 mg-eq/l, Zigh Lake is 34.9 mg-eq/l, Buyukshor Lake is 13.5 mg-eq/l, Khojahasan 8.8 mg eq/l in Lake Masazir, 392.5 mg eq/l in Lake Masazir, It is 50.12 mg-eq/l in Kurdakhani lake [5]. If we take into account that the limit value for cod in water bodies is 7.0 mg-eq /l, it can be said that the waters of other lakes, except the water of Yasamal and Gumyatag lakes, are too cod.

Conclusion

Thus, in the research work, the amount of various physico-chemical parameters (amount of cations and anions), phenols, and surface-active substances was determined in water samples taken from the lakes of BuyukshorMasaz r, Mirzeladi, Kurdakhani, Q r z , Khojahasan, Gumyatag, Z gh, Bulbula, Gala. It has been known that the water of other lakes, except the water of Yasamal and Gumyatag lakes, is very cod. The amount of surface-active substances in Masaz r, Buyukshor and Z gh lakes repeatedly exceeds the limit of concentration [7]. In Yasamal, Bulbula and Masaz r lakes, the amount of phenol slightly exceeds the permissible concentration limit. The water of other lakes besides Gumyatag, Yasamal and Masaz r lakes is cloudy and has a pungent smell.

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References

1. Mustafayev Islam, HajiyevaSevinj, AliyevaTarana MODERN NATURAL-ECOLOGICAL CHARACTERISTICS OF ABSHERON LAKES//AZERBAIJAN 2th. INTERNATIONAL CONGRESS OF SCIENTIFIC RESEARCH (Strengthening International Relations for Sustainable Development in Azerbaijan), 2024, Azerbaijan p.79-82
2. Hacıyeva S. R., Mustafayev İ. İ., Əliyeva T. İ. Abşeron yarımadasının bəzı göllərinin eko-kimyəvi tədqiqi.// MÜASİR TƏBİƏT VƏ İQTİSAD ELMLƏRİNİN AKTUAL PROBLEMLƏRİ BEYNƏLXALQ ELMİ KONFRANS, Gəncə, 2024, s.8-11
3. Гаджиева С.Р., Мустафаев И.И., Алиева Т.И. Экологическое оценивание озера Масазыр// VI Международная (XIX Региональной) научная конференция «Техногенные системы и экологический риск», Обнинск, 2024, 236 -238
4. **Севиндж Гаджиева, Ислам Мустафаев, Тарана Алиева, АйтенСамедова, ГюллюГюллерли**ОЦЕНКА ЭКОЛОГИЧЕСКОГО СОСТОЯНИЯ ОЗЕРА ГЫРМЫЗЫ// Proceedingsof Azerbaijanhightechnicaleducationalinstitutions, volume 45 (05), issue 10 , 2024, c.37-46
5. BayramovQ.İ., ƏliyevaT.İ., AbbasovaS.A. Kürdəxanı gölününekolojidəyərləndirilməsi//Ekologiyavə sutəsərrüfatı jurnalı, №4, 2024, s. 21-25
6. С.Р.ГАДЖИЕВА, Т.И.АЛИЕВА, А.А.САМЕДОВА Определение синтетических поверхностно-активных веществ (СПАВ) неионогенного происхождения в некоторых озерах Абшерона// Azərbaycan xalqının Ümummilli lideri Heydər Əliyevin anadan olmasının 100-cü ildönümünə həsr olunmuş "Davamlı inkişaf strategiyası: qlobal trendlər, milli təcrübələr və yeni hədəflər" II Beynəlxalqelmikonfransınınmaterialları. MingəçevirDövlətUniversiteti, 2023-cü il, s.274-276
7. Hajıyeva S.R., Yusifova M.N., Aliyeva T.I. The ecological state of BoyukShor lake of Azerbaijan//Environmental Monitoring and Assessment, (2020) V.192:articul N 780, p.1-11, https://doi.org/10.1007/s10661-020-08762-9

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DEVELOPMENT OF CLIMATE CHANGE MITIGATION MEASURES IN PEAR CROP

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Abstract

Climate change is one of the main factors that have a serious impact on agriculture. Especially fruit trees, including the pear plant, are affected by sudden changes in weather conditions. These effects can lead to reduced productivity, disruption of the growing season, and increased disease. General ideas about measures to combat climate change in the pear plant and their results have been presented. Improving the soil structure provides a stable growing environment for the pear plant. Increasing organic matter and applying crop rotation improves the water holding capacity of the soil and increases the resistance of the plant to drought. Cultivation of new pear varieties that are resistant to climate change is an important measure. Varieties that are resistant to heat and diseases can help achieve a more stable crop. For this, it is necessary to support scienti c research at the local and regional level. Application of drip irrigation technology in pear orchards not only prevents water loss, but also supports continuous water supply of plants. Correct management of the irrigation regime increases the resistance of the pear plant to stress and increases productivity. Climate changes can cause the spread of diseases and pests.The application of biological control methods, i.e. natural enemies and microbiological means, minimizes the use of pesticides and reduces the negative impact on the ecosystem. The application of meteorological data in farms for the purpose of planning according to climate change is an important step. Advanced climate data allows optimization of planting dates and accurate forecasting in pear orchards. The implementation of measures to combat climate change in the pear plant makes an important contribution to maintaining the stability of productivity and reducing losses in the future. The use of modern agricultural technologies, cultivation of new varieties and proper irrigation methods will help to ensure sustainability in pear cultivation. These measures will play an important role in minimizing the negative effects of climate change on agriculture.

Keywords: Crop Hardiness, Agriculture, Irrigation, Soil Conservation

Introduction

In recent decades, global climate changes have had a serious impact on agriculture. Climate change-induced problems such as drought, heat waves, unseasonal rainfall and increased pests have threatened agricultural productivity. The pear plant is a fruit species with important economic importance in regions with a moderate climate like Azerbaijan. Climate changes have a negative impact on the agricultural sector worldwide. The pear plant, which is widespread and economically important in temperate climates, is no exception to these effects. Drought, extreme heat, erratic rainfall, and increased incidence of pests reduce the yield and quality of the pear crop. In this article, the impact of climate changes on the pear plant will be analyzed in more detail, a plan of measures to solve the current problems will be presented, and future development prospects will be examined. The pear plant grows well in mild climate conditions. An extreme increase in temperature weakens photosynthesis, shortens the growing season and reduces productivity. Drought causes water imbalance, weakening of the root system and reduced fruit size. Excessive rainfall disrupts the soil structure, causes soil erosion and weakens the stability of the plant s root system. The lack of precipitation leads to salinization of the soil and a decrease in productivity. The pear plant is sensitive to seasonal changes. It causes the vegetation period to start prematurely, which increases the plant s susceptibility to frost damage. It disrupts the photosynthesis process and leads to a decrease in the chlorophyll content of the leaves.

Research Object and Materials

It limits the growth of fruits and causes a decrease in weight and quality.

Drought causes the pear plant s water needs to weaken, weakens the plant s root system, results in insuf cient fruit lling, and disrupts owering and fruit formation processes. Unseasonal and unevenly distributed precipitation due to climate change. Excessive precipitation increases soil erosion, which lowers soil fertility. Lack of precipitation causes soil dryness and salinization. This situation threatens the health of pear roots. Climate change increases the population of pests. In particular, pests such as the codling moth (Cydia pomonella) and the pear psyllid (Cacopsylla pyri) cause serious damage to the pear plant. Warmer and wetter climatic conditions create a favorable environment for pests to multiply. Excessive heat and drought have a negative effect on the sugar content, acidity and color of fruits. Excessive precipitation causes the fruits to rot and become un t for sale. To prevent the negative effects of climate change on the pear plant, a number of agrotechnical and technological measures are implemented. This technology allows ef cient use of water resources. During drip irrigation, the roots of the plant are supplied with water directly, which prevents water wastage. During periods of drought, this method facilitates the management of scarce water resources. Precipitation storage and use as a reserve plays an important role in making crop rotation sustainable. Proper pruning of pear orchards and optimization of lighting conditions increase product quality. Planting planning and rotation systems in accordance with climate changes help to maintain productivity. Training programs should be organized to improve the skills of farmers in using modern technologies. Climate-resistant agricultural methods, water resource management and biological control techniques should be taught in the training. Unstable climate conditions change the sugar, acidity and aroma value of fruits, which leads to a decrease in commercial value. Application of drip irrigation technologies allows more ef cient use of water resources. gives The construction of water collection and storage systems ensures the water needs of plants during periods of drought.

New varieties resistant to drought, diseases and high temperature conditions are created by biotechnology and genetic selection methods. Enriching the soil with organic matter, i.e. compost and green manure methods, improves the soil structure. Mulching techniques conserve soil moisture and reduce erosion. Biological control methods, that is, the application of bene cial insects, help to reduce the use of chemical pesticides.

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Results and Discussion

Timely detection and prevention of pests is ensured through smart farm technologies. Correct pruning of pear trees and maintenance of spacing helps regulate the microclimate. Organic agricultural methods increase product quality and maintain ecological balance. The use of arti cial intelligence and satellite monitoring systems for climate data analysis allows to increase productivity. Smart irrigation and fertilization systems ensure optimal resource management. Training programs should be organized to increase farmers use of modern methods adapted to climate changes. Measures such as increasing subsidies, promoting the cultivation of climate-resistant species and supporting innovative projects are important. The exchange of experience with foreign countries and the joint implementation of climate adaptation projects can contribute to the development of this eld. Although climate changes have important effects on the cultivation of pears, modern technologies, agrotechnical measures and it is possible to minimize these effects by applying climate adaptation strategies.

In order to create a sustainable development model for the pear plant under the conditions of Azerbaijan, the cooperation of both the public and private sectors is necessary. With the widespread application of climate-tolerant agricultural practices, Azerbaijan s competitiveness in the eld of pear production will increase. Climate changes are creating serious problems for agriculture, including pear production.

Conclusion

However, with the application of modern technologies, genetic selection, and effective management strategies, it is possible to minimize the effects of these problems. If a plan of measures adapted to the conditions of Azerbaijan is developed and implemented, both product quality and quantity will be increased, and at the same time, a positive contribution will be made to the national agricultural economy.

References

1.Həsənov Z.M. Meyvəçilik. Bakı: “MBM”, 2011, 519 s.

2.Həsənov Z.M. Meyvəçilik (laborator-praktikum). Bakı: “MBM”, 2010, 343 s

3.Həsənov Z.M., Cəfərova İ.H., Ağayev F.N., Süleymanova Y.V. Bağban nəyi bilməlidir. Bakı: 2009, 367 s.

4. Sadıqov Ə.N, Azərbaycanda yayılmış meyvə bitkiləri. Bakı: “Müəllim” nəşriyyat, 2023. 632 səh.

5.Kənd və meşə təsərrüfatı// http://e-kitab.ameanb.nmr.az/Az/KitabEtrafli.aspx?id=26715

6.Meyvə bağlarına qulluq// http://aqronom.blogspot.com/2015/02/meyv-baglarnaqulluq.html

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BIODIVERSITY OF GREATER CAUCASUS FOREST BIOGEOCENOSES SOILS

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Abstract

The aim of this work is to determine the biomass reserves, tree suitability potential of forest biogeocenoses, total phyto-geographical parameters of Sheki-Zagatala economic district. The study also provides a general characterization of chemical and bio-ecological properties of terrace soils developed on different soil-forming rocks in the mountainous zone of the Greater Caucasus. Since the southern part of the Greater Caucasus is the most important tourist area of Azerbaijan, modern soil research is very important for the development of the country. In root mass and in upper horizonts of soils bacteria groups are: firmicutes, bacteroidetes, actinobacterias, proteobacterias, chloroflexi, leotiomycetes, eurotimycetes, agaricomycetes, zygomycetes and others. Ascomycota, basidiomycota, mucoromycota, rozellomycota and other dominant groups of fungi were selected in root mass and in humus horizont. Relict plants of the following families were found: Woodsiaceae, Amaryllaceae, Asparagaaceae, Dryopteridaceae, Iridaceae, Liliaceae, Juncaceae, Apiceae, Asteraceae, Caryophyllaceae, Brassicaceae, Betulaceae, Campanulaceae, Caprifoliaceae, Lamiaceae, Paeoniaceae, Primulaceae, Ranunculacea, Rosaceae.

Keywords: Bacteria groups, forest ecosystems, microbial biomass, soil fertility

Introduction

Sheki-Zagatala economic region, considered one of the rich regions of the Azerbaijan Republic, is located in the northwest of Azerbaijan, on the southern slope of the Greater Caucasus. The economic district has limited soil resources. The large elevation difference in the area has led to a variety of natural conditions. The zone has moderate climatic conditions. The population lives mainly in the foothills.

Soil microbial biomass and trees play an important role in the cycling of substances in forest ecosystems, and are responsible for the decomposition of organic residues entering the soil, the formation of humus, and the transfer of greenhouse gases from soils to the atmosphere [1,2]. Due to the increasing interest in assessing the role of forests, the determination of microbial biomass stocks in the soils of forest ecosystems is of particular importance. At present, humankind has come close to a point beyond which further growth in the scale of economic activity, if based on the former consumerist approach to the use of soils and land resources, may jeopardize the foundations of life on the planet. The farming terraces in the mountain zone are extremely striking landscape features [2,3,5].

One of the world centers of terrace farming is the mountainous zones of the Greater Caucasus, which is a unique reserve of highly fertile erosion-resistant soils. Even do publications on the current state of terrace farming and data on terraces in different parts of the Caucasus are not provided. The centuries-old practice of continuous functioning of terraces shows the potential for agricultural use of soils without loss of fertility. In particular, for South China, there are data on several thousand years of cultivation of terrace soils. The age of terraced farming in South Arabia is assumed even greater, where the beginning of terraced farming dates back to the Early Bronze Age. There is a large number of works on irrigated terraces of the Middle East. They are characterized by alluvium inflow from the channels of temporary watercourses during the creation of terraces in the river valleys. For terraces in the Mediterranean region, data on the current dynamics of erosion damage and soil water regime are given. The effect of slope terracing as a way to increase soil moisture reserves is particularly emphasized. In mountainous natural-scientific study of soils of agricultural terraces has not been carried out on a large scale until recently. In recent years, work has been actively carried out to study the history of the emergence of terrace farming. The urgency of studying soils of ancient agricultural terraces of mountain landscapes is conditioned by their importance as the only main reserve of fertile soils in the southern regions of the Greater Caucasus in the territory of Azerbaijan.

Moving on to the description of soil properties different key areas, it is necessary to briefly characterize the general regularities of soil organization in the terrace body. Soil of any individual agricultural terrace could be divided into 4 zones: erosive or zone of agrogenic destruction of the soil-forming rock (the area of the rear seam of the terrace), transit-metamorphic (the central part of the terrace), accumulative (the front part of the terrace) and zone of deserption and soil crip (terrace edge). Soil properties in each zone differ significantly. In the erosion zone, the soil-forming rock material is plowed into the arable layer every year. As a rule, the soil here consists of relatively large fragments of soil-forming rock with a small proportion of fine grains (less than 10%). In the case where the soil-forming rocks are limestone deluvium, rather large stones enter the arable layer and are extracted and stockpiled at the field edges, forming large rock piles. It is noteworthy that in some cases the area of stone heaps is comparable or even exceeds the area of the field itself. All stones larger than 5-7 cm that hinder plowing are removed from the arable layer; smaller stones are evenly distributed throughout the entire arable layer. The erosion zone of the terrace is characterized by unfavorable conditions for plant cultivation. Soil fertility in this area is slightly improved due to the input of humus material with surface runoff from the slope of the overlying terrace. This zone is present in all soils except those developed on the outcrops of dense rocks. In this case, the rear seam area is often completely devoid of soil cover, and a soil layer is present only in the abutment part of the terrace. In the transit-metamorphic zone, there is active crushing of the primary eluvium of the soil-forming rock due to mechanical destruction by arable tools, physical and biological weathering, as well as accumulation of fine soils coming with surface runoff and wind material. In general, soils of the upper half of the terrace are characterized by gradual and regular change of all properties in anthropogenic-evolutionary series from agrolithozem to agrotemno humus soil.

Research Object and Materials

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Sheki-Zagatala economic region of the Azerbaijan Republic, is located in the north-west of Azerbaijan, on the southern slope of the Greater Caucasus. The objects of the study were the soils of agricultural terraces formed on different rocks: mixed deluvium of clays and sandstones; limestones; sandstones; and clay shales. Sample plots were laid out based on the predominant tree species and age groups. Soil sampling from humus horizons carried out at each site using the envelope method. A soil section was laid in the center of the site, from which samples were taken by genetic horizons. Plant and soil analyses in the field and in laboratory analyses were performed according to generally accepted laws in botany and in soil science [6,7,8].

Results and Discussion. Soil properties of agricultural terraces were determined by the nature of soil-forming rocks, as well as by the duration and intensity of anthropogenic activity. The more favorable for agricultural development were the initial soils, the longer and stronger anthropogenic transformation they were subjected to. This led to sharp changes in chemical properties and reduction of biological activity. The only exception is the increased activity of urease enzyme as a consequence of organic fertilizers application. In each terrace it is possible to distinguish a zone of agrogenic destruction of soil-forming rock (rear seam of the terrace), transit-metamorphic zone (the central part), accumulative zone (the front part) and zone of deserption and creep (terrace slope). When studying soil properties, important information can be obtained from the sections laid in the accumulative part of the accretionary part at some distance from the slope. To fully characterize the soil cover of a terrace, it is necessary to study the soil combination covering all three zones.

In terms of the total number of species, the flora of Azerbaijan is much richer than other regions of the Greater Caucasus. Plant species occurring in the Sheki and Oguz region account for 65% of the total number of plant species growing in the Republic of Azerbaijan [9,10].

As a result of the research it was established that in the territory of the region the morpho-structures determined the asymmetry of the landscape. Depending on the slope exposure, forest, forest-shrub plant complexes were formed. The richness of the flora and diversity of the vegetation cover of the study area is related to its physiographic and natural-historical conditions, as well as the complex history formed under the influence of remote floristic areas (fig. 1.a and b). The Azerbaijan Republic is also rich in relict plants, which could be found in all zones, especially in the south slope of Great Caucasus zone. Woodsia caucasica, Galanhus lagodechianus, Omithogalum magnum, Polystichum fominii, Crocus speciosus, Crocus adamii, Gagea germaniae, Lilum monodelphum, Poa iberica, Luzula abchasca, Heracleum asperum, Cicerbita deltoides, Hierasium macrolepis, Centaurea Transcaucasia, Cerastium holosteum, Dianthus fragrans, D. subulosus, Minuartia biebestenii, Eruca leptaphyllum, Betula raddeana, Campanula kolenatiana, C. sarmatica, Valeriana cardamines, Ballota gricea, Paeonia mlokosewitchii, Primula juliae, Hellorus causacica, Delphinium tomentellum, Cerasus pallasii, Rosa oxyodon, Primula juliae and others.

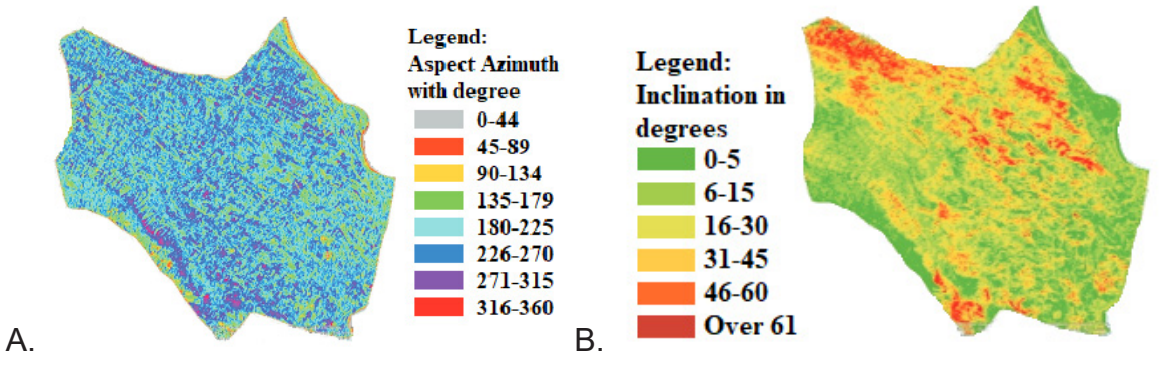
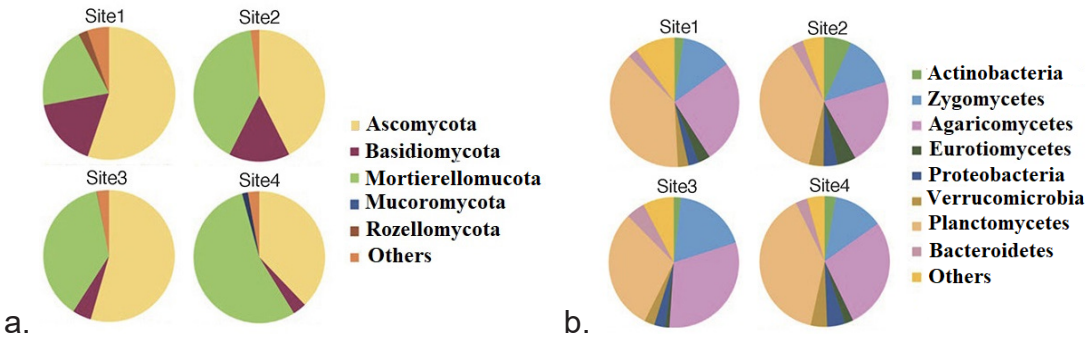


Fig 1. A. Aspect map and B. Slope map of the relief of the southern part of the Sheki and Oguz region in Azerbaijan Republic



Note: Site 1 - Sheki region; Site 2 - Zagatala region; Site 3 - Balakan region; Site 4 - Gabala region

Fig. 2. a. Composition of dominant fungi groups and b. dominant bacteria groups in different selected research areas of Sheki-Zagatala economic region

The main regions considered rich in wood resources and soil biomass (bacterial and fungal diversity in soil (0-50 cm) and in the root phytomass of trees) in Sheki, Zagatala, Balakan and Gabala were determined in different seasons of the year (fig. 3). The main regions considered rich in wood resources and soil biomass were identified. In these regions (Sheki, Zagatala, Balakan, Gabala) the total biomass was studied in different months for 2 years. The main factors of multi-year dynamics are soil organic matter accumulation, plant succession and pH change. The most long-term changes in soil microbial communities are associated with changes in bioclimatic conditions. It is obvious that soil biomass is subject to variability not only in space but also in spring, summer, autumn and winter (fig. 4).

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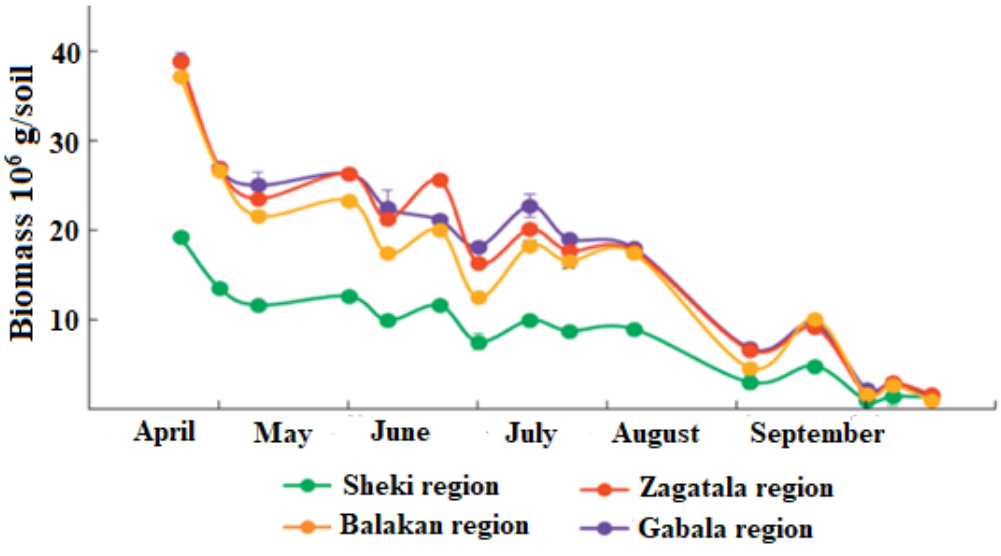


Fig. 3. Soil biomass in different seasons (2022-2023) of Sheki, Balakan, Zagatala, Gabala regions

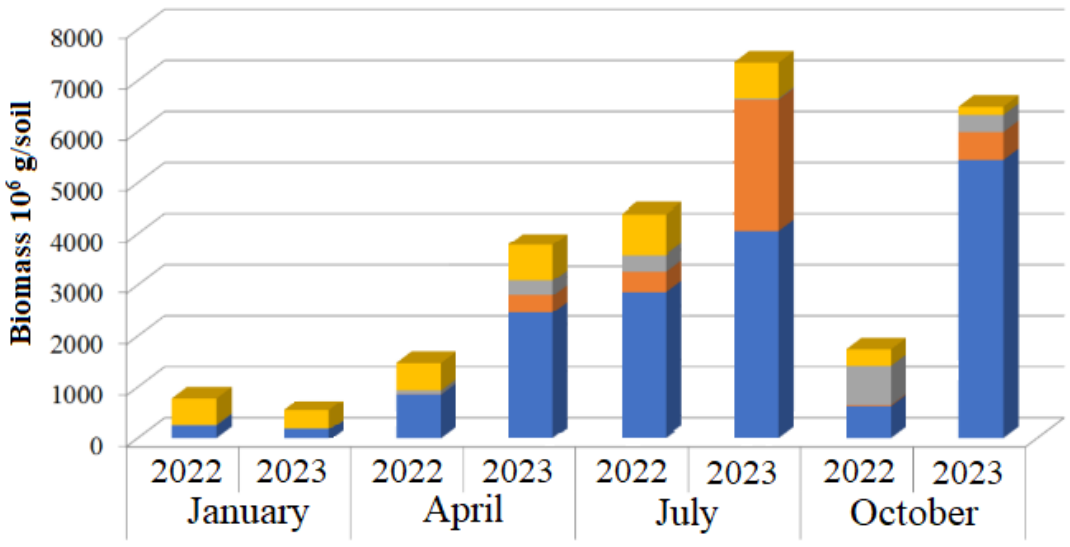


Fig. 4. Soil biomass in different times of Sheki-Zagatala economic regions (2022-2023)

Conclusion

Microbial biomass of forest soils is closely related to their rock composition [11]. The presence of a close relationship between microbial biomass and organic carbon content in humus horizons of soils was quite expected (r=0.54). Moreover, within one soil profile, the relationship between these properties was even more pronounced: the correlation coefficient for the studied sections ranged from 0.89 to 0.97. Down the profile, the content of humus and microbial biomass of soils naturally decreases. As a result of research it was established that the distribution areas and species composition of the main species of useful plants were formed as a result of zonality, endemism, ecological-biological and geographical conditions. In their morpho-anatomical, morpho-physiological, taxonomic characteristics, prevail permanent features peculiar to the species. The conducted phyto-geographical analysis shows that boreal 112 (41.48%), xerophilic 85 (31.49%) and Caucasian 24 (8.89%) elements (221 species, 81. 86%) prevail among the ranges of species used by the population.

Recommendation

This study is of crucial importance as Sheki-Zagatala economic region should promote agroforestry practices in new areas based on ecological assessment. The results obtained from the study will support the implementation of new projects related to ecotourism, planning and development in rural development/climate change/forestry/agroforestry/agriculture. The suitability of tree cover will support the planning and management of appropriate agroforestry models in border forest areas.

Conflict of interest

The authors declare that they have no conflict of interest in relation to this research, whether financial, personal, authorship or otherwise, that could affect the research and its results presented in this paper.

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References

1. World Terraced Landscapes: History, Environment, Quality of Life. Editors: Mauro Varotto, Luca Bonardi, Paolo Tarolli. Publisher: Springer International Publishing. 2019. 356 p. https://doi.org/10.1007/978-3-319-96815-5
2. The State of the World's Forests 2020. Forests, biodiversity and people. Book (series). Rome, Italy. FAO and UNEP publisher. 2019. 214 p. DOI: 10.4060/ca8642en https://www.fao.org/state-of-forests/en/
3. Pietsch D., Mabit L. Terrace soils in the Yemen Highlands: Using physical, chemical and radiometric data to assess their suitability for agriculture and their vulnerability to degradation // Geoderma. 2012. vol. 185. pp. 48–60. https://doi.org/10.1016/j.geoderma.2012.03.027
4. Ahmad F, Uddin MM, Goparaju L (2018) Agroforestry suitability mapping of India: geospatial approach based on FAO guidelines. Agrofor. Syst. https://doi.org/10.1007/s1045 7-018-0233-7
5. Kazeev K.Sh., Kolesnikov S.I. Biodiagnostics of soils: methodology and methods of research. Rostov-on-Don: Publishing house of the Southern Federal University, 2012. 260 c.
6. Solomon, J. (2014). Red list of the endemic plants of the Caucasus: Armenia, Azerbaijan, Gerogia, Iran, Russia, and Turkey /J. Solomon, T. Shulkina, G. Schatz – US: Missouri Botanical Garden Press. 451 p
7. Rowell, D. L. (1999). "Soil Science: Methods & Applications," 1st Edition. Longman Scientific & Technical; Wiley, Harlow publ. 1994. UK, London. 368 p. https://doi.org/10.4324/9781315844855
8. Zvyagintsev, D. G., Babieva, I. P., Zenova, G. M. (2005). Soil Biology. Moscow State University. 445.
9. Huseynova, S. M., Ismayilov, A. I., Babayev, M. P., Jafarov, A. M. (2024). Taxonomic attribution of the haplic gleysols of the Azerbaijan Republic in world reference base for soil resources, International Journal of Advances in Applied Sciences (IJAAS), vol. 13, no. 1, 116-122. ISSN: 2252-8814, https://doi.org/10.11591/ijaas.v13.i1.pp116-122 https://ijaas.iaescore.com/index.php/IJAAS/article/view/20948
10. Hasanova, T. A. (2023). Numbers of earthworm communities in agroecosystem of gray-brown soils of the Greater Caucasus. VI International Scientific and Practical Conference "Healthy Soils - Guarantee of Sustainable Development" dedicated to the 140th anniversary of the establishment of soil science as a science and the publication of fundamental scientific work of V.V. Dokuchaev "Russian Chernozem". Dokuchaev "Russian Chernozem", Kursk State University, Kursk, March 30-31, 6-8
11. Hasanova, T. A., Asgarova, G. F. (2021). Phytomass of Gray-brown Soils Forming in Arid Ecosystem of Azerbaijan, Bulletin of Science and Practice Scientific Journal. Publishing Center Science and Practice. vol. 7, no. 9. 110-115, Nizhnevartovsk, Russia, 2021, https://doi.org/10.33619/2414-2948/70

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IMPACT OF CLIMATE CHANGE ON THE ECOLOGICAL SITUATION OF WATER RESOURCES OF THE REPUBLIC OF AZERBAIJAN

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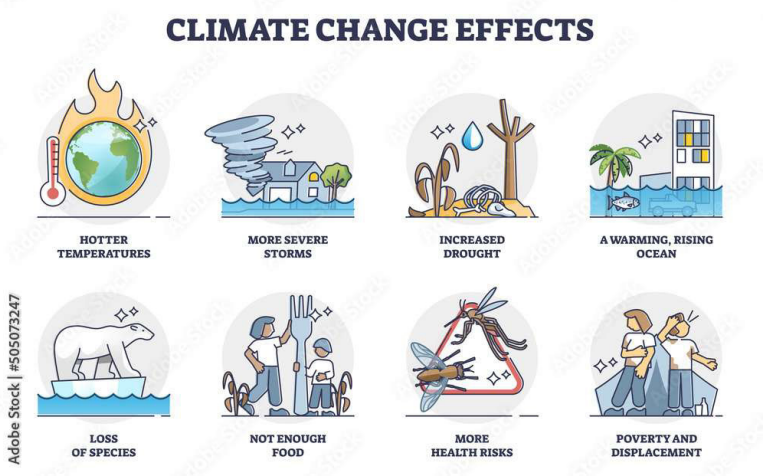
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Abstract

Climate change is having a negative impact on global water resources due to rising temperatures and the uneven distribution of atmospheric precipitation. These processes lead to the reduction of glaciers and snow cover, as well as the depletion of river and groundwater resources worldwide. As a result, water scarcity and the reduction of agricultural land occur, which ultimately increases the frequency of droughts. Azerbaijan is among the countries affected by this issue, as it has some of the most limited water resources in the South Caucasus, with a signi cant portion of surface water originating from neighboring countries. It is expected that by 2100, water resources in the country could decrease by up to 40%. In recent years, the water level in the Mingachevir reservoir has decreased by 50%, and drought occurrences have become more frequent. To address these challenges, protecting water bodies, ef cient water use, and strengthening international cooperation are essential. Collecting rainwater and reusing water can contribute to these efforts. In Azerbaijan, particularly in the Karabakh region, several projects are being implemented, such as utilizing rainwater and developing water systems in Fuzuli and Aghdam cities. These measures are crucial for optimizing water use and protecting resources.

Keywords: Climate Change, Water Resources, Ecological Status, Groundwater, Surface Water

Introduction: The rise in global temperatures and the uneven distribution of atmospheric precipitation are affecting both underground and surface water resources. Climate change has also led to the reduction of glaciers and snow cover worldwide. According to *National Geographic*, in 1910, there were 150 glaciers in the state of Montana, USA, but by 2007, only 27 remained. (Smith et al.., 2020). The reduction in glaciers and snow cover is a primary cause of the decrease in river and groundwater resources. As a result, many regions around the world are facing drinking water shortages, decreasing agricultural land, and an increasing risk of droughts. Water scarcity directly impacts food security, and if these trends continue, humanity will inevitably face major problems.Climate change refers to long-term changes in global average temperatures and weather patterns. Speci cally, it encompasses global warming driven by the emission of greenhouse gases due to human activities, as well as the large-scale changes in weather models that result from it.



Picture.1 (National Climate Data Center 2021).

Problem Statement:

Global climate change has led to disruptions in hydrological regimes, directly affecting the quantity and quality of water resources. However, there is no speci c methodology or formula to predict changes in water resources, particularly for forecasting increases or decreases in water availability. Therefore, there is a pressing need to develop accurate prediction models for water resources management.

Research Objectives:

The aim of this study is to develop a methodology for predicting the impact of climate change on water resources in Azerbaijan, with a particular focus on forecasting the changes in the country s groundwater and surface water resources over the short, medium, and long term.

Signi cance:

This research will help to understand the effects of climate change on water resources in Azerbaijan and provide essential tools for managing the country s water resources. The study will also emphasize the importance of sustainable water use and conservation strategies, which will be critical as the country faces increasing water scarcity in the future.

Research Object and Materials

This study focuses on Azerbaijan s surface and groundwater resources, which are critical for agricultural production, drinking water supply, and maintaining ecological balance in the region.

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The data for this study has been primarily gathered from of cial reports of Azerbaijan s Ministry of Ecology and Natural Resources, including statistics on water levels in major reservoirs, rainfall data, and river ow rates. Hydrological models and climate forecasts were also used to predict the future status of water resources in the country. The research primarily focuses on the water resources of Azerbaijan, particularly major rivers like the Kura and Araz, as well as the Mingachevir reservoir, and also investigates both local and transboundary water sources.



Picture 2. Aras River



Picture 3. Kura River

Results and Discussion

The study indicates that by 2100, Azerbaijan s water resources are expected to decrease by 40%. This reduction is mainly due to climate change and decreased in ows from transboundary rivers. In the last ve years, the water levels in the Mingachevir reservoir have decreased by 50%. Additionally, the country has been experiencing more frequent droughts, largely due to reduced rainfall and lower water ows from neighboring countries. (Mammadov, R. 2020)

These ndings highlight the increasing threat of water scarcity in Azerbaijan, exacerbated by climate change. The reduced availability of water resources is leading to heightened competition for water, especially between agricultural and urban sectors. The depletion of local water sources, combined with the reliance on transboundary rivers, underscores the need for sustainable water management practices and international cooperation in managing shared water resources.

Comparison with Previous Research:

Previous studies have recognized the general trend of declining water resources in the region due to climate change. However, this study speci cally emphasizes the role of reduced transboundary water ows as a signi cant factor contributing to Azerbaijan s water scarcity, which has been less explored in earlier research.

Implications:

The ndings underscore the need for ef cient water use, equitable distribution, and the protection of water resources from pollution. Azerbaijan must implement sustainable water management practices and enhance cooperation with neighboring countries to address these challenges. (Aliyev, M. 2022).

Conclusion

Summarize Key Findings: The study reveals that climate change will signi cantly reduce Azerbaijan s water resources, with a projected 40% reduction by 2100. The depletion of surface water and the increasing frequency of droughts are major challenges that need to be addressed.

Answer Research Questions/Objectives: The research con rms that Azerbaijan s water resources are highly vulnerable to climate change, and future water management strategies must prioritize ef cient water use, conservation, and equitable distribution.

Practical Implications: The ndings suggest that Azerbaijan should invest in rainwater harvesting systems, improve water infrastructure, and promote water-saving technologies in agriculture. These measures will help mitigate the impact of water scarcity and ensure the sustainable use of water resources.

Future Research: Future studies should focus on developing more accurate forecasting models for water resource availability and exploring alternative water sources, such as desalination, to reduce the impacts of water scarcity.

Closing Statement: Overall, this study contributes to a better understanding of how climate change impacts water resources in Azerbaijan and emphasizes the need for urgent action to protect the country s water supply for future generations.

Acknowledgment

This comprehensive scienti c research aims to provide a detailed understanding of the impact of climate change on Azerbaijan s water resources, particularly in the Karabakh region. The study emphasizes the importance of effective water management and international cooperation to address the growing issue of water scarcity in the region.

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References

1. Mammadov, R. (2020). The impact of climate change on Azerbaijan. Institute of Ecology and Natural Resources.
2. Mammadov, A. (2019). Climate change and its impact on agriculture in Azerbaijan. Azerbaijan Natural Resources and Energy Strategy (pp. 45-59). Baku: Az rkitab Publishing House.
3. Azerbaijan National Academy of Sciences. (2018). Azerbaijan s natural resources and their management. Institute of Ecology and Natural Resources.
4. Mammadov, R., & Aliyev, H. (2021). Azerbaijan s water resources and the impact of climate change on these resources. Azerbaijan s Ecological Problems, 15(2), 98-112.
5. Aliyev, M. (2022). Crisis ecological processes and climate change in Azerbaijan. Azerbaijan Ecology and Resource Management, 18(3), 205-219.
6. Smith, J. A., & Green, R. B. (2020). Climate Change and Agriculture: A Global Perspective. Cambridge University Press.
7. Johnson, M. T., & Lee, K. R. (2019). Effects of temperature variability on crop yield. Journal of Agricultural Science, 12(3), 145-158. https://doi.org/10.1002/jas.2020.00344
8. National Climate Data Center. (2021). Climate trends in agriculture. NOAA. https://www.noaa.gov/climate/agriculture

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THE INFLUENCE OF ENVIRONMENTAL CONDITIONS ON THE DIAGNOSTIC PARAMETERS OF ALLUVIAL-MEADOW-FOREST SOILS IN THE GANIKH-AGRICHAY VALLEY OF AZERBAIJAN

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Abstract

This study (2021-2023) characterizes the ecological features of soil-forming and improved nomenclature of alluvial-meadow-forest soils in the ood plains of subtropical forest-shrubby zone within Azerbaijan. In climatic terms, the Ganikh-Agrichay valley has typical transitional features between the forest (southern slope of the Greater Caucasus) and steppe (Shirak steppe plateau) zones, where the annual precipitation (625-800mm) is equal to evaporation. The average annual air temperature is 12.1-13.20 C. The weighted deposits contain a considerable amount of humus (1.2-1.8%) and its water-soluble part, total nitrogen (0.09-0.13%) which affect signi cantly morphogenetical diagnostics of above-described soils. The spatial thickness of decomposed-accumulative layer (AU=25-30sm), content of humus (4.5-7.3%), total nitrogen (0.23-0.31%), base saturation 21.4-25.7mmol-ekv), pH(6.6-7.3), granulometric composition (<0,01mm=39,5-47,8%), density (1.12-1.35 g/cm ^3) of strati ed and typical suborders of alluvial-meadow-forest soils. The status of humus content is characterized by a high activity , in which humic acid (15.3-20.8%) and fulvic acid (16.2-22.5%) dominates importantly while the third fraction riches to 1.23-2.30% in selective-group content. The ratio of Ch.a.:Cf.a.reaches 0.88-0.93 in leached soil pro le (5.8-6.0) while reaching 1.19-1.32 in carbonated soils (7.3-7.5).

Keywords: alluvial soils, humus, soil diagnostics, fractional composition of humus, granulometric composition

Introduction

As noted in J.Berhal, the importance of river valleys for the development of agriculture in the ancient East has long been known. Primarily, emergence of agricultural development was limited to areas with favorable soil moisture regime and high fertility where accommodate alluvial soils, particularly in oodplains [6].

G.V.Dobrovolsky [9] highly substantiatedtheoretical importance of studying alluvial soils that occurred in oodplains particularly pointing out signi cant variabilities in space and time. In the oodplains, soil forming processes are newly manifested in the adjacent territories to the river bed(local shallow pools where optimal condition for herbaceous vegetation exist) while territories released from ood regime are characterized mainly zonal indications of soil forming.

The morphogenetic diagnostics and ameliorative characters, of the irrigative soils that spread widely in the river valleys of the subtropics and semidesert zones in Azerbaijan possessing an ancient farming culture have been comprehensively learnt [1.5.8.9].

Our comparative geographic studies and their detailed mapping made it possible to signi cantly re ne the structure of the soil cover, classi cation position and nomenclature of the alluvial-meadow-forest soils of Azerbaijan, including the oodplain strip of the Kur river, and stop in more detail on their morphogenetic diagnostics. Irrigated variants of these soils were identi ed as an independent type [2,3.7.11].

Research Object and Methodology

The Ganykh-Agrichai valley with an area of more than 200 thousand hectares geomorphologically consists of cones of the out ow of large mountain rivers (Belokanchai, Katekhchai, Talachai, Kurmukhchai, Shinchai, etc.) of the southern slope of the Greater Caucasus. In the object of study, signi cant areas are also occupied by oodplain low (0.5-6.0 m) and high terraces (10-24 m) of the Ganykh and Agrichai districts. Climatically, the Ganykh-Agrichai valley has typical transitional features between the forest (southern slope of the Greater Caucasus) and steppe (Shirak steppe plateau) zones, where the annual precipitation (625-800mm) is equal to evaporation. The average annual air temperature is 12.1-13.2^{0}C. The vegetation cover is represented by lowland forests with a predominance of white-leaved poplar, oak, hornbeam, willow, mulberry, shrub and with an abundance of lianas. Meadow and meadow-marsh vegetation is widespread among lowland forests.

The complexity of soil formation conditions and the extreme diversity of the soil cover of the alluvial plains require detailed soil studies. Therefore, the key site methods were used in eld soil work. At the research site, 2 characteristic plots with an area of 10 hectares were selected, each of which contains more than 10 soil sections at a depth of 1.0-1.5 m

Results and Discussions

Alluvial meadow-forest soils are mainly distributed in the marginal parts of the cones of the out ow of the mountain rivers of the Ganykh-Agrichay valley and are formed in combination with meadow-marsh soils. Humus-accumulative horizons (AUv+AU=25-30cm) of the described soils are characterized by a dark (in a wet state - black) color, a signi cant humus content (5.4-7.6%) and a lumpy granular structure. The amount of total nitrogen in the mountains. AU is 0.26-0.31%. The C:N ratio is in the range of 9.8-14.3, which is explained by the relatively weak degree of decomposition of organic residues in the soil. The sum of the exchange bases is quite high and amounts to 23.8-27.5 mmol-eq. The composition of the exchange bases is dominated by calcium. The soil pro le is leached from carbonates to 1.2-1.5 m. The granulometric composition of the described soils is clay. The amount of physical clay (<0.01mm) in the upper part of the pro le ranges from 38.8 to 47.5 %, and silty particles (<0.001mm) make up 9.6-13.4%.

The results of routine observations show that during the rainy period (may), the turbidity of river and irrigation waters increases signi cantly (4.27-9.20 g/l), in summer (july), due to a decrease in precipitation in mountainous areas, it decreases sharply (0.40-1.02 g/l). It is known that the physico-chemical parameters of suspended sediments signi cantly affect the morphogenetic data of irrigated soils, since they are

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quite rich in humus (1.5-1.8%) and its water-soluble parts (0.049-0.053%), gross nitrogen (0.03-0.05%)

Alluvial-meadow-forest irrigated soils differ signi cantly from virgin subtypes in terms of soil formation and morphological and diagnostic features. As a result of long-term irrigation with turbid mountain river waters, a suf ciently humusized (3.0-4.3%) and powerful accumulative layer (AU a=50-60cm) was formed in them, characterized by a dark grayish olive shade, lumpy-dusty structure; signs of agroirrigation sediment are distinguished. The granulometric composition of irrigated soils exposed to the above turbid river waters for a long time is heavier than forest soils. A common feature of irrigated alluvial-meadow-forest soils is a signi cant gleying of the middle parts of the soil pro le, where the amount of physical clay (<0.01 mm) reaches up to 57.5-61.2%. A sharp increase is observed in the content of silty particles (<0.001mm=28.2-32.3%).

Tabl 1. Diagnostics parametric of alluvial-meadow-forest soils in the oodplain Ganik-Agrichay valey of Azerbaijan

	Horizon, cm					Water	Soil		
Alluvial-meadow-forest									
106	AO 0-2	Ground litter							
	AU' 2-16	7,55	0,31		No	6,7	27,5	13,4	47,5
	AU» 16-32	6,00	0,27		"--"	7,0	25,4	11,0	42,8
	B/C 32-54	1,70	0,09		"--"	7,2	23,2	11,8	38,6
	AU^{h}_{g} 54-85	2,34	to as.	--	"--"	7,3	21,4	4,1	22,8
	Cg 85-120	1,29	"--"	--	"--"	7,2	13,8	8,0	35,6
108	AO 0-2	Ground litter							
	AU 2-13	5,35	0,26		No	6,6	23,8	9,6	39,8
	A/B 13-28	2,56	0,15		"--"	6,9	21,3	10,6	32,5
	B/C 28-65	1,22	to as.	--	"--"	7,1	15,7	7,5	26,8
	AU^{h}_{g} 65-92	2,14	"--"	--	"--"	7,3	22,5	16,8	42,5
	Cg 92-130	0,97	"--"	--	"--"	7,3	16,7	10,9	31,4
Irrigated alluvial-meadow-forest									
109	AU'a 0-25	4,25	0,36		No	7,3	32,0		
		2,97	0,20		"--"	7,3	29,5		
	A/B 46-70	1,89	0,14		"--"	7,5	23,8		
	Bg70-95	0,98	to as.	-	"--"	7,5	20,4		
	B / Cgca95-124	0,74	"--"	-	2,6	7,8	23,8		
		0,56	"--"	-	3,7	7,9	24,9		
112	AU' 0-23	4,40	0,27		No	7,1	28,9	22,7	57,5
	AU» 23-42	3,32	0,21		"--"	7,3	25,3	28,2	60,2
	A/B 42-68	2,43	0,10		"--"	7,4	23,2	25,6	50,8
	B/Cg 68-90	0,89	to as.	-	"--"	7,5	14,6	10,4	36,7
	AU^{h}_{g} 90-118	2,25	"--"	-	"--"	7,3	25,4	25,4	58,8
	Cg 118-150	0,61	"--"	-	"--"	7,6	11,2	8,2	33,7

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Table 2 Chemical parameters of suspended sediments of river waters of Kanikh-Agrichay valley Azerbaijan

Where the sample was taken	Turbidity, g/l		Humus, %	Water-soluble humus, %	Nitrogen, %	$CaCO_3$,%	pH in aqueous solution
	May	**July**					
Mazımçay	2,936	0,136	1,52	0,042	0,115	No	7,3
Balakənçay	4,273	0,454	1,18	0,038	0,098	«--»	7,5
Qatexçay	5,056	0,372	1,45	0,035	0,103	«--»	7,7
Talaçay	7,148	0,634	1,62	0,043	0,113	«--»	7,5
Gürmüxçay	9,205	1,023	1,84	0,051	0,128	«--»	7,6
Qanıxçay	6,972	0,567	0,95	0,029	0,091	3,4	7,9
Əyriçay	7,861	0,567	1,02	0,034	0,112	4,1	7,9

The fractional group composition of humus is signi cantly dominated by the rst fraction of humic acids (15.3-20.8%) and fulvic acids (10.5-18.0%). Attention is drawn to the very low content of the third fraction, both humic (2.0-3.1%) and, especially, fulvic acids (1.2-3.0%). The amount of both humic (22.2-26.5%) and fulvic acids (20.5-24.8%) in terms of carbon in alluvial meadow dark soils is very signi cant. In alluvial-meadow-forest soils, the ratio of $C_{h.a}$:$C_{f.a}$ is greater than one, in mountains. The AU of the analyzed samples is 0.88-0.93.

In irrigated soils, there is a noticeable increase in the content of humic acids (31.7-35.8%) in the composition of humus, the ratio of $C_{h.a}$: $C_{f.a}$ increases to 1.19-1.32. It should be noted that the increase in the proportion of humic acids in the composition of humus during cultivation occurs mainly due to the second fraction, which is mainly associated with calcium and mobile forms of R_20_3. The humin content in irrigated soils also increases signi cantly (43.6-52.3 %).

Conclusion

The main genetic features and diagnostic indicators of virgin and irrigated variants of alluvial meadow-forest soils of the Ganykh-Agrichai valley of Azerbaijan have been determined. The humus state of alluvial meadow soils is characterized by signi cant mobility, where the rst fraction dominates in terms of the fractional composition of both humic acids and fulvic acids.

References

1. Babayev M.P., Həsənov V.H, Cəfərova Ç.M., Hüseynova S.M. Azərbaycan torpaqlarının morfogenetik diaqnostikası, nomenklaturası və təsnifatı, “Elm”, Bakı, 2011, 448 s.

2. Əliyev H.Ə. Böyük Qafqazın şimal-şərq hissəsinin meşə və meşə-bozqır torpaqları. // Azərb. SSR EA-nın nəş-tı, Bakı, 1964,264 s.

3. Həsənov V.H. Azərbaycanın allüvial-hidromorf torpaqlarının morfogenetik diaqnostikası, təsnifatı və qleyləşmə prosesinin subtropik xüsusiyyərləri. Bakı, Elm, 2021, 410 s.

4. Həsənov V.H. Azərbaycanın çay subasarlarında zəif inkişaf etmiş ibtidai allüvial- çəmən-meşə torpaqların morfogenetik diaqnostikası. Əkinçilik Elmi Tədqiqat İnstitunun elmi əsərlər toplusu XXVIII cild, Bakı, 2017, s. 386-392.

5. İsmayılov B.N. Quba-Xaçmaz massivinin allüvial-çəmən-meşə torpaqlarında suvarmanın torpaq proseslərinin dinamikasına təsiri. // AMEA Torpaqşünaslıq və Aqrokimya İnstitutunun əsər. XVIII cild, “Elm”, Bakı, 2009, s.101-110.

6. Бернал Дж. Наука и история общество. Изд. иност. литер., М.,1956, 367 с.

7. Гасанов В.Г, Исмаилов Б.Н. Морфогенетическая диагностика и номенклатура аллювиально-луговых почв Ганых-Агричайской долины // Вестник Рязанского Государст-венного Агротехнологического Университета, Рязань, 2016, № 2 (30), с.12-18.

8. Гасанов В.Г, Исмаилов Б.Н. Влияние орошение на морфогенетические показатели аллю-виально-лугово-лесных почв Куба-Хачмазского массива Азербайджана. Сибирский Вестник сельскохозяйственных наук, Новосибирск, 2017, том 47, №2,с. 105-113.

9. Добровольский Г.В. Почвы речных пойм центра Русской равнины. Изд МГУ, Москва, 1968, 296 с.

10. Ковда В.А. Основы учения о почвах. Наука,М.,1973, кн.2, 467 с.

11 Hasanov V.H. Genetical features and diagnostics of alluvial-meadow soils, In the floodplains of Azerbaican. Russian Agricultural Sciens, 2018, 43, № 1, pp. 68-74

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EFFECT OF FERTILIZERS AND ORGANIC-MINERAL COMPLEXES ON THE QUALITY INDICATORS OF AGRICULTURAL PLANTS

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Abstract

As we know, while ensuring the independence and sovereignty of our republic, in the last 15 years, the State has prepared road maps of the State Programs in different areas, taking into account the years 2025-2040, and ensured the implementation of them by various groups. One of these programs is the issue of safe recycling and disposal of waste generated in industry, household, agriculture, production and service areas in order to protect human health and environmental safety, as well as improving the well-being of the population. is one of the factors that ensure economic ef ciency.

The presented research work is a contribution to the improvement of the ecological environment within the framework of the mentioned State Programs, as well as the fertilization of the soil in the agricultural elds and the provision of plants with cheap organic fertilizers. Application of the product obtained as a result of research as fertilizer in agriculture and study of ecological effects. In addition, it is necessary to reduce the costs of incineration and removal of waste, and at the same time to achieve the production of cheaper organic fertilizers, to create an incentive in the activity of entrepreneurial subjects in agriculture, and to ensure the improvement of the environmental condition of the environment. In uence of the organic-mineral complexes of fertilizers on soil fertility and the quality indicators of agricultural plant crops in different soil and climate conditions of Azerbaijan has been studied.

Keywords: organic fertilizers, mineral fertilizers, acidity, cotton ber, nitrate, starch, sugar content, vitri cation, gluten

Introduction

With the increase in population, the scale of industrial activity increases, which makes the issue of optimizing the interaction between man and nature urgent. At the same time, improving the environment and human health are of great importance to society. The ever-increasing human population in the world highlights the issue of more ef cient use of available land and plant resources. Apart from the creation of productive agricultural plant varieties, the application of organic mineral fertilizers has a special place in solving this issue. At present, a very high part of the agricultural products produced in the eld of plant growing in the world is obtained as a result of the application of organic and mineral fertilizers. From this point of view, it is important to study important issues such as preserving soil fertility at the same time for the effect of fertilizers on plant productivity and product quality. The growing human population, growing settlements, and the by-products of anthropogenic activities (waste) also increase. Using these side (waste) products as fertilizer and developing technologies for this purpose is one of the priority issues of today. One of the waste products is sewage. During its cleaning, sediment (sludge) is formed. Both the volume and toxicity of sludge, resulting from the growth of cities and the intensi cation of industrial production, naturally increase. In European countries, about 25-30 kg of dry sediment is formed per person per year.

Using of organic waste as fertilizer will signi cantly reduce the mineral fertilizer rates applied in agriculture, which will have a positive effect on the ecology, which is a problem of the modern era, and can be economically bene cial to farms. Application of new technologies to the soil, and the application of organic mineral complex and ef cient fertilizer norms, which affect the productivity and quality of plants, is an urgent issue and is of great theoretical and practical importance. It has been proven by the conducted researches that in our republic there are 40 and 22 million tons of different waste materials that can be used as organic fertilizers. These wastes are collected every year in different places (public places, agricultural elds, abandoned places on roadsides) and cause the environment to ourish. [6.14] There is no single rational and ecologically safe, currently proven technology for sludge disposal in our republic, and its appearance is unlikely to be created in the near future, because the sediments of different treatment plants have different physico-chemical and biological properties, as well as completely different qualitative and quantitative elemental composition. Cleaning and disposal of such sediments (sludge) is a serious environmental problem. The main principles of its solution are: a set of ecological and economic interests of society, ecologically safe disposal and use of sludge, its involvement in the economic cycle. The problem of using waste for fertilizer has various aspects and is inseparable from the problem of soil fertility and ecology.

Research Object and Materials

Field work in irrigated grass-gray soils in Azadkend village of Saatli region in Mugan-Salyan region by applying organic-mineral complexes with cotton plant variety Ba-440 White gold in 7 variants and 4 repetitions, with sugar beet plant in Shirinbey village of Saatli region in Mugan-Salyan region. It was carried out in 4 repetitions and 8 variants with the NZ (high yield - high sugar) Porto na KWS variety of sugar beet plant produced in Turkey on irrigated jamen-grey soils in the area.

It was conducted with potato plant in the irrigated light gray brown (light chestnut) soil of Ziyadl village, Samukh district, Ganja-Gazakh region. The study was conducted in 4 repetitions, 10 variants, and the potato variety Arinda was used as experimental material.

Research methodology

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Field studies were conducted in accordance with accepted agricultural practices.

Ammonium salt (33.4%), phosphorus-amaphos (51%), potassium-potassium sulfate (52%) and organic-mineral complexes were used as nitrogen fertilizers. Agrochemical analyzes of the soil: total nitrogen I.V. Tyurin, Absorbed ammonia (N-NH4) - D.P. Konev, nitrate nitrogen (N-NO3) Grandval-Liage, total phosphorus - A.M. Mesheryakov, free phosphorus - M.P. Machigin, total potassium - P.K. Smith , determined by exchangeable potassium-P.V. Protosovusul.

Phenological observations (height of the main stem, number of bolls per bush and mass of raw cotton per boll) were not carried out on the cotton plant. During the observations, 20 plants were marked for each variant, and all observations were made on these plants using the method of Dospexov (1973).

Biometric measurements were carried out (bush budding, owering and cone formation).

Analysis and Discussion

The correct application of organic and mineral fertilizers under agricultural crops such as potato, sugar beet and cotton is of great importance in increasing the productivity of the soil, as well as in increasing the quality and quantity of the product. Since the nutrient requirements of each of these plants are different, the application of fertilizers should be carried out based on certain rules and speci c requirements.[1]

Potatoes require a lot of nitrogen, phosphorus and potassium for high productivity, which can be met by applying organic fertilizers and compost at the same time. In addition to improving the soil structure in the early stages of potato development, manure also increases the activity of soil microorganisms. Nitrogen from mineral fertilizers stimulates the vegetative development of the crop, phosphorus strengthens the root system, and potassium increases the accumulation of starch, increasing the resistance of the plant to diseases.

Potato is an agricultural plant that is widespread in the world and has great importance in terms of human nutrition. Potatoes are called the second quarter due to the nutrients and taste.

In some years, when a plant is given a high dose of fertilizer, the development of the above-ground mass is accelerated and the process of plant maturation is delayed, as a result, at the time of harvest, the potato tubers are not mature and contain a small amount of starch [11].

The authors [10, 12] determined in their research the positive effect of phosphorus and potassium fertilizers on the accumulation of starch in potato stulas.

Providing microfertilizers against the background of mineral fertilizers further improves the quality of the product, makes the plant resistant to root rot and other diseases. [3, 9]

Our republic has favorable soil and climate conditions for growing this valuable plant and obtaining high sugar content. Currently, in order to satisfy the population s demand for sugar, the need to cultivate sugar beet in the industrial direction has emerged. [7].

The biological properties of sugar beet have been studied by many scientists. [2.7].

Table 1Effect on the quality of potato tubers on light gray-brown (light chestnut) soils of different norms and proportions of fertilizers (starch in %) (Samukh region, Ziyadl village, Arinda variety) 2023

№	Variants	Special weight	Starch, %
1	**Control (free fertilizer)**	1,109	20,1
2	**N60P60K60**	1,112	20,7
3	**N60P60K90**	1,114	21,1
4	**N60P60K120**	1,117	21,8
5	**N90P90K60**	1,115	21,4
6	**N90P90K90**	1,118	22,0
7	**N90P90K120- fon**	1,120	22,5
8	**Fon + $Mn_{1,5}$ +$B_{1,5}$**	1,121	22,7
9	**Fon + Mn_3 +B_3**	1,123	23,1
10	Fon + Mn_5 +B_5	1,125	23,5

All rates and rates of fertilizers tested in our experiment have improved the quality of the potato crop. As can be seen from Table 1, the highest quality indicator of the potato variety Arinda is noticeable in the variant applied N90P90K120+Mn5+B5. Here, the amount of starch

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was 23.5%. In the control (without fertilizer) version, the amount of starch was 20.1%. It can be concluded that in the N90P90K120+Mn5+B5 applied version, the increase was 3.4% compared to the control, and 1% compared to the background.

Sugar beet is a sensitive plant to fertilizers. It is important to apply the correct fertilization system to obtain a product with a high sugar content. Manure or green manures from organic fertilizers during cultivation create conditions for food supply in the initial stages of sugar beet. Phosphorus from mineral fertilizers plays an important role in increasing the amount of sugar, nitrogen helps the formation of vegetative mass, but too much nitrogen can reduce the amount of sugar.

Sugars in the plant body are represented by glucose, fructose, maltose, sucrose. Sugar beet contains 13-22% of sugar. 12-15 grams per 100 grams of beets or 12-15 kg of pure sugar are obtained from 100 kg of sugar beets. [13].

Table 2. Effect of fertilizers on the amount of sugar in the sugar beet root and fruit crop, (Shirinbey village, Saatli district, Porto na KWS variety) (s/ha, 2023)

№	Variants	Repetition					Average product, cen/ha	Harvesting sugar, cen/ha	Increase	
		I	II	III	IV	Average sugar %			cen/ha	%
1	Control (free fertilizer)	16.2	15.4	16.6	15.0	15.8	231.0	36.50	-	-
2	N60P90K90	17.9	18.2	17.7	17.4	17.8	272.5	48.50	12.00	32.88
3	N90P90K120	18.4	18.1	17.8	20.1	18.6	320.5	59.61	23.11	63.31
4	N120P90K150	19.6	19.8	19.2	19.0	19.4	351.5	68.19	31.69	86.82
5	N120P90K120+B_3	20.2	20.8	19.6	18.6	19.8	364.0	72.07	35.57	97.45
6	N120P90K120+$Mn_{1.5}$	19.8	20.0	19.0	19.6	19.6	359.5	70.46	33.96	93.04
7	N120P90K120+ $B_{3,+}Mn_{1.5}$	20.0	19.8	20.0	20.2	20.0	374.5	74.90	38.40	105.2
8	H120П90K150+ $B_{3,+}Mn_{1.5}$	20.8	21.0	20.4	20.2	20.6	386.0	79.52	43.02	117.86

All rates and rates of fertilizers tested in our experiment improved the quality of the sugar beet crop. Thus, the highest sugar content and sugar accumulation is noticeable in the variant applied N120P90 150+B3,+Mn1.5. During the research carried out in the Shirinbey village of Saatli district, the sugar level in this version compared to the control is 20.6%; and sugar harvest was 79.52 s/ha, compared to the background sugar content was 1.2%, sugar harvest was 11.33 sen/ha. Thus, as a result of the conducted research, the highest quality indicators of sugar beet were recorded in the variant applied N120P90K150+B3,+Mn1.5 (table 2).

Cotton-Balanced use of nitrogen, phosphorus and potassium is important for cotton growth. As organic fertilizers, composted manure and green manure play a major role in improving soil structure while stimulating the early development of cotton. [4] Nitrogen from mineral fertilizers promotes healthy vegetative growth. Phosphorus plays a role in the formation of generative organs (owers and seeds), and potassium improves the ber quality of cotton. [8]

In general, organic fertilizers play an important role in increasing the effect of mineral fertilizers by improving the structure of the soil. [5, 13]. In addition, the quality of fruits and seeds can be increased as a result of the application of the fertilization system suitable for plants. At the same time, as a result of the correct application of fertilizers, it is possible to maintain the long-term productivity of the soil. Potassium and other trace elements increase the resistance of plants to diseases and pests. The rate and time of correct application of fertilizers should be determined according to the type of plant, soil characteristics and climatic conditions. Properly balanced fertilization both preserves ecological sustainability and provides economic bene ts.

Natural minerals of non-ore origin widely distributed in Azerbaijan (mainly from volcanic mud and igneous shale), waste of various purposes, etc. the expansion of the country s potassium-phosphorus-nitrogen fertilizer raw material base, including the fertilization of unusable lands, thereby improving the ecological environment, is the main goal of multidisciplinary research. Preparation of complex fertilizer by identifying areas of volcanic breccia and igneous shale with rich mineralogical, elemental and organic-chemical content, as well as performing analytical studies (chemical, radioactive, microbiological, etc.) of household, industrial waste and other intended products as additional material to be used. technology (as well as semi-industrial equipment), as well as the relevant farm operating under the Ministry of Agriculture of the Republic of Azerbaijan of the organic-mineral complex to be purchased It is very important to solve application-oriented scienti cally based issues, such as applying different soil-related options in the elds related to the subjects and determining their impact on the water-physical

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properties of the soil, as well as on the nutritional regime, development, and productivity of plants.

The organization of the collection of this waste, as organic fertilizer, its preparation and application can give the following results to farms, as well as to agriculture.

Thus, increasing the fertility of the soil, improving the agrochemical indicators of water and physical properties of the soil in the cultivated areas, accelerates the conversion of mineral fertilizers and reduces the loss of substances, reduces the application of mineral fertilizers and prevents environmental pollution.

It has been proven in the conducted studies that organic-mineral complexes create a balance of nutrients in the soil. Organic-mineral complexes combine both organic and mineral nutrients. This ensures that plants receive nutrients both in the short and long term. Mineral components provide plants with permanent nutrients

Thus, the research was conducted by applying mineral-organic complexes made from waste materials (sludge of the river water, cotton straw).

Fiber quality characteristics were determined in the cotton sample according to options as research material. (table 3)

According to the results of the analysis, the upper average length (UHML) indicator of all samples was 26.7-28.4 mm and corresponded to IV and V ber types of medium ber varieties.

The length uniformity index (Unf) is the main length component and is a percentage of the ratio of the average length of the ber to the upper average length. According to the standards, the average indicator of the equality index is 80-82%, 77-79% is considered low, less than 77% is considered very low, 83-85% is considered high, and more than 85% is considered very high. In the studied samples, this indicator was very high, 91.1-97.3%.

According to the international classi cation, ber speci c breaking load (Str) and ber elongation to break (Elg) are the strength components of cotton ber.

The speci c breaking load is determined by the force that causes the ber to break. The tenacity index of cotton ber is 23 g/tex and below very weak, 24-25 g/tex weak, 26-28 g/tex medium, 29-30g/tex strong, and 31g/tex and higher very is considered solid. In the studied samples, the speci c breaking load was estimated at an average level, varying between 25.8-28.7 g/tex.

Analyzing the results of the research, it is clear that the applied version of the organic mineral complex showed better results in plant development than other variants.

Table 3. Technological Properties of Cotton Fiber

№	Name of varieties	Average length, mm	Upper mid length, mm	Equal in length-lik index, %	Specific breaking load, g/tex	Elongation at break %	Micro-neur, unit	Linear density, m/tech	Counter-failure rate, Rd, %	Degree of yellowness, + b	Sort by color, CG	Garbage-Leaf-Factor %	Index of short fibers, %
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	Control	26,7	27,4	97,3	27,4	6,8	5,0	168	63,6	18,5	21-1	-	<3
2.	Fon-$N_{120}P_{120}K_{120}$	25,5	27,9	95,0	26,4	7,0	5,0	176	63,0	16,9	21-1	-	<3
3.	Complex	25,3	26,7	94,8	27,1	7,0	4,9	159	62,7	16,8	21-1	-	<3
4.	silt+sand	25,3	27,6	91,1	25,8	6,7	5,1	187	64,5	17,3	21-1	-	<3

CONCLUSION

1. Analyzing the results of the research, it is clear that the applied version of the organic mineral complex showed better results in plant development than other options.

2. The highest quality indicator of the potato variety Arinda is noticeable in the variant applied N90P90K120+Mn5+B5. Here, the amount of starch was 23.5%. In the control (without fertilizer) version, the amount of starch was 20.1%. It can be concluded that in the N90P-90K120+Mn5+B5 applied version, the increase was 3.4% compared to the control, and 1% compared to the background.

3. All rates and rates of fertilizers tested in our experiment improved the quality of sugar beet crop. Thus, the highest sugar content and sugar accumulation are noticeable in the version with N120P90 150+B3+Mn1.5 applied. During the research carried out in the Shirinbey village of Saatli district, the sugar level in this version compared to the control is 20.6%; and sugar harvest was 79.52 s/ha, compared to the background sugar content was 1.2%, sugar harvest was 11.33 sen/ha. Thus, as a result of the conducted research, the highest quality indicators of sugar beet were recorded in the version with N120P90 150+B3+Mn1.5 applied.

4. Preparation and use of organic mineral complexes is economically ef cient and ecologically important. Thus, the production of such fertilizer from household waste prevents environmental pollution and costs such as waste transportation, burial, etc., which is very important.

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REFERENCE LIST

1.A.H.Babayev., S.A.Osmanova., Effect of soil cultivation and fertilizers on the degree of soil fragmentation under irrigation conditions. Agrarian science of Azerbaijan. Baku 2016. № 5. p. 20-31

2. Jabrayilov M.Sh. - Fertilization of pepper plants in Absheron conditions. Azerbaijan Academy of Sciences Publishing House, Baku, 1966

3. Huseynov R.G., Agrochemical characteristics of irrigated lands of Azerbaijan, Azerbaijan State Publishing House, Baku 1976, p. 134

4. Y.C. Hasanov. Agrophysical properties of natural and anthropogenic soils of Ujar support station. Azerbaijan Reclamation and Water Management Open Joint-Stock Company, AzHveM EIB Scientific Works Volume XXXI., Baku, Science, 2011, Pg. 168-172

5. M.P. Babayev., E.A. Gurbanova., f.M. Ramazanova., S.I. Najafova. Lands of the Republic of Azerbaijan. Baku, "MSV Nashr" LLC. 2022. P. 63-66

6. P. B. Zamanov. Effectiveness of organic fertilizers obtained from the recycling of common waste in Azerbaijan in agriculture. A collection of works on soil science and agrochemistry. Volume 23 № 1-2 Pages 283-288.

7. Pishnamazov Ya.M. Cultivation of sugar beet or its fodder. Baku: Azyarnyashr, 1964, 44p

8. Taghiyev R.A. Some issues of improving the technological quality of cotton fiber. Agricultural science news. Baku 1986. № 2. pp. 19-22.

9.T.V.Protosov., G.D.Korostelova. loss of nitrogen from various fertilizers on irrigated lands. Agrochemistry, 1972, № 10

10. Prokashev S.M. Biochemistry of the potato plant. M., 1953

11. Sukhoivanov V.A. Fertilizer and starch content in potato tubers. // VKPUP. International Congress on Mineral Fertilizers. Report of the co-participants of the CFM congress, 1976

12. Tashkhodzhaev A.G. The effect of superphosphate on the yield of potatoes grown on gray soils. // Agrochemistry in agriculture. M., Chemistry, 1975, № 6, pp. 18-19

13.Z.R.Movsumov. Nitrogen in agriculture of Azerbaijan. Baku, 1978

14.stat.gov.az

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WAYS OF DEVELOPMENT OF FRUIT GROWING IN AZERBAIJAN

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Abstract

Azerbaijan s geographical location, climate, relief, and soil cover have led to the multifaceted development of plants here. The territory of the Republic of Azerbaijan has a complex relief. This is related to geological development. 73% of the area is up to 1000 m, 27% is above 1000 m, and 18% is below sea level. The annual number of sunny hours in the territory of Azerbaijan varies between 1800 and 2900 hours. The annual amount of solar radiation reaches 125-134 kcal/cm^2 in the Kura-Araz and Lankaran plains, 120-130 kcal/cm^2 in the foothills, 140-150 kcal/cm^2 in the highlands, and 145-160 kcal/cm^2 in Nakhchivan. Soil is a complex natural product, formed under the in uence of many components. The role of climate and relief in soil formation in our republic is greater. 4200 species of plants grow on the territory of Azerbaijan. This is 0.84% of the plants growing on the earth, 66% of the plants growing in the Caucasus.

Fruit growing is one of the areas with suf cient potential in the agricultural sector of our country. Fruit growing is one of the specialized elds of agriculture in Azerbaijan. Our country is specialized in Guba-Khachmaz for umbel fruits, Sheki-Zagatala for hard fruits, Nakhchivan Autonomous Republic for pome fruits, Kur-Araz for dry subtropical fruits, Lankaran for citrus fruits, and Absheron Peninsula for southern plants. The largest fruit-growing region in our country is the Guba region. 2/3 of the fruit produced in Azerbaijan is provided by Guba-Khachmaz and 15% by Sheki-Zagatala and Nagorno-Shirvan economic regions.

Keywords: fruit growing, climate, soil

Introduction

Fruit growing is an important component of the agrarian economy of Azerbaijan. In the current period, when the world population is growing rapidly and global climate change is intensifying, the state s need for an effectively functioning agricultural sector is felt more prominently. An ef cient agricultural sector means that the economy can achieve higher production of agricultural products by spending fewer resources. In our country, which has genetic resources consisting of folk selection, scienti c selection, and introduced varieties, one of the main goals is to grow cherry varieties that meet the requirements of the market economy and to apply modern cultivation technologies in order to strengthen the export potential. For this, it is very important to provide producers with accurate information about seedling breeding, variety selection, implementation of well-directed selection programs, soil cultivation, irrigation, fertilization, and integrated control measures against diseases and pests.

Plants have a limited ability to compete against one or more stress factors. This situation creates a state of stress in organisms, which triggers various biochemical and physiological mechanisms to overcome this stress and protect themselves. The study of these mechanisms is of great theoretical and experimental importance in the creation of plant varieties and forms that are tolerant to unfavorable environmental factors.

In order for organisms to survive in unfavorable environmental conditions, it is important for them to have genes whose expression is accelerated by the effect of stress. The discovery of stress response genes is very important for biological factors such as human health, plant productivity, etc. Determining the mechanism for recognizing signals that change the gene expression of an organism can be useful for regulating gene expression under different stress conditions.

The term stress was rst introduced into the scienti c literature half a century ago. The rst to apply this term to biology was the Canadian physiologist G. Selye. According to Selye, there is a nonspeci c reaction in the body to any harmful effects. He called this phenomenon stress, which is aimed at mobilizing the body s defense forces. The sum of the body s defense reactions during stress is called general adaptation or stress syndrome. The factor that causes this condition is a stressor, and the degree to which they cause stress is called the stressor effect [4].

Research Object and Materials

Plant breeding is the science of changing plant traits to obtain desired characteristics. It has been used to improve the quality of food for humans and animals [1]. The goal of plant breeding is to produce crop varieties with unique and superior characteristics for various agricultural applications. The most commonly considered traits are related to resistance to biotic and abiotic stress, grain or biomass yield, end-use quality characteristics such as taste or concentration of certain biological molecules (proteins, sugars1, lipids, vitamins, bers), and ease of processing (harvesting, milling, cooking, malting, blending, etc.).

It belongs to the genus of cherries of the Rosaceae family. It grows wild in Ukraine, Moldova, Crimea, and the Caucasus. Currently, due to the abundance of cultivated cherry varieties, wild cherries have lost their importance. However, wild forms are found in the forests.

Wild cherries bloom in April-May. Their owers are white, fragrant, ve-petaled, and have long stems. Several owers hang from one place like an umbrella. Their fruits ripen in June-July. Their shape is round or heart-shaped. They are black, yellow-red, and dark red in color. Their taste is bitter and sometimes sweet. Sweet cherries are eaten fresh, and compotes, juices, extracts, jams, and other products are made from them. Bitter cherries are suitable for wine production. Their seeds contain 30% oil and up to 1% essential oil. They can be used for

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technical purposes. Their leaves contain 250 mg% vitamin C. Wild cherry secretes a large amount of resin, which is also used to dye fabrics.

Cherry juice is used for better digestion of food. It is also used in folk medicine against constipation. Its wood is hard, yellow-red in color. Sawn timber is made from cherry wood, and hookah rods are made from its thin branches. Cherry is also important as a honey-producing and ornamental plant. Bees can produce 36 40 kg of honey from 1 hectare of owering cherry.

Cherry (Prunus avium) owers have about 30 stamens and a single pistil surrounded by 5 petals. There are 2 ovaries in the ovary. Unpollinated owers soon fall from the tree [1].

Although owers can remain open for up to 5 days, the ability of some owers to receive stigmas begins to decline as they open. It is said that the earliest-opening owers will produce the best quality fruit.

There are several methods of arti cial pollination. Some of them are listed below:

1. This method is mainly used for vegetable plants that have separate male and female parts. In this technique, we take the male owers and remove their petals. This process should be done without touching the stamens to prevent pollen from getting on the ngers. After that, we need to look for the female ower that has opened by pushing back the petals. Then we need to touch the stamens of the male ower to the stigma of the female ower and roll it smoothly and gently so that the pollen can transfer to the stigma and pollination can occur.

2. In this method, we can move the cotton over the stamens of the male owers to collect as many pollen grains as possible. After that, the collected pollen is poured onto the stigma of the female ower.

3. This method is mainly used for self-pollinating plants such as tomatoes, beans, peppers, etc. In this method, fans are placed on the branches to shake the stems so that the pollen grains fall on the stigma.

Results and Discussion

Arti cial pollination has many advantages. Some of them are given below:

- Arti cial pollination can increase the size of the fruit and the number of seeds.

- It has the ability to convert owers into fruits.

- It is more suitable as it does not depend on any chance factor.

- Through this type of pollination, we can create a large number of hybrid plants.

Pollination is the process of transferring pollen from one point to another. This process is usually carried out by agents such as birds, insects, water, wind, and seed production. When these agents are not available, arti cial pollination methods are used. Pollination is the activity of transferring pollen from the anther, the male part of a plant, to the stigma, the female part, for fertilization and seed production. Pollinators include birds, insects, and animals, such as wind, water, and sometimes the plants themselves. Plants participate when the process of self-pollination occurs in an indoor ower. Arti cial pollination is a type or category of pollination carried out by humans using external factors. It is a mechanical process used to pollinate plants when natural pollination is not available or is undesirable. Arti cial pollination is usually carried out when natural pollinators are not available, and the introduction of these pollinators can be potentially risky. Therefore, alternative methods such as arti cial pollination are used.

Conclusion

Humans have had a wide-ranging impact on pollinators over the years. The use of chemical pesticides, including herbicides, is causing problems for pollinator species. These chemical fertilizers are designed to kill insects, but they can also kill native owers and plants that pollinators rely on for energy. The trees, shrubs, and owering plants that pollinators rely on for habitat and food are gradually disappearing as a result of human interference.

References

1. Gurbanov I.S., Khankishiyeva E.M., Suleymanova S.C., Sadiqova N.M. Cherry plant (Prunus avium). Baku-2019. 178 p.

2. Stress and adaptation of plants. R.T. Aliyev., M.A. Abbasov., V.R. Rahimli.

3. Sadiqov A.N. Fruit plants distributed in Azerbaijan. Baku-2023. 630 p.

5. http://az.wikipedia.org
6. http://www.agro.gov.az
7. http://www.aqroinfo.az

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EFFECTS OF AFFORESTATION ON MICROCLIMATIC CONDITIONS AND ECOLOGICAL BENEFITS IN AZERBAIJAN

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Abstract

Afforestation plays a pivotal role in restoring degraded landscapes and enhancing environmental sustainability, particularly in regions like Azerbaijan, where deforestation and land degradation have impacted microclimatic conditions and ecological balance. This paper examines the effects of afforestation on microclimatic conditions and the associated ecological bene ts within the context of Azerbaijan s diverse ecosystems. Afforestation helps regulate local temperatures by providing shade and increasing humidity through transpiration, which can mitigate extreme temperatures in semi-arid and urban areas. It also reduces wind speeds, particularly in the arid lowlands, thus helping to prevent soil erosion. Additionally, increased vegetation cover can in uence precipitation patterns and stabilize the water cycle, aiding water retention and mitigating ood risks in ood-prone regions. Ecologically, afforestation enhances soil conservation by reducing erosion, restoring biodiversity, and improving water retention in soils. In Azerbaijan, afforestation can rehabilitate natural habitats, improve air quality, and combat deserti cation, particularly in vulnerable areas like the Absheron Peninsula. Furthermore, afforestation contributes to carbon sequestration, playing a critical role in climate change mitigation by absorbing carbon dioxide. By addressing land degradation and promoting biodiversity, afforestation supports sustainable livelihoods for local communities through improved agricultural productivity and the development of ecotourism. In conclusion, afforestation offers wide-ranging bene ts for Azerbaijan, improving both microclimatic conditions and the resilience of ecosystems, making it a key strategy for environmental recovery and sustainable development.

Keywords: Vegetation, Urban areas, Microclimatic Condition, Land Degradation, Environmental Recovery

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IN BROWN MOUNTAIN-FOREST LANDS OF GREATER CAUCASUS DYNAMICS OF THE HYDROTHERMAL REGIME

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Abstract

The article describes the dynamics of the main hydrothermal regime in the mountain-forest lands, one of the natural landscapes of the Greater Caucasus. It was determined that the hydrothermal regime of the soil in the area changed according to the climate of the atmosphere and the changes that occurred. All this allows us to show how these factors affect the development of the soil formation process.

Depending on the seasons, it was determined that due to the decrease in air temperature in winter, the soil temperature also decreases and varies between minus 0.5-1.3^{0}C. The temperature gradually increases as it goes to the lower layers and is 5.1^{0}C at 60 cm, and does not change during the day.

In spring, as the number of sunny hours increases, the upper layers of the soil begin to heat up and the temperature rises to 11-12^0 C. Due to the heat conduction of the soil, the temperature of the soil sub-layers also increases. During this period, a favorable temperature and humidity regime for the development of plants is created. Biological processes are activated in good humidity and temperature conditions.

During long and hot summer days, due to the lack of favorable humidity under high temperature conditions, the process of weakening of plants is observed. During this period, the temperature on the soil surface rose to 26^{0}C, and its amount at a depth of 60 cm was 20.4^{0}C.

In autumn, due to the gradual cooling of the air and the increase of precipitation, the soil surface begins to cool and the temperature varies between 13-24^{0}C along the pro le. Thus, the study of the humidity and temperature regime occurring in the soil is of practical importance, allowing to regulate the water and heat demand of plants during the growing season, and it is also of great theoretical importance by determining the direction of the soil formation process.

Keywords: temperature, humidity, hydrothermal regime, precipitation, brown mountain-forest soils

Introduction

As we know, the temperature and humidity regime in the soil has a great in uence on the process of soil cultivation and at the same time for the normal development of plants and soil microorganisms. These processes greatly affect the biological and biochemical processes in the soil, speeding them up or weakening them.

The main source of heat for the earth is the Sun. In addition, a certain amount of heat is generated as a result of the decomposition of organic matter in the soil. At the same time, the lack of water in the soil or lack of it has a negative effect on the development and productivity of plants, lack of nutrients. Therefore, since many processes in the soil depend on these properties of the soil, its study has great scienti c and practical importance.

A number of researchers have made a great contribution to the study of the dynamics of soil processes(Aliyev,1973; Hasanov,1992; Geraiza-de,2014;). However, it is known from the literature that these researchers studied the soil temperature and humidity regime separately, which does not allow for determining the joint effect of these factors on soil processes. In this regard, studying them together will have a greater effect.

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Research Object and Materials

Based on these, we conducted research in the brown mountain-forest soils of the Greater Caucasus, and the methods accepted in our country and abroad were used in the research (Mamedov, 1970).

Analysis and discussions- The research works were carried out in stationary conditions in Pirgulu area of Shamakhi region. The soils of the area are brown mountain-forest soils (Cambisols), spread between the heights of 900-1200 m in the forest zone.

These lands belong to the broad-leaved forest zone of the mountainous region of the Republic, mainly consisting of pistachio and walnut forests, and in some places they are cut and used under agricultural crops. The average annual temperature is 8-100C and the annual amount of precipitation varies between 500-1000 m, which differs sharply in different areas, which indicates that the soils of those areas are different. When the brown mountain-forest soils have the same pro le, the amount of humus for them is (5-8%), and it decreases as you go to the lower layers. The soil environment is acidic (about pH 6.0-6.7), the total absorbed bases (28-40 m.eq/100 g) are high.

Konur mountain-forest soils are divided into the following subtypes, which differ from each other. There is a great similarity in the morphological structure of typical weakly unsaturated, residual carbonate, graying brown mountain-forest soils (Mammadov, 2002).

In the area of our study, the temperature and the amount of atmospheric precipitation had the greatest in uence on the temperature and humidity regime of the soil.

Due to the rapid melting of the thick snow cover left over from the winter in spring in the studied area, snow water and spring rains in March led to the accumulation of more moisture in the soil, which resulted in the observation of the annual maximum moisture in the soil at the beginning of the vegetation period.

Depending on the seasons and months in the area, the temperature of the air and soil is characterized by different indicators.

So, as can be seen from the graph, the lowest temperature was observed in January, 0.5^0C in the air and 1.0^0C in the soil. In the following years, its amount increased and reached the maximum level in July and was 23.2^0C in the air and 26.4^0C on the soil surface. During the year, the average annual temperature of air and soil was 1.1-13.60, respectively.

The amount of rains was the most in spring and autumn months, 48-67 mm, and the least amount was in winter and summer months (24-35 mm), during the year it was 591 mm.

The amount of possible evaporation is 700 mm during the year, and its maximum amount is observed in July at 122 mm.

Since the relief of the area is complex, this has a certain effect on the hydrothermal regime of the soil. Here, in particular, the granulometric composition of soils, the amount of organic substances and carbonates, heat and water absorption capacity, hardness, etc. has more advantages.

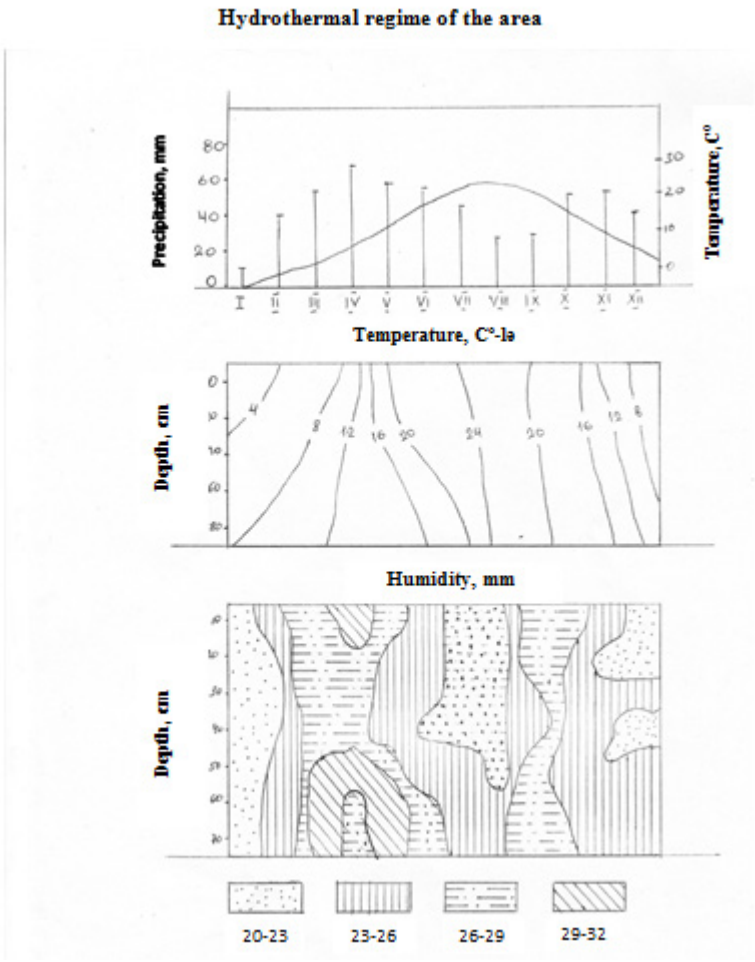
It should be noted that soil temperature and humidity have a signi cant effect on each other. The thermal conductivity of the soil increases here with the increase of humidity and silt particles. In dry years, the soil has less moisture, and it heats up and cools down quickly compared to moist soils in rainy years.

In general, the amount of rain decreases from May to early August. As a result of this change in precipitation and the increase in temperature from the beginning of August, the soil moisture is greatly reduced.

Results and Discussion

As can be seen from the picture, the maximum moisture along the pro le in the brown mountain-forest soils was in March, April, and October, which is related to the heavy rainfall during that period. In general, changes in soil moisture depend on air temperature and the amount of atmospheric precipitation. Depending on the expansion of the studied area, the degree of inclination, the density of the forest at the absolute height, the tree species and the composition of the soil, the amount of moisture in the pro le of the soil under the same climatic conditions and the change in seasons may be different.

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Seasonal humidity changes in the soil pro le in the study area are different depending on the climatic characteristics of each month. As can be seen from the picture, the minimum amount of moisture in the soil is observed in December and January.

Thus, the amount of precipitation was 40-42 mm in January and December, and the temperature was -0.5+2.00 in these months. During this period, the amount of moisture in the soil varied between 20.0-27.7% in a layer of 60 cm.

In the summer months, the temperature in that area was high (19.8-23.20), and the amount of precipitation was 24-25 mm. During this period, the amount of possible evaporation in the area was 131-169 mm, the amount of moisture in the soil uctuated between 20.2-26.4% in a layer of 60 cm.

Regarding the amount of humidity in the spring and autumn months in the area, according to the temperature and precipitation, its amount changed depending on the months, and its amount increased to 33.6%, having the highest indicators. Regarding the climate indicators of the area, as can be seen from the graph, the temperature indicators were average compared to the winter months, and the amount of precipitation varied between 32-94 mm.

Depending on the depth of the soil in the studied area, the temperature regime has changed according to the weather regime. The average annual temperature of the soil surface is 18.00, and varies from minus 0.5 to 26.4^{0}C during the year. During the year, the soil temperature is higher than the air temperature.

The maximum annual temperature on the soil surface is observed in July (26.4^0 C), and the minimum in January (1^{0}C).

Part of the air and soil temperature is spent on evaporation. The maximum amount of annual evaporation is observed during the growing season.

It is clear from the graph that the soil temperature varies more according to the seasons of the year. So, the minimum temperature here was in winter, and the maximum temperature was in summer. At the same time, temperature equality was observed in the 0-60 cm layers in the soil in spring and partially in autumn.

Depending on the seasons, it was determined that due to the decrease in air temperature in winter, the soil temperature also decreases and varies between minus 0.5-1.3^{0}C. The temperature gradually increases as it goes to the lower layers and is 5.1^{0}C at 60 cm, and does not change during the day.

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As the number of sunny hours increases in spring, the upper layers of the soil begin to heat up and the temperature rises to 11-12^{0}C. Due to the heat conduction of the soil, the temperature of the soil sub-layers also increases. During this period, a favorable temperature and humidity regime for the development of plants is created. Biological processes are activated in good humidity and temperature conditions.

During long and hot summer days, due to the lack of favorable humidity under high temperature conditions, the process of weakening of plants is observed. During this period, the temperature on the surface of the soil rose to 26^{0}C, and its amount at a depth of 60 cm was 20.4^{0}C.

In autumn, due to the gradual cooling of the air and the increase of precipitation, the soil surface begins to cool, and the temperature varies from 13 to 24^{0}C along the pro le. Thus, the study of the humidity and temperature regime occurring in the soil is of practical importance, allowing to regulate the water and heat demand of plants during the vegetation period, as well as having great theoretical importance by determining the direction of the soil formation process.

Conclusion

In the article, the temperature and humidity regime of mountain-forest soils depending on the seasons was studied. It has been determined that the hydrothermal regime here changes depending on the local climate conditions, as the soils of this zone are alluvial.

References

1. Aliyev G.A., Hasanov Kh.N. – Influence of forests on soil processes. Baku-1973, 45 p.

2. Babayev M.P., Hasanov V.H., Jafarov Ch.M., Huseynova S.M. - Morphogenetic diagnostics, nomenclature and classification of Azerbaijani soils, Baku-2011, 449 p.

3. Hasanov Kh.N. - On the hydrological role of forests in the Republic of Azerbaijan. Baku-1992, 89 p.

4. Geraizade A.P., Kocharli S.A. - On the nature of hydrothermal indicators of serous soil types of soils of the Shirvan change. Az. ET Institute of Agriculture collection of works, volume XXV, Baku-2014, p. 385-389

5. Gerayzade A.P., Kocherli S.A. - Dynamics of temperature in air, soil surface and profile, Works of ATC, Volume XI, Part II, Baku, 2010, pp. 24-31.

6. Hasanov Y.C. - Monitoring of agrophysical properties of irrigated lands of Azerbaijan. Baku, 2013, p. 230

7. Kocharli S.A. - Water-heat balance and dynamics of soil processes of cotton-alfalfa crop rotation in the conditions of the Mugan steppe Avt. kand. diss. Baku, 1983, 19 p.

8. Kocharli S.A., Gyulalyev Ch.G., Kozlova A.A., Dzhafarov A.M. – Dynamics of some soil properties in cotton-alfalfa crop rotation. Soils and Environment, ISSN N2618-6802 (On-Line), Volume 5, Issue 1, 2022, p.1-13

9. Hajiyev G.A., Rahimov V.A. - Climate characteristics of the administrative regions of the Azerbaijan SSR. Baku-1977, 269 p.

10. Mamedov R.G -Agrophysical characteristics of the Priaraksin strip. Baku, “Elm”, 1970, p. 318

11. Mammadov G.S. - Land resources of Azerbaijan. Baku, 2002, 131 p.

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"EVALUATING GROWTH POTENTIAL OF Moringa Oleifera AS AN ALTERNATE FOOD SOURCE"

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ABSTRACT

Moringa oleifera, originally a rapidly proliferating tropical crop, has been cultivated since ancient days. Due to its excellent temperature tolerance, this crop may adapt to regions affected by climate change, such as the Mediterranean basin. Moringa oleifera is a fast-growing, pliable species. It is rich in protein and is used for human consumption, animal feed, and medicine. Despite being found in most areas, minute research has been done on Moringa seeds. This study aimed to determine the adaptability of four landraces of Moringa oleifera at the University Research Farm (Koont) of Pir Mehr Ali Shah, Arid Agriculture University Rawalpindi. After being treated with tap water, hot water, and control water, the seeds were sowed in polythene bags in the nursery. The germination and growth potential were assessed by using different parameters. Germination of the seed was recorded for three weeks in laboratory and nursery conditions and statistically analyzed using ANOVA techniques. Moringa oleifera seeds were treated to enhance the germination potential of different landraces. Hot water treatment showed signi cant value in growth parameters. It is recommended that Moringa oleifera be treated with water to improve the germination and growth parameters. These ndings suggest that pre-treating the seeds can enhance the establishment of Moringa oleifera seedlings.

Keywords: Growth; Moringa oleifera; nursery; germination

INTRODUCTION

Trees, a crucial component of Earth's biodiversity, play a vital role in the well-being of people worldwide, offering ecological, cultural, and economic bene ts. However, the world's forests are rapidly declining, a crisis exacerbated by the unsustainable exploitation of wood, seeds, oils, resins, fruits, and bark. This practice has pushed many tree species to the brink of extinction. The situation is further complicated by the complex germination process, which is in uenced by a range of physical and physiological factors, posing a signi cant challenge for vulnerable species [Iralu et al., 2019].

One of the most bene cial and nourishing plants on earth is Moringa oleifera. These trees grow in tropical and subtropical climates, whereas Pakistan's climate varies from continental to tropical. M. oleifera trees are a food source and can grow in tropical and subtropical regions of Pakistan, including most of Punjab [Dawood, 2020].

Moringa oleifera is a small, fast-growing, evergreen or deciduous tree that can reach 10 to 12 meters high. It has an open, spreading crown with drooping, brittle branches, a thick, corky, pale bark, and a tripinnate leaf. The fragrant, bisexual yellowish-white owers are borne in spreading or drooping axillary clusters [Ashfaq et al., 2011; Parrotta, 2014]. When the pods dry out, they split into three pieces. Each pod contains spherical seeds with a brownish semi-permeable seed shell. Because it is a softwood tree, it produces low-quality wood, yet it has been claimed for ages that the tree has a variety of industrial, heritage, and medical uses [Amjad et al., 2015]. The other terms used for Moringa are Horseradish tree, Mulangay, Mlonge, Benzolive, Drumstick tree, Sajna, Kelor, Saijihan and Marango. The name of the horse radish tree for Moringa was due to the taste of its roots [Fahey, 2005; Anwar & Rashid, 2007]. Moringa has 13 species viz., M. arborea, M. borziana, M. concanensis, M. drouhardi, M. hildebrandtii, M. longitude, M. oleifera, M. ovalifolia, M. peregrine, M. pygmaea, M. rival, M. ruspoliana, and M. stenopetala. [Farooq & Koul, 2018].

Moringa oleifera is a part of the ontogenetic family (Moringaceae) of shrubs and trees that originated in Agra and Oudh in northwest India. It is native to Pakistan, Bangladesh, and Afghanistan's sub-Himalayan regions. [Shujatha & Patel, 2017; Rani & Arumugan, 2017]. The plant is de ned as a drought-resistant agricultural cultivar that proliferates. It may thrive in less fertile environments. [Fahey, 2005, Anwar & Rashid, 2007]. In Pakistan, Moringa oleifera is locally named Sohanjna and is fully grown wildly in the provinces of Punjab, Sindh, and Khyber Pakhtunkhwa (KP) [Faisal et al., 2019]. There is a vast genetic diversity of Moringa present in Pakistan. This genetic diversity can be improved to enhance multipurpose usage [Shahzad et al., 2018]. Moringa concanensis and Moringa oleifera Lam. are indigenous to Pakistan, with three landraces existing in Pakistan: white-seeded Moringa from Faisalabad origin, black-seeded Moringa from Multan origin, and PKM1 Indian landrace [Khan et al., 2017; Batool et al., 2019].

Moringa oleifera does not impose much fertilizer, but a standard quantity, especially organic fertilizers for long-term fertilization, might help it develop more quickly. It has been demonstrated that organic matter enhances soil characteristics such as aggregates, water-holding capacity, hydraulic properties, bulk density, level of compaction, fertility, and resilience to water and wind erosion [Abukari & Nasare, 2020]. Sowing and cuttings are the two most common methods for obtaining M. oleifera plants. Sowing is recommended for seed production because improved varieties can be chosen for growth, ensuring proper and sustainable production [Mishra et al., 2012]. Moringa oleifera viability rapidly reduces over time. Most germination tests occur between 7 and 21 days, and seeds germinate in 5 to 10 days. Since germination was measured three days after imbibition, the quality of the seeds utilized in the experiment can be regarded as high [Ontivero et al., 2021].

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Moringa oleifera dried leaves have seven times the vitamin C of an orange, ten times the vitamin A of a carrot, 17 times the calcium of milk, 15 times the potassium of bananas, 25 times the iron of spinach, and nine times the protein of yogurt [Ashfaq et al., 2011]. They are high in essential human health elements, including lipids, proteins, and critical minerals. They make signi cant and tasty economic products, including Moringa powder and juice [Rajput et al., 2019].

Although many studies have been published on the attributes of Moringa species, the literature regarding seed treatment of Moringa oleifera trees in the Pothohar region is inadequate. Time is needed to evaluate different seed treatments for optimum germination and growth performance of Moringa trees in the Potohar region's climate. The outcome of this study might help ensure food security. It was determined that mass production of seedlings utilizing the most effective pre-sowing seed treatments could support the propagation and culture of Moringa oleifera trees.

MATERIALS AND METHODS

Experimental Site

The area chosen for the experiment was the research eld of the Forestry Department at Koont Research Farm of PMAS Arid Agriculture University Rawalpindi, located in Dhudial, a village in district Chakwal. This experimental site is situated at an elevation of up to 1200 ft. It is located at about 32 N latitude, about 72 E longitude, and 70 kilometers from Pakistan s capital, Islamabad. The Mean annual rainfall ranges from 450 - 550 mm.

Experimental Treatments

This study consists of treatments in laboratories and other elds. Three treatments, i.e., hot water (T1), simple water (T2), control (T0), and four landraces, i.e., L1, L2, L3, and L4, were used for the CRD Concept laboratory experiment. The landrace of Moringa PKM-1, white seeded, black seeded, and Ghana was used. The healthy and sturdy seeds were taken from NARC and other sources. Seeds were treated with three separate treatments to determine the seed germination rate and were sown in soil with a standardized composition. The following formula calculated the total germination percentage.

$$\text{Total Germination\%} = \frac{\text{Total number of seeds that germinated}}{\text{Number of seeds sown}} \times 100$$

Seed Treatments

Before initiating the germination tests, all seeds were immersed in a beaker of water, and those that oated were eliminated. Then, the following seed treatment was done. Control (T0), Moringa oleifera seeds were put in petri dishes without care. Moringa oleifera seeds were immersed for 24 hours in natural water (T2). The Moringa oleifera seeds were immersed for 5 minutes in boiling water at 80 C and soaked for 24 hours in lukewarm water (T1).

Parameters Studied

The germination rate, plant height, number of leaves, and stem diameter parameters were studied to determine the effect of seed treatment on landraces of Moringa oleifera in terms of these parameters.

Data Collection

The Moringa oleifera leaves were counted manually monthly and bi-monthly. The average was calculated for each treatment. Measuring tape and a vernier caliper were used to measure the diameter. The following equations speci ed the diameter of the plant stem.

Diameter = Girth/ where (= 3.14) Girth = Circumference

A measuring tape was used to measure plant height. Using a measuring tape, the height of each plant was calculated from below the soil surface to its tip in centimeters; thus, the average was then obtained. At the end of July, seeds were planted in 8 4-inch polythene tubes packed with soil at a depth of three times the seed size. Seed germination was recorded for three weeks. Seedlings were watered according to soil conditions. Then, growth parameters were recorded every week for two months.

Statistical Analysis

The data was analyzed using ANOVA techniques and statistical software (Statistics 8.1) under a complete randomized block design. The means of signi cant effects were determined using LSD at the 5 percent probability level.

RESULT AND DISCUSSION

Germination Rate

Figure (1) demonstrates the effect of seed treatment on Moringa oleifera landraces. The mean germination percentage was signi cantly different for all treatments. The maximum germination percentage was recorded in simple water-treated seeds (87.5%), which was considerably higher than hot water-treated seeds (68.7%) and control seeds (50%).

Figure (2) explains the germination percentages of different Moringa oleifera landraces. The white-seeded Moringa landrace recorded a signi cantly higher seed germination percentage, 83.3%, than PKM-1, 75%, Black seeded, 62.5%, and Ghana landrace, 54.17%.

Figure 3 illustrates that seeds treated with water recorded 100% germination in PKM-1 and white-seeded Moringa landraces while 75% in black-seeded and Ghana landraces.

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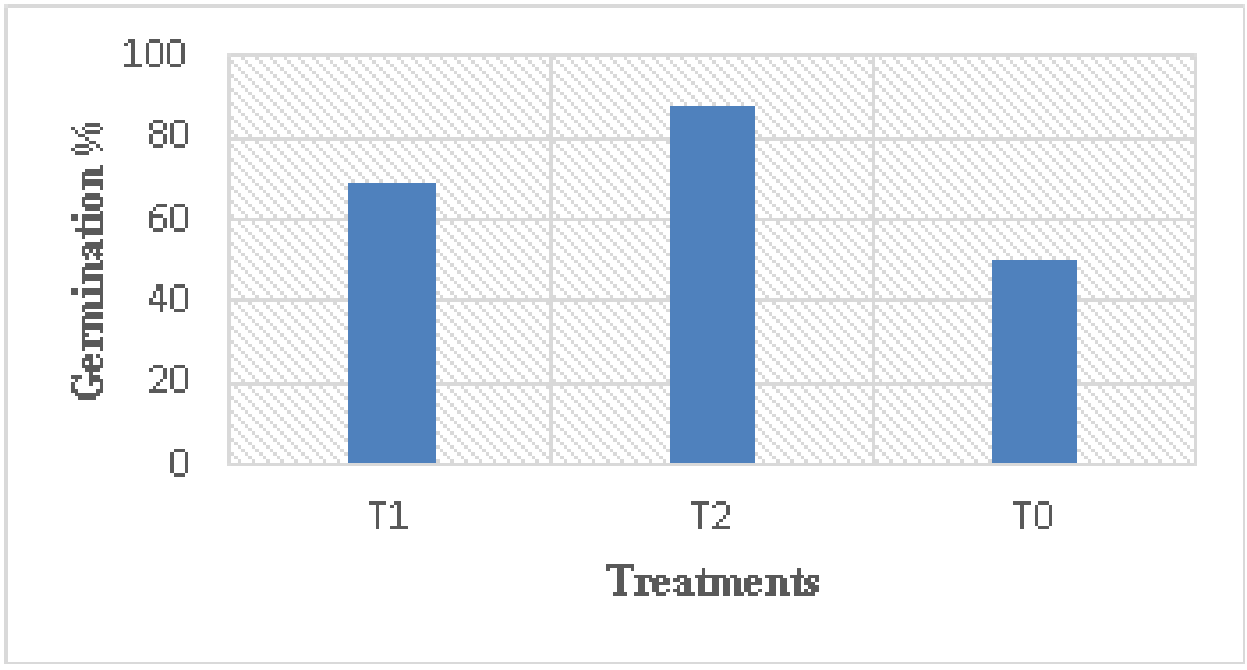


Figure 1: Effect of seed treatment on germination percentage

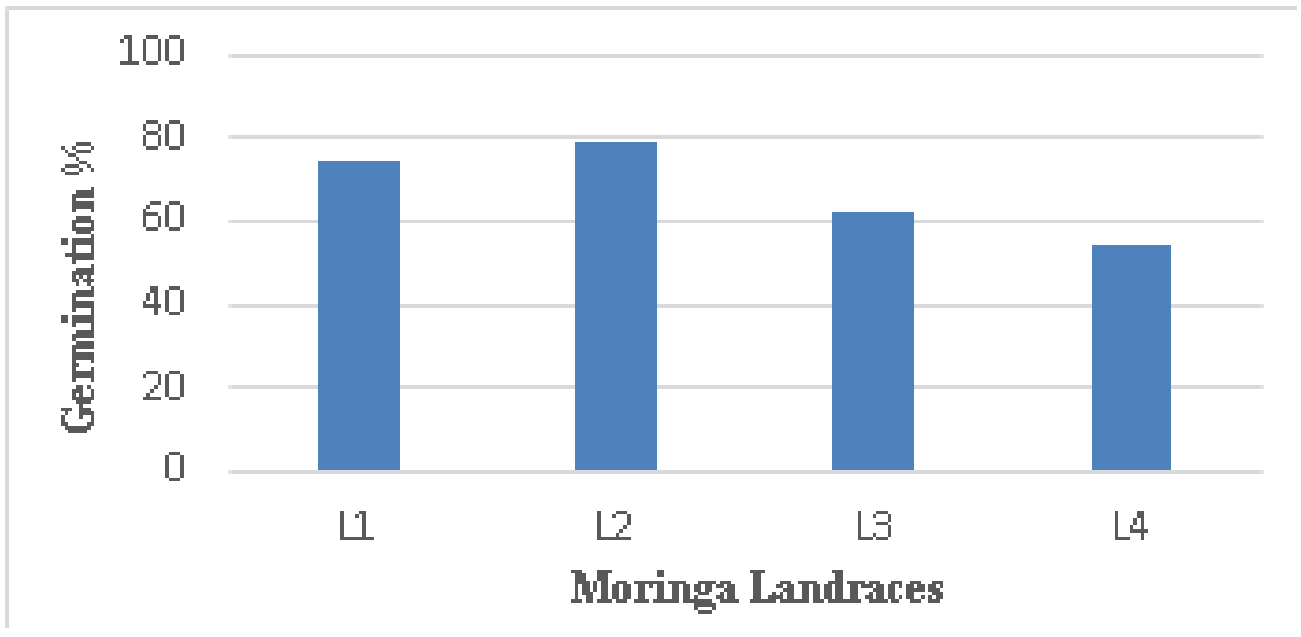


Figure 2: Germination percentage of different Moringa landrace

Figure 3: Effect of different seed treatments on germination percentage of Moringa landraces

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Number of leaves

Figure 4 shows the recorded data for the effects of different seed treatments on several leaves. The mean value recorded for hot water-treated seed shows a signi cantly different 286.3 number of leaves compared to other seed treatments, simple water 223.06, and untreated seed 119.5.

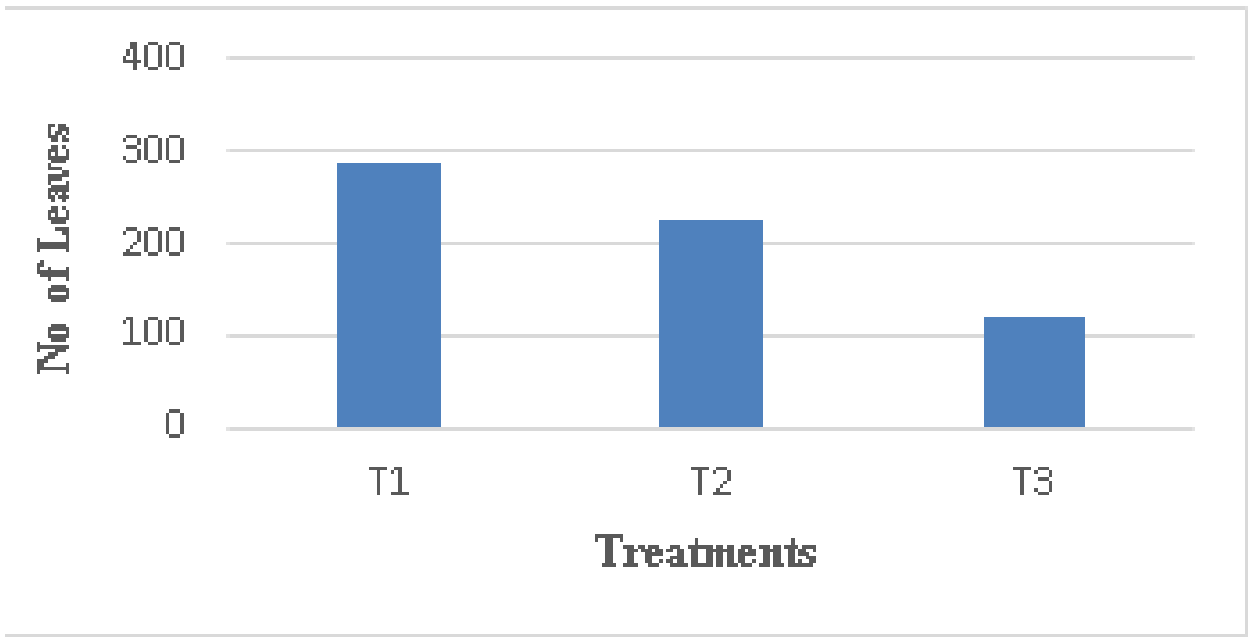


Figure 4: Effect of seed treatments on the number of leaves of Moringa oleifera landraces

Plant Height

Figure 5 explains that the data recorded for plant height of different treatments show statistically different values. Seeds treated with hot water show a signi cantly different value (44.7cm) compared to simple water (41.18cm) and control seeds (34.18cm).

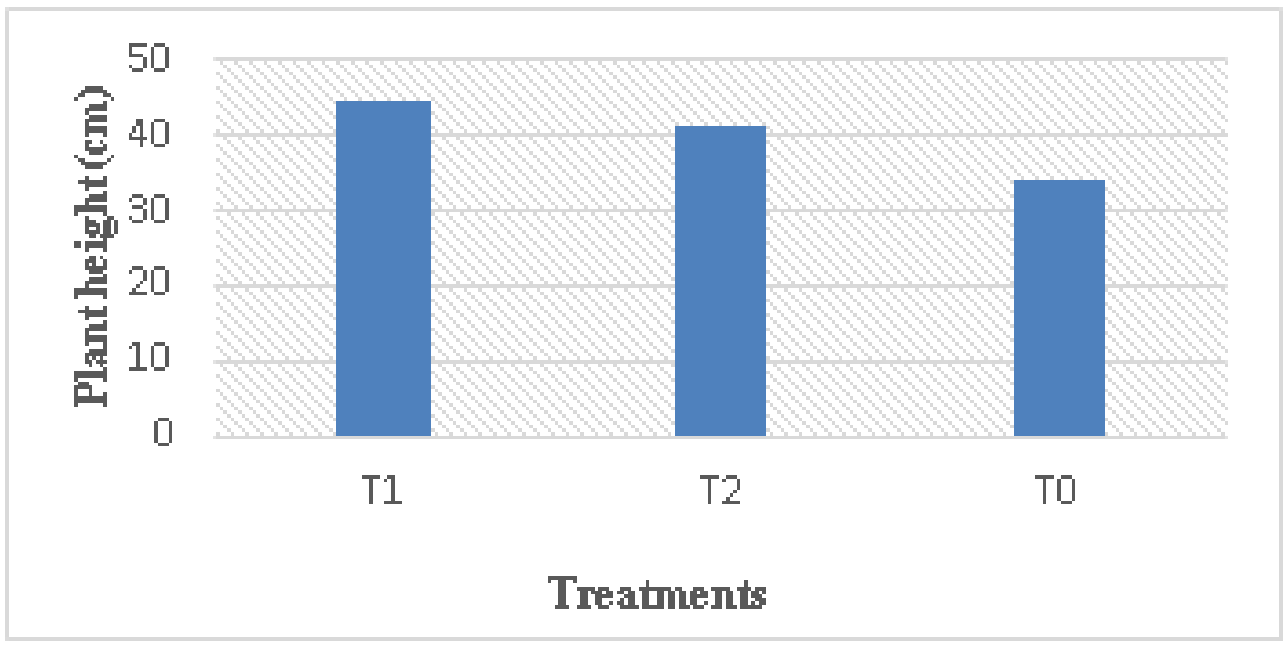


Figure 5: Effect of seed treatments on Moringa plant height

Stem Diameter

Figure 6 illustrates that different treatments affect the average diameter of Moringa oleifera plants. At a 5% signi cance level, different treatments result in plants with statistically different stem diameters. Hot water treatment (T1) yielded a stem diameter of 10.51 mm, followed by simple water (T2), 8.7 mm, and control (T0), 7.1 mm.

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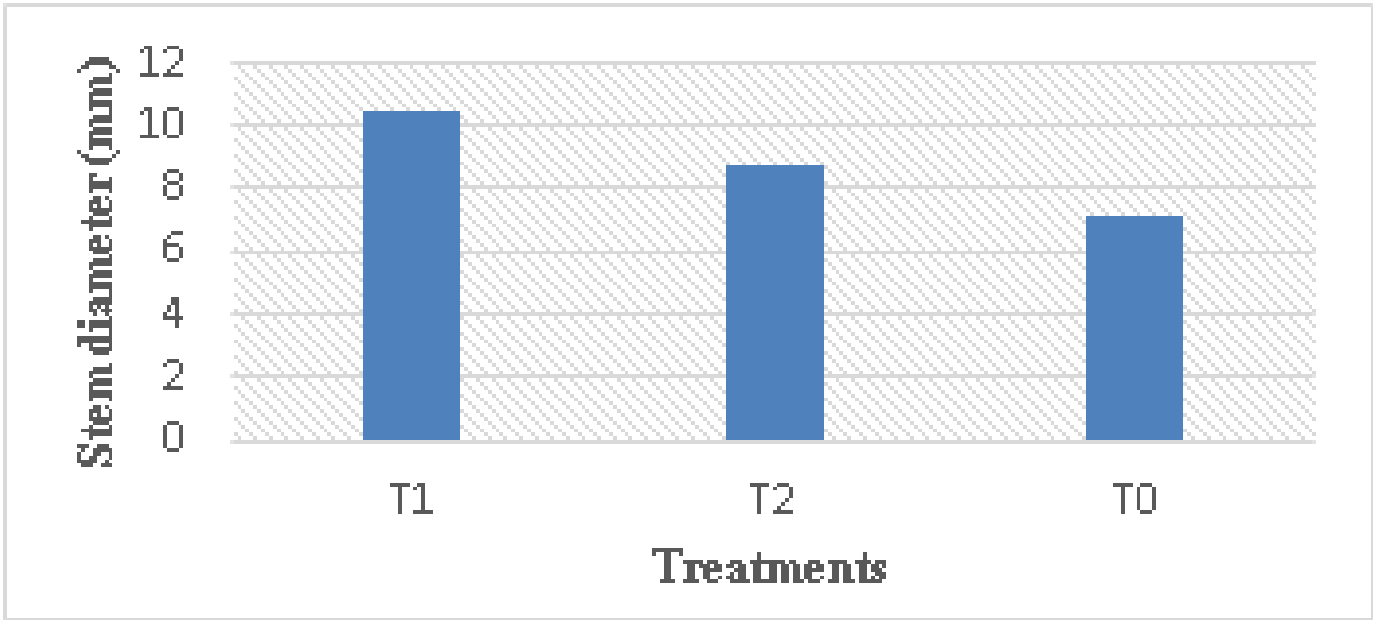


Figure 6: Effect of seed treatments on stem diameter

DISCUSSION

The differences between seed treatments demonstrate that different treatments affected seed germination ef ciency. This signi cant observation shows that the treatments may allow Moringa oleifera seedlings to proliferate. Effective seed treatments, such as simple, hot water, and untreated, could rapidly yield Moringa oleifera seedlings for communities. It is acknowledged that poor pre-sowing seed treatment might result in inadequate germination [P rez-Garc a & Benito, 2006]. Other than dormancy and hard-seed coatings, other factors may in uence seed germination. The maturity stage at which seeds are taken from the pod is one factor that signi cantly affects the lifetime and the viability duration of seeds [Epkong, 2008]. The nding of this research was that different seed pre-sowing treatments improved the germination and growth of Moringa oleifera seeds, which is signi cant because it demonstrates the possibility of promoting the rapid propagation and cultivation of Moringa oleifera landraces through the mass production of seedlings using the most effective seed treatments examined in this study. The current research is relevant to Materechera s (2017) studies, which observed the potential to promote the quick propagation and cultivation of M. oleifera by mass-producing seedlings from the most effective seed treatments examined in this work. Treatments varied in their effectiveness in enhancing seed germination. Our results on the effect of seed treatment on growth parameters were also con rmed by the observation of Ullah et al (2019).

CONCLUSION

Based on the ndings, it is concluded that the growth of Moringa trees in the Potohar region was optimum in response to hot-treated seeds. Adequate germination was observed in cold-water-treated seeds.

RECOMMENDATION

Seed treatments bene t seed germination, seed growth, and nutritional parameters. Seed treatments enhance the germination and growth of Moringa oleifera. Hot water treatment is a simple and effective way of breaking seed dormancy. Seed treatment is recommended to be amazingly effective in the Potohar region and enhanced in other areas. More research is required to authenticate this study.

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REFERENCES

Abbas, R. K., Elsharbasy, F. S., & Fadlelmula, A. A. (2018). Nutritional values of Moringa oleifera, total protein. Amino acid, vitamins, minerals, carbohydrates, total fat, and crude ber under the semi-arid conditions of Sudan. Journal of Microbial & Biochemical Technology, pp. 10, 56 58.

Abdulkadir, A. R., Zawawi, D. D., & Jahan, M. S. (2016). Proximate and phytochemical screening of different parts of Moringa oleifera. Russian Agricultural Sciences, 42(1), 34-36.

Abdull Razis, A. F., Ibrahim, M. D., & Kntayya, S. B. (2014). Health bene ts of Moringa oleifera. Asian Paci c Journal of Cancer Prevention, 15(20), 8571-8576.

Abukari, A., & Nasare, N. I. (2020). Effect of Different Rates of Rice Husk Biochar on the Initial Growth of Moringa oleifera under Greenhouse Conditions in the Savannah Ecological Zone of Ghana. Turkish Journal of Agriculture-Food Science and Technology, 8(1), 13-17.

Afzal, S., Nawaz, M. F., Qadir, I., Gul, S., Yasin, G., & Ahmad, I. (2020). Variability in leaf mineral composition of Moringa oleifera in irrigated plains of Pakistan. South African Journal of Botany, 129, 442-447.

Ahmed Hassanein, A. M., & Abdulah Al-Soqeer, A. (2017). Evaluation of Seed Germination and Growth Characteristics of Moringa oleifera and M. peregrina under Laboratory, Greenhouse and Field Conditions. International Journal of Agriculture & Biology, 19(4).

Akhtar, T., Aziz, M. A., Naeem, M., Ahmed, M. S., & Bodlah, I. (2018). Diversity and Relative Abundance of Pollinator Fauna of Canola (Brassica napus L. Var Chakwal Sarsoon) with Managed Apis mellifera L. in Pothwar Region, Gujar Khan, Pakistan. Pakistan Journal of Zoology, 50(2), 567-573.

Alegbeleye, O. O. (2018). How functional is Moringa Oleifera? A review of its nutritive, medicinal, and socioeconomic potential. Food and Nutrition Bulletin, 39(1), 149-170.

Ali, A. M., Tajo, S. T., Zage, A. U., & Ali, M. (2019). Phytochemical Screening, Proximate and Mineral Analysis of Moringa oleifera Leaf in Kano, Northern Nigeria. Journal Allied Pharmacy Science, 55-60.

Al-Shoaibi, A. K., & Boutraa, T. (2021). Comparative study on germination, growth, and gas exchanges of the tropics tree Moringa oleifera and its desert relative Moringa peregrina under saline conditions. South African Journal of Botany, 139, 374-385.

Amaechi, N. C., Onwuka, Q. I., & Ihechere, L. A. (2018). Comparative Evaluation of Amino Acids in Leaves, Seeds and Flowers of Moringa Oleifera: It s Potentials in Combating Malnutrition. Pp. 21-25

Anwar, F., & Rashid, U. (2007). Physico-chemical characteristics of Moringa oleifera seeds and seed oil from a wild provenance of Pakistan. Pakistan Journal of Botany, 39(5), 1443-1453.

Arowosegbe, S. (2019). Comparative Studies on the Phytochemical Content and Proximate Composition of Different Parts of Moringa Oleifera Plant Grown in Ado-Ekiti, Nigeria. Bulletin of Pure & Applied Sciences-Botany, (1).

Ashfaq, M., Basra, S. M., & Ashfaq, U. (2011) Moringa a miracle plant of agro forestry and southern Punjab, Pakistan. World Environmental Day, 41-54

Balarabe, M. A. (2019). Nutritional analysis of cooked and dried leaves of Moringa oleifera. Plant, 7(4), 71-75.

Batool, S., Khan, S., Basra, S. M., Hussain, M., Saddiq, M. S., Iqbal, S & Hafeez, M. B. (2019). Impact of natural and synthetic plant stimulants on Moringa seedlings grown under low-temperature conditions. International Letters of Natural Sciences, 76.

Bichi, M. H. (2013). A review of the applications of Moringa oleifera seeds extract in water treatment. Civil and Environmental Research, 3(8), 1-10.

Boumenjel, A., Papadopoulos, A., & Ammari, Y. (2020). Growth response of Moringa oleifera (Lam) to water stress and to arid bioclimatic conditions. Agroforestry Systems, 1-11.

Braide, W., Ibegbulem, C., Adeleye, S., Mike, A., Lugbe, P., Akien, A., Uzor, B. and Korie, M. (2017). Microbiological and Nutritional Analysis of Roots and Seeds of Moringa oleifera. International Journal of Research in Pharmacy and Biosciences, 4(12), pp.19-24.

Castillo-Lopez, R. I., Leon-Felix, J., Angulo-Escalante, M. ., Gutierrez-Dorado, R., Muy-Rangel, M. D., & Heredia, J. B. (2017). Nutritional and phenolic characterization of Moringa oleifera leaves grown in Sinaloa, M xico. Pakistan Journal of Botany, 49(1), 161-168.

Chelliah, R., Ramakrishnan, S., & Antony, U. (2017). Nutritional quality of Moringa oleifera for its bioactivity and antibacterial properties. International Food Research Journal, 24(2), 825.

El-Absy, K. M., Khazen, N. A., Al-Rashidi, M. M., Al Anezi, B. B., Al Anezi, F. H., Al Atawi, N. S & Al Balawi, H. N. (2019). Comparing between Germination Percentage in Moringa peregrina and Moringa oleifera under Laboratory Conditions. Asian Plant Research Journal, 2(4) 1-9.

Fahey, J. W. (2005). Moringa oleifera: a review of the medical evidence for its nutritional, therapeutic, and prophylactic properties. Part 1. Trees for life Journal, 1(5), 1-15.

Khan, S., Basra, S. M. A., Afzal, I., & Wahid, A. (2017). Screening of moringa landraces for leaf extract as biostimulant in wheat. International Journal. Agriculture Biology, 19, 999-1006.

Materechera, S. A. (2015, November). In uence of pre-sowing seed treatments on the germination of moringa (Moringa oleifera Lam.). In I International Symposium on Moringa 1158 (pp. 149-158).

ISBN: 978-9952-8545-1-0 https://doi.org/10.30546/19023.978-9952-8545-1-0.2025.0756

Mishra, S. P., Singh, P., & Singh, S. (2012). Processing of Moringa oleifera leaves for human consumption. Bulletin of Environment, Pharmacology and life sciences, 2(1), 28-31.

Moyo, B., Masika, P. J., Hugo, A., & Muchenje, V. (2011). Nutritional characterization of Moringa (Moringa oleifera Lam.) leaves. African Journal of Biotechnology, 10(60), 12925-12933.

Oduro, I., Ellis, W. O., & Owusu, D. (2008). Nutritional potential of two leafy vegetables: Moringa oleifera and Ipomoea batatas leaves. Scienti c Research and Essays, 3(2), 057-060.

P rez-Garc a, F., & Gonz lez-Benito, M. E. (2006). Seed germination of ve Helianthemum species: Effect of temperature and presowing treatments. Journal of Arid Environments, 65(4), 688-693.

Rajput, H., Prasad, S. G. M., & Srivastav, P. (2019). Nutritional quality analysis of dry Moringa powder verity-PKM- 1. The Pharma Innovation Journal, 8(7), 95-98.

Shahzad, U., Jaskani, M. J., Awan, F. S., Shahjahan, M., & Abbas, S. (2018). Genetic divergence of Moringa oleifera, economically important, yet an endangered species from Pakistan. International Journal of Agriculture and Biology, 20(7), 1497-1504.

Sujatha, B. K., & Patel, P. (2017). Moringa Oleifera Nature s Gold. Imperial Journal of Interdisciplinary Research, 3(5), 1175-1179.

Rani, E. A., & Arumugam, T. (2017). Moringa oleifera (Lam) A nutritional powerhouse. Journal of Crop and Weed, 13(2), 238-246.

Ullah, S., Fahad, S., Latif, N., Mirza, S. N., Shahzad, H., Rizwan, M., & Khan, M. A. (2019). 84. Growth potential of primed Moringa oleifera varieties under nursery and eld conditions of Potohar region -Pakistan. Pure and Applied Biology, 8(1), 813-819.

Dawood, N. (2020). Effect of RF plasma on Moringa seeds germination and growth. Journal of Taibah University for Science, 14(1), 279 284. https://doi.org/10.1080/16583655.2020.1713570

Iralu, V., Barbhuyan, H. S. A., & Upadhaya, K. (2019). Ecology of seed germination in threatened trees: A review. Energy, Ecology and Environment, 4(4), 189 210. https://doi.org/10.1007/s40974-019-00121-w

Khurana, E., & Singh, J. S. (2004). Germination and seedling growth of ve tree species from tropical dry forest in relation to water stress: Impact of seed size. Journal of Tropical Ecology, 20(4), 385 396. https://doi.org/10.1017/S026646740400135X

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LAND COVER OF GILGILCHAY BASIN AND CHARACTERIZATION OF LAND FUND USE

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Introduction

The current state of land cover and land fund use is characterized. It was determined that washed brown mountain-forest soils have a higher weight (22777 ha). The remaining soils are distributed in descending order as follows: carbonate and partially deserted brown mountain-forest (16096 ha); grassy mountain meadow (14471 ha); dark and ordinary mountain gray-brown (9467 ha); typical brown mountain-forest (8701 ha); dark and ordinary mountain-chestnut (4779 ha); carbonate residue, partially deserted brown mountain-forest (4376 ha); meadow-gray (1980 ha); light meadow-gray (1002 ha); oodplain-alluvial-meadow (2746 ha); gray and gray-brown (2627 ha); typical brown mountain-forest (1752 ha).

The Gilgilchay basin is considered to be moderately developed (36.78%) in terms of agriculture. Along with natural landscapes, anthropogenic landscapes (settlements, roads, etc., farmland - arable land, perennial plantations, etc.) are also spread within the basin. The following data were used in the analysis of the degree of anthropogenic assimilation of the basin area: the structure of farms; distribution of farms within landscape types (assimilation degree of landscape complexes).

Keywords: Gilgilchay basin, landscape, farm location, area, ARCGIS program

Analysis and discussion

There is the following structure of farms in the Gilgilchay basin: arable land, perennial crops, pastures, hay elds, fallow lands. Research and calculations based on ArcGIS show that the total area of farmland in the Gilgilchay basin is 31042 ha (34.25% within the basin), of which 3,541 ha or 11.41% are irrigated, the rest, 27501 ha or 88.59% are non-irrigated areas.(Figure_1)

The total area under crops in the Gilgilchay basin was 7397 hectares, accounting for 23.81% of farmland, and its speci c weight in the basin is 8.21%. The speci c weight of perennial crops in our research object does not exceed 86 ha. This accounted for 0.28% of

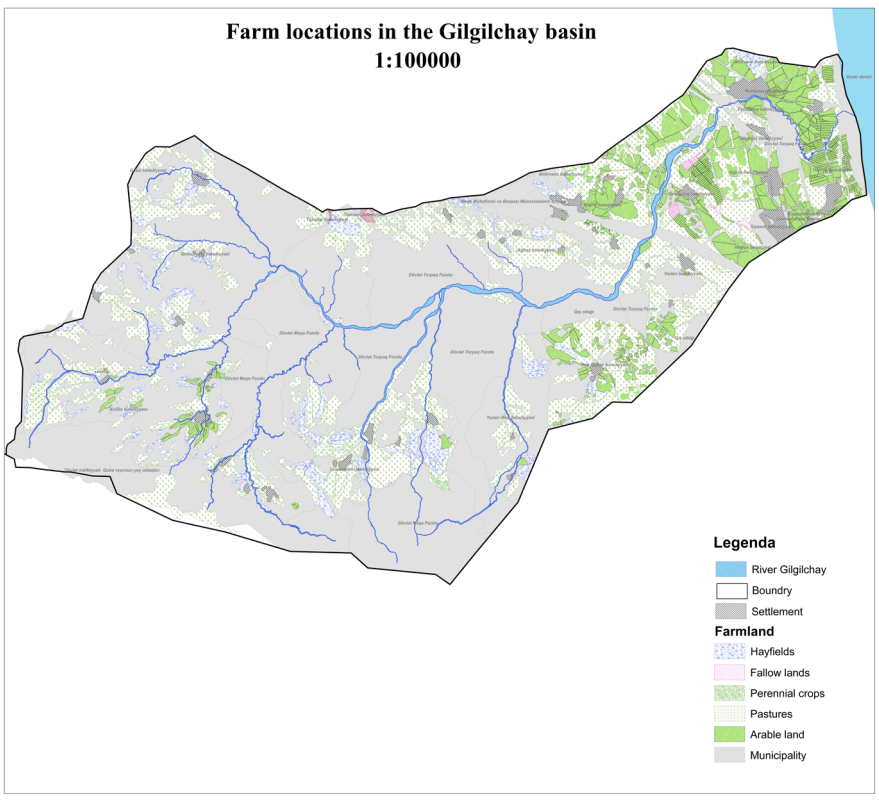


Figure.1 Farm location in the Gilgilchay basin with program ARCGIS

the total area of farmland and 0.097% of the basin area.

Researches show that pastures in the Gilgilchay basin have a higher weight. Pastures account for 65.51% or 20342 hectares of farmland. The speci c weight of this farm within the basin is also signi cantly higher (22.40%).

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The area of hay elds within the basin, which is another important economic area, is 3032 ha, and has a speci c weight of 9.79% within the farm area. The speci c weight of this farm within the basin was 3.34%. One of the farms with a small speci c weight (0.42%) within the farms is the registered lands (130.0 ha) in the Gilgilchay basin.

Thus, the analysis of farmland within the Gilgilchay basin shows that arable + peaceful and perennial plantings, which are of greater economic importance, accounted for a total of only 8.38% (7613 ha) within the basin. Within farms, their speci c weight was 24.51%. The distribution of farmland in the administrative districts and administrative-territorial districts within the Gilgilchay basin is also of interest. Researches show that 28.9% of the farmland in the Gilgilchay basin or 8980 ha include to Shabran region; 47.7% or 14793 ha include to Siyazan, 23.40% or 7269 ha to Guba administrative region. There are sharp differences in the distribution of farmland within administrative districts. Thus, while the sown area was only 12.21% (903 ha) in Shabran region, this gure was 82.24% (6080 ha) in Siyazan region, and only 5.55% (414 ha) in Guba region. The speci c weight of other farms within the administrative districts was also different. Similarly, there are differences in the distribution of perennial crops. Thus, 52.27% or 46 ha of perennial crops are located in the territory of Shabran region, 47.72% or 40 ha in the territory of Siyazan region.

The total area of settlements within the Gilgilchay basin was 1908.36 ha (1.86%), of which 17.09 % (326.19 ha) was in Guba, 20.02 % (385.96 ha) was in Shabran, 62.68% (1196.21 ha) falls to the share of Siyasan districts.

Conclusion

Broad-leaved forest and post-forest forest-shrub landscape of sharply fragmented middle mountain range in the Gilgilchay basin, sharply fragmented middle-mountainous broad-leaved forest and post-forest landscape-type medium-mountainous landscape. The total area of this landscape type is 58,664 ha, covering 64.67% of the basin area. The climate of this area is mostly cool.

The broad-leaved forest of the sharply fragmented middle mountain range and the post-forest landscape-shrub landscape type are considered to be moderately assimilated areas in terms of economy. The area of farmland here is 14,897 hectares, which is 25.4% of the landscape zone.

The area of natural lands not used or partially used in economic turnover within the area is 43081 ha, which is 73.44 % of the lanscape area.

The broad-leaved forest landscape of the moderately fragmented lowland is one of the most economically assimilated areas. Thus, the area of farmland here was 8735 hectares, which was 61.14% of the landscape zone. The area of unused or partially used natural lands within the territory is 4781 ha, which is 33% of the landscape area

The arid forest-shrub landscape of the intensively fragmented foothills has undergone anthropogenic changes due to intensive farming and cattle-breeding. The existing plant formations are mainly derivative, steppe-xerophilic. Thus, the area of farmland here was 1493 hectares, which was 85.16% of the landscape zone. The area of unused or partially used natural lands within the territory is 238 ha, which is 13.59% of the landscape area.

The area of semi-desert landscape of medium and weakly divided mountain plains and lowlands is 7092 ha, covering 7.82% of the basin area. He was strongly disliked as a result of his economic activities

The semi-desert landscape of the middle and weakly divided mountain plains and lowlands attracts attention with its high degree of settlement. Within this landscape type, the total area under settlements, roads and man-made facilities was 728 ha, or 8.04% of the landscape area.

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REFERENCES

1. Babayev, M.P.The Institute of Soil Science and Agrochemistry of Azerbaijan National Academy of Sciences in independence years (1991-2011). // -Samsun: Eurasian Soil Wokrshop, -2013. №4, -p. 46-47.
2. Babayev, M.P. National Reference Base of Anthropogenic Soil Resources in the Azerbaijan Republic // -Bishkek: Special Issue for Agricasia "1st Central Asia Congress on Modern Agricultural Techiques and Plant Nutrition", -2013. Vol. 2, Number 2 (1), -p. 885-890.
3. Hajıyeva, A.Z.. Antropogenic transformation of natural landscapes in the south-eastern slope of greater Caucasus (based on study of pasturehayfield landscapes) // -Baku: Azərbaycan Coğrafiya Cəmiyyətinin "Coğrafiya və təbii resurslar" jurnalı, -2016. -p. 39-44.
4. Hajıyeva, A.Z. Stady of the pasture-hayfield transformation of natural landscapes in the south-eastern slope of Greater Caucasus and relevant risks and dangers through special observation squares // Journal Massachusetts Review of Science and Technologies, -2016. Vol.VII. №1(13), -p.253-260.
5. Hasanov, V.H. Morphogenetical diagnostics of alluvial-meadow-forest soils in dry subtropics in the floodlands of Azerbaijan // -Bishkek: Soil-Water Journal, -2013. Volume 2 Number 2 (1), -p. 1167- 1177.
6. Hasanov, V.H. Change of the morphogenetic peculiarities of plain alluvial-meadowforest soils under an anthropogenic influence in the dry subtropics river valleys of Azerbaijcan. // 9th International Soil Science Congress on "The Soul of Soil and Civilization", -Side, Antalya,Turkey, -2014, -p.33- 40
7. Hasanov, V.H. Enviromental genetic features and diagnostics of alluvial marsh marled soils in the dry-steppe subtropical zone of the Kura floodplain // -Moscow: Russian Agricultural Sciences, -2017. Vol. 43, No. 3, -p. 249–254
8. Ismayilov, A.I. Soil Resources Of Azerbaijan // Soil Resources of Mediterranean and Caucasus Countries / Y. Yigini, P. Panagos, and L. Montanarella, (eds). Office for Official Publications of the European Communities, Luxembourg, -2013, -243 p., -p. 18-39.
9. Mamedov, G.Sh., Heydarova, R.M. Soil mappinq of the Mil plain of Azerbaijan Based on the Aerospase materials. // European American Global journal of Aqricultural research, -2016. Vol. 4, № 6, -p.7-12.
10. Mamedov, G.Sh. Ecoethic problems of Saline and Salty soils in Azerbaijan. // "Ecological engineering and environment protection" 5-th international conference proceedinqs. -Plavdiv, Bulqaria, -June 5-7, -2017, -p. 55-62.
11. Mamedov, G.Sh., Mammadova, S.Z. Ecoethic problems of soil erosion in Azerbaijan. // "Ecological engineering and environment protection" 5-th international conference proceedings. -Plavdiv, Bulgaria, -June 5-7, -2017, -p. 75-80.
12. Mamedov, G.Sh., Shabanov, J.A., Kholina, T.A. Ecological Assessment of Soils in High-Mountain Landscapes of Northeastern Part of the Greater Caucasus (Azerbaijan). // Journal "Eurasian Soil Science" -2017,. Vol. 50, №5, -p. 630-635.

ISBN: 978-9952-8545-1-0 https://doi.org/10.30546/19023.978-9952-8545-1-0.2025.0756

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SOILS OF LANKARAN-ASTARA ECONOMIC REGION OF AZERBAIJAN

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