ISSN: 2347-7431
EPRA International Journal of Climate and Resource Economic Review
-Peer Reviewed Journal
Volume: 11 | Issue: 4 |July 2023 || SJIF Impact Factor (2023): 8.076 || Journal DOI: 10.36713/epra1213

ORGANIZATIONAL-ECONOMIC BASES OF THE IMPACT OF CLIMATE CHANGE ON AGRICULTURE AND DIRECTIONS OF INSURANCE

Kodir Nosurullaev
PhD student, "Tashkent Institute of Irrigation and Agricultural Mechanization Engineers" National Research University, Uzbekistan

ABSTRACT---

The Central Asian region is particularly vulnerable to the effects of climate change, which will exacerbate an already difficult situation characterized by low rainfall, aridity, severe weather fluctuations and uneven distribution of resources. Measures for adaptation to climate change are included in the complex of preventive / preparatory / response measures to combat the negative effects of climate change. Such measures are aimed not only at mitigating the negative impact, but also at maximizing the use of existing opportunities.

The fact is that adaptation measures (in addition to other development priorities) are, in fact, very costly: hence the lack of funding. In addition, there is a lack of local experience with climate change modeling and conflicting models and forecasting methods that are then difficult to use to build comparative data. We should not disregard the fact that traditionally the accuracy of predicting climate change is not high. Despite the differences in situations in the five countries of the region, two critical priorities for adaptation measures are relevant for the entire region. These priorities were water and agriculture.

Based on the results of the analysis , it was concluded that over the past few years, the region has made significant progress in the field of adaptation – identified high-risk areas, proposed adaptation measures, drafted national adaptation plans and, finally, formed a small fund of "best practices" in the field of application of adaptation measures. Further activities are proposed to be concentrated in the following areas: 1) improving the quality of the proposed measures (eliminating inconsistencies between the required and proposed measures) and 2) promoting the implementation of adaptation measures (eliminating inconsistencies between the proposed and actually implemented local measures). Beyond the water and agriculture sectors, there is a need for more research and policy action in the health, forestry and biodiversity sectors.

KEYWORDS: *climate change, agriculture, fruits and vegetables, indestructibility, insurance*------------------

INTRODUCTION

Climate change remains one of the most important challenges and threats to humanity. It has significant economic costs. Greenhouse gas emissions are external factors and represent the biggest market failure the world is facing [Stern, 2008]. The negative impacts of climate change vary across sectors. Agriculture remains one of the hardest hit sectors, facing significant change due to increased emissions and temperatures. At the same time, agricultural development also contributes to greenhouse gas emissions. Thus, this commentary aims to analyze the two-way relationship between climate change and agriculture.

It is estimated that global warming of 2°C, as in the most optimistic forecast, could reduce agricultural production by up to 25%. The results of many country studies demonstrate that climate change can lead to significant losses in the agricultural sector. Data from Peru show that high temperatures reduce agricultural productivity as farmers respond to reduced yields by increasing planted areas during the agricultural year. It is important to note that family members, including children, work more on the farm when faced with high temperatures. These changes in resource use partially offset the fall in agricultural income. In addition, in hot years, farmers change the structure of their products. This strategy can lead to land degradation and negatively affect the accumulation of human capital, as children spend less time on education [Aragon et al., 2019].

Other examples of negative impacts of climate change on agriculture include the cases of African countries. For example, in 2007 a severe drought in Lesotho, one of the least developed countries in southern Africa, dramatically reduced crop yields and raised food prices. As a result, 20% of the country's population was in need of emergency food aid. Climate change is estimated to have contributed to a 50% reduction in the number of self-sufficient households in Lesotho and caused a 37% decline in average household purchasing power. It should be noted that high dependence on imports, rainfed agriculture and extreme climate variability are the main features of many African countries [Otto et al., 2021].

The forecasts for the agricultural sectors of advanced economies are also not encouraging. Estimates based on various climate models predict that future climate change will reduce annual U.S. corn yields by about 15% in 2050. Estimated production volumes and average prices for 2006-2010 show that a 15% yield loss would result in an annual loss of $6.7 billion by 2050. The study predicts significant costs for future climate change in the absence of unprecedented adaptation [Burke and Emerick, 2016]. Many studies predict that changes in temperature and precipitation will lead to a marked increase in food prices by 2050. Under conditions of high uncertainty, by 2050 food prices may rise up to 84% [Carraro, 2016]. Moreover, climate change affects human health, and there are clear implications for mental health and well-being on the rise. Rural communities are recognized as one of the most vulnerable segments of the population. Therefore, a well-informed rural population is concerned about the environmental, financial, health and social impacts of climate change [Austin et al., 2020]. Thus, the direct impacts of climate change on the agricultural sector include increased temperatures, weather variability, shifting agro-ecosystem boundaries, invasive species and pests, and more frequent extreme weather events. This reduces yields, the nutritional value of staple crops, and livestock productivity [World Bank, 2021]. Climate change is pushing up food prices, which is a major concern in low-income countries dependent on food imports.

At the same time, agricultural activities, in particular the cultivation of crops and livestock for food production, remain an important driver of climate change. Various agricultural soil management practices, including the application of synthetic and organic fertilizers, the growth of nitrogen-fixing crops, the drainage of organic soils, and irrigation, increase the availability of nitrogen in the soil and lead to emissions of nitric oxide (N2O). Livestock, especially cattle, produce methane (CH4) as part of their normal digestive processes. Moreover, manure management practices also contribute to CH4 and N2O emissions. In 2019, the agriculture sector accounted for 10% of total U.S. greenhouse gas emissions, and has increased by 12% since 1990. Of note, N2O emissions from soil management increased by 9%, while CH4 and N2O emissions from livestock manure management systems increased dramatically to 60% [Environmental Protection Agency (EPA), 2021a].

Various sources show different contributions of agriculture to global greenhouse gas emissions. According to the US Environmental Protection Agency (EPA, 2021b), the agricultural sector accounted for 24% of global greenhouse gas emissions in 2010. This share was a direct result of crop and livestock production and deforestation. OECD (2016) notes that agriculture accounts for a significant share of greenhouse gas emissions that cause climate change – 17% directly from agricultural activities and another 7-14% from land-use change. The World Bank (2021) indicates that agriculture currently accounts for 19–29% of total greenhouse gas emissions. The Bank notes that without action, this percentage could rise substantially as other sectors reduce their emissions. Thus, the share of agriculture in global greenhouse gas emissions is about 30%.

To mitigate the negative effects of climate change, the Food and Agriculture Organization of the United Nations (FAO) is proposing a climate-smart approach to agriculture. The approach has three main goals. First, it aims to increase agricultural productivity and income. Second, it is designed to adapt and build resilience to climate change. Third, it aims to reduce and/or eliminate greenhouse gas emissions [FAO, 2021]. However, cross-country differences in adaptation strategies are significant. Developed countries are leading in this process. Scientists from various advanced countries are conducting various studies on changing the menu for cattle. Recently, US researchers found that green, red or amber algae could be the perfect new ingredient on a cattle menu. In particular, Asparagopsis taxiformis , a red algae found in the tropics, can suppress up to 80% the production of methane in the stomach of cows. Researchers at the University of Copenhagen conducted the same study in 2019, experimenting with various algae found in the North Sea. They found a consistent reduction in methane emissions of about 20%. At the same time, start-ups from the UK have proposed burping masks for cattle to neutralize methane. Many developed countries are also considering new food management systems to reduce food waste [De Lorenzo, 2021].

The situation is different in developing and low-income countries. Traditional agriculture remains a key source of income. Farmers are not considering adaptation strategies, not only because of financial and technological constraints, but also because of a lack of awareness of the bilateral relationship between climate and agriculture. Therefore, the global response to the problem will be uneven. Policy makers in developing countries should take this issue into account.

Agribusiness representatives should also be concerned about the future of the sector in the face of climate change. However, agricultural corporations are responding to this global common problem in different ways. In the US, big companies are actively lobbying against climate policy. In particular, meat and dairy companies are working together in a similar fashion to the fossil fuel industry, which has built up widespread opposition to climate policy. Typically, influence occurs through lobbying, political campaigning, and academic research. In particular, they fund their own academic experts, who then publish studies minimizing or denying a causal relationship between animal husbandry and climate change. It should be noted that since 2000, six large American groups have together spent about $200 million on lobbying [Samuel, 2021].

Thus, climate change and the agricultural sector have bilateral impacts. To mitigate mutual negative effects, there is a great need for multilateral cooperation, since individual countries cannot solve these problems. Governments around the world should start their own intervention policy. At the same time, developed countries and international development institutions should assist developing and low-income countries in their adaptation strategies. Developing countries, in turn, must work to raise awareness of the problem, which will enable the responsible private sector to change its management practices. Large corporations, together with governments, must invest in new technologies that are beneficial to agriculture, as well as change food management systems. This policy can contribute to the sustainable development of the agricultural sector in the face of climate change.

MATERIALS AND METHOD

Research methods are based on the concept of climate-smart agriculture proposed by the Food and Agriculture Organization of the United Nations (FAO UN). The information base of the study was the data of statistical observation of Uzbekistan and Central Asia, the annual reports of the UN FAO on food security of countries and climate change, the Ministry of Agriculture of Uzbekistan, etc. In the process of working with information arrays, the authors used methods of economic and statistical analysis. The study also used such general scientific methods of cognition as analysis, grouping, generalization, systematization, comparative and integrated approaches.

RESULTS AND DISCUSSION

The agricultural insurance market offers the following types of insurance for vegetable crops:
Insurance of financial losses of agricultural producers as a result of a shortfall in the harvest of vegetable crops on open ground;
Insurance of financial losses of farmers-producers of agricultural products due to a shortage of agricultural crops due to damage to vegetable crops in open ground by frosts;
Insurance of financial losses of agricultural producers as a result of crop shortages;
Vegetable crops planted in open ground: cabbage, beets, carrots, onions, garlic, tomatoes, cucumbers, peppers, Bell Peppers, eggplants, radishes, turnips, radishes, zucchini, squash and other vegetables.
Gourds: melon, watermelon, pumpkin and other gourds.

The insurance contract is concluded for 1 (one) agricultural year for crops sown no later than the calendar dates (approved by the Ministry of Agriculture and the Ministry of Water Resources), and for 20 (twenty) days after germination, based on the positive opinion of the Insurer after studying the area and condition of the sown areas.
Insurance risks - wind, storm, hail, heavy rain (mudflow), avalanche, fire, explosion, lightning, drought and garmsil, sharp drop in air temperature, frost, heavy snow, low water (deficit), high water level (flood) .
An insured event is the financial loss of the Insured as a result of a shortage and loss of crops of vegetables and gourds due to insurance risks.

The insured value is the value of the crop, determined on the basis of the average yield for the last 3 (three) years, based on the selling price of 1 centner of products or on the basis of a contractual agreement.

Sum insured – an amount not exceeding 50 (fifty) percent of the insured value.

The insurance premium is determined on the basis of the insurance tariff (rate) approved by the Insurer in relation to the Sum Insured.

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If the possibility of harvesting is reduced or lost as a result of damage or loss of the insured crop, the Policyholder shall notify the Insurer of the incident within 3 (three) days. The notification is written in free form and includes the month, day, period of the incident, the name of the incident, its duration, speed or intensity, the name of the damaged orchards, how it was damaged (briefly), the sown area, if there are perpetrators - information about them. The difference between the insured value of the crop and the value of the crop obtained from one hectare of sown area in the current year is the loss incurred by the insured person.

The amount of financial loss is calculated separately, taking into account all products received.

In the case of the main vegetables grown in the open field (cabbage, cucumber, tomato, beetroot, carrot, potato, onion and garlic), the insurance indemnity is determined for each of them separately, and for other vegetables - by groups.

Currently, there are a number of problems in the development of the sphere of insurance of horticultural, melons and melons and potatoes:
Including:
low level of coverage when concluding insurance contracts with farms;
a database, according to a preliminary assessment, of insurance risks has not been formed;
lack of free funds during the period of crop care to pay the insurance premium on time, in order to ensure the execution of insurance contracts concluded by policyholders;
the funds allocated for the payment of the insurance premium are not included in the composition of borrowed and credit funds directed to the insurers for the production of products.
insufficient organization of work to control the timely implementation of agrotechnical measures for the care of crops during the period of the insurance contract.
Recommendations for the elimination and improvement of existing problems in the insurance of horticultural, vegetable and melon crops:
Adoption of a special law "On agricultural insurance";
Allocation of special funds for the payment of insurance premiums in order to ensure the execution of insurance contracts through loans and credits allocated to farms specializing in fruit and vegetable growing;
preparation of special radio and television programs on the provision of insurance services to farms in the field of fruit and vegetable production;
Organization of a monitoring system for the care of crops and carrying out agrotechnical activities during the period of the insurance contract.

Through the implementation of the above proposals, it is possible to achieve insurance protection for farms operating in the field of horticulture from various natural disasters and ensure their financial sustainability.
According to the Decree of the President of the Republic of Uzbekistan No. 387 “On additional measures for financial support of agricultural production” dated 07.02.2022. agricultural enterprises are allocated loans from the budget for growing fruits, grapes, potatoes, vegetables, melons, herbs and medicinal plants, legumes and oilseeds.

An insurance policy for insuring the risk of non-repayment of credit funds or crop risk insurance can be accepted as collateral for loans provided to crop producers and used to repay loans;
50 percent of crop insurance expenses of crop producers are covered by the State Support Fund for Agriculture.
The Ministry of Finance was instructed to ensure the allocation of the necessary funds from the State Budget of the Republic of Uzbekistan to the State Support Fund for Agriculture in order to cover 50 percent of crop insurance costs for crop producers for 2023 and subsequent years

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Table 1. Summary of four SRES profiles and scenarios emissions by 2100

A1	A2	B1	B2
• rapid economic growth; • the peak of the world population by the middle of the century, followed by a decline; • introduction of faster and more efficient technologies; • capacity building, regional convergence and enhanced cultural and social interactions; • Scenarios of this profile are further subdivided into three sub-profiles: A1B (balance between all energy sources); A1T1 (non-fossil energy sources) and A1F1 (fossil energy intensive)	• regional orientation of economic development; • fragmentation and slow process of technological change; • constant growth of the world population; • heterogeneity of the world, arrogance; • preservation of local identity.	• the peak of the world population in the middle of the century and its decline thereafter; • rapid changes towards the development of services and the information economy; • introduction of environmentally friendly and resource -saving technologies; • global solutions for economic, social and environmental sustainability; • regional convergence.	• solutions for economic, social and environmental sustainability at the local level; • continuous growth of the world population at a slower pace compared to profile A2; • average level of economic development; • less rapid but more diverse technological changes compared to profiles A1 and B1; • Ensuring environmental protection and social justice at the local and regional levels.

A number of Atmospheric and Oceanic General Circulation Models (GCMs) can be used to assess regional climate changes. Various models or their combinations are usually used to construct climate change scenarios . In Uzbekistan, for example, data from six models were averaged: CGCM1-TR, CSIRO-TR, ECHAM4, HadCM3, CCSR-NIS, GFDL-TR. MAGICC / SCENGEN 4.1 software. was used for the analysis.

Table 2 below shows estimates of climate change scenarios for the countries of Central Asia using temperature and cage numbers . These scenarios provide possible pictures of climate change in Central Asia for the periods up to 2030, 2050 and 2085 compared to the base period 1961-1990. Some countries take into account and average data from all four SRES emissions scenarios (P-50 - medium scenario) , and in other countries scenarios A2 (pessimistic) and B2 (optimistic). This part of the report is based entirely on the results reported in the national communications of the five countries.

Table 2. Temperature and precipitation scenarios for Central Asia

A country	2030	2050	2085
Kazakhstan	T: +1.4 °C P: +2%	+2.7 °C + 4%	+4.6 °C +5%
Kyrgyzstan (A2; B2)	T: -/- P:	-/-	6.1°C; 4.6°C -2.2%; +8.3%
Tajikistan	T: + 0.2-0.4 °C P: +2%	-/-	-/-
Turkmenistan	T: -/- P:	-/-	+ 4.6 - 5.5 ° C - 17-56%
Uzbekistan (B2)	T:1.2°C P: 2.0%	2.2°C;4.0%	3.3°C 3.5%
Average for CA	T: 1.02°C P: 2.0%	3.1°C 4.0%	4.7 °C -2%

T - Temperature ; P - Precipitation ; -/- - Data not found

Uzbekistan: Estimated changes in mean annual temperature and annual precipitation by region are made for GHG emission scenarios A2 and B2. The scenarios show a significant increase in temperature on the territory of Uzbekistan, especially in winter. According to calculations, the increase in minimum temperatures will be more intense than the maximum ones. With regard to precipitation: there may be a slight increase in precipitation in the winter season (December-February). Possible increase in the number of days with heavy precipitation. Such a forecast increases the risk of mudflow formation .

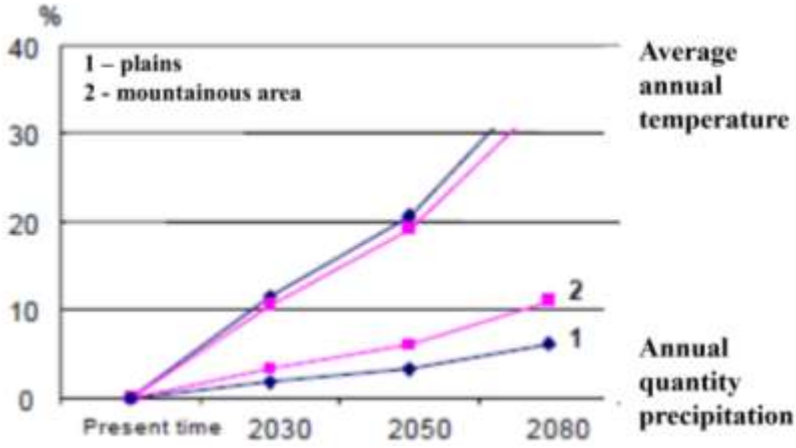

Figure 3. Estimated standard deviation of change in perspective, averaged data from scenarios A2 and B2 for mountainous and lowland areas of Uzbekistan (SNC, p. 70)

Vulnerability is defined in terms of exposure, sensitivity and adaptability or ability to adapt. In other words, the vulnerability assessment should assess the impact of climate change on a particular sector, the sector's sensitivity to such changes, and, finally, the ability to adapt to expected changes.

Adaptive capacity is defined as "the property of a system to adapt its characteristics or behavior in order to expand the range of coping impacts resulting from current climate change or future climatic conditions".

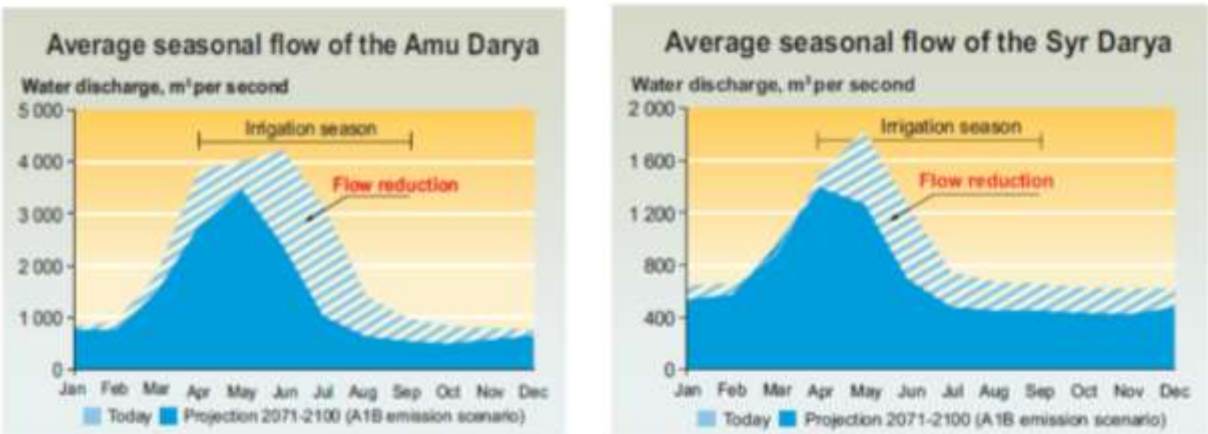

Figure 4. Forecasts of average seasonal flows of the Amu -Darya and Syr-Darya

With regard to agriculture and ecosystems, almost all observed climate change has multifaceted impacts on ecosystems. For example, an increase in minimum temperatures and a subsequent decrease in the number of cold days can lead to reduced damage to some crops and increased damage to other crops, and the expansion and activation of some pests and disease vectors. Increasing rainfall irregularities can have a negative effect on the timing of heavy rains followed by droughts, resulting in an increased risk of soil erosion. At other times, except during the summer season, such heavy rains do not benefit in terms of the necessary soil moisture, since the soil cannot quickly absorb moisture. Surface runoff and high air temperature contribute to the evaporation of moisture.

Table 3. Regional Impact and Vulnerability to Climate Change in Central Asia

Impact (T&R)	Vulnerability by sector
Temperature • According to scenario A2 (pessimistic), by the end of the 21st century, the increase in the average annual air temperature compared to the base period (1960-1990) will vary from 4.7°C in Kyrgyzstan to 5.5°C in Turkmenistan (Table 2) • Under scenario B2 (optimistic), the expected increase in annual air temperature will be 1-1.5% lower than under scenario A2. For example, in Uzbekistan, in the long term, the average temperature increase is expected to be +4°C for A2 and + 3.3°C for B2	**Water resources** • In Kazakhstan, for example, by 2030, water resources in mountainous areas will increase in the range from 0.8 - 4.5% to 14.0-22.5%, while in lowlands there will be a decrease of 7.0 - 10.3%. • In the short term (until 2030) the water resources of the Amudarya basin may decrease by 5 to 8% compared to the current level, while the deviations will be minimal for the Syrdarya basin. • By 2050, water runoff in the Amudarya and Syrdarya basins will dry up by 10 to 15 and 6 to 10%, respectively. • The northern plains of Central Asia will experience a decline in water resources of 6-10% by 2030 and 4-8% by 2050.
Resources • Insufficient funding and lack of economic valuation of adaptation measures. • Imperfect system for financing environmental protection.	**Agriculture and Ecosystems** • The main pressures on water resources in Central Asia will be in the irrigated agriculture sector, resulting in an overall decline in productivity in the range of 15-50%. • Livestock productivity will decline with a reduction in pasture land and a 30% decline in the fertility of existing pastures. • Water scarcity and droughts will greatly affect the water supply of natural resources in general, resulting in loss of biodiversity, deterioration of water quality, increased risk of forest fires and loss of soil fertility.
Economy • Weak incentives for users of natural resources to introduce new technologies. • Lack of incentives for the industrial sector to meet high standards.	**Hydropower** • Under the most unfavorable climate change scenarios, the total hydropower potential of the rivers flowing into Issyk-Kul could fall by more than half of its previous level by 2100.
Extreme events • Increased risk of dangerous and extreme hydrometeorological events such as hail, drought, extreme high or low temperatures, etc., which will cause an increase in emergency situations, including heavy rainfall, mudflows, landslides, avalanches, floods and droughts, earthquakes	**Mudflow** • Mudflow intensification is possible ; • With climate warming by 2-30C, the upper boundaries of the watersheds will rise to above 4000 m, and the watershed area will increase several times, which will turn into a potential source of mudflows.
Information management • Lack or lack of monitoring data and information on vulnerability to climate change. • Lack of climate change data in national languages hinders public awareness and dissemination of updated climate information in rural remote areas • High uncertainty in climate change projections and vulnerability assessments	**Health** • Increase in infectious diseases and incidents of infection, including malaria. • Increase in diseases of the circulatory system, malignant neoplasms and diseases of the cardiovascular system. • Increased risk of heat and cold stress in the population. • Increase in gastrointestinal diseases in areas of insufficient water supply, especially in rural areas.

DISCUSSION

The national communications of the countries and the above-mentioned materials name the following common for the region, problems associated with climate change, including:

Increasing scarcity of existing water resources and deterioration of their quality;
Increased risk of dangerous and extreme hydrometeorological events;
Increased risk of disease and stress associated with climate change;
Increased risk to existing ecosystems and threat to biodiversity.

CONCLUSIONS

Improve the efficiency of the irrigation system and save water resources; increase crop yields and livestock productivity; Transboundary water management; implement integrated water resources management (IWRM) at all levels; develop better management systems in the water sector. Combating soil degradation; take preventive health measures; create conditions for the conservation and maintenance of lake and river ecosystems.

REFERENCES

1. *Aragon, Fernando, Oteiza, Francisco and Juan Pablo Rude (2019). How do farmers cope with extreme heat? Available at https://voxdev.org/topic/agriculture/how-do-farmers-cope-extreme-heat. Retrieved 20.04.2021.*
2. *Burke, Marshall and Kyle Emerick (2016). Adapting to Climate Change: Data from US Agriculture. American Journal of Economics: Economic Policy, 8(3): 106–140.*
3. *World Bank (2021). Climate-smart agriculture. Available at https://www.worldbank.org/en/topic/climate-smart-agriculture. Retrieved 17.04.2021.*
4. *De Lorenzo, Daniela (2021). A diet of seaweed can reduce CO2 emissions in cattle. Available at https://www.forbes.com/sites/danieladelorenzo/2021/04/20/a-seaweed-diet-could-reduce-cattles-co2-emissions/?sh=bf936a84b9f0. Retrieved 20.04.2021.*
5. *Carraro , Carlo (2016). Climate Change: Scenarios, Impacts, Policies and Development Opportunities. Agricultural Economics, 47: 149–157.*
6. *Austin, Emma K., Rich, Jane L., Kiem, Anthony S., Handley , Thonell , Perkins, David and Brian J. Kelly (2020). Concern about climate change among rural Australians. Journal of Rural Research 75: 98–109.*
7. *Otto, Friederike, Verschoor , Jasper and Piotr Wolski (2021). How climate change affected food insecurity during the 2007 Lesotho drought. Available at https://www.weforum.org/agenda/2021/03/lesotho-and-south-africa-the-effects-of-daught-on-climate-change/. Retrieved 04/18/2021.*
8. *OECD (2016). Agriculture and climate change: Towards sustainable, productive and climate-friendly agricultural systems. Retrieved 04/18/2021.*
9. *Samuel, Segal (2021). It's not just big oil. Big Meat is also spending millions to stifle good climate policy. Available at https://www.vox.com/future-perfect/22379909/big-meat-companies-spend-millions-lobbying-climate. Retrieved 04/18/2021.*
10. *Stern, Nicholas (2008). Economics of climate change. American Economic Review: Papers and Materials, 98: 2-37.*
11. *FAO (2021). Climate-smart agriculture. Available at http://www.fao.org/climate-smart-agriculture/en/. Retrieved 17.04.2021.*
12. *EPA (2021a). Sources of greenhouse gas emissions. Emissions from the agricultural sector. Available. Retrieved 04/18/2021.*
13. *EPA (2021b). Global data on greenhouse gas emissions. https://www.epa.gov/ghgemissions/global-greenhouse-gas-emissions-data#Sector. Retrieved 04/18/2021.*
14. *Durmanov, A., Kalinin, N., Stoyka , A., Yanishevska , K., & Shapovalova , I. (2020). Features of application of innovative development strategies in international enterprise. International Journal of Entrepreneurship, 24 (1 Special Issue), 1–9.*
15. *Tkachenko, S., Berezovska, L., Protas, O., Parashchenko , L., & Durmanov , A. (2019). Social partnership of services sector professionals in the entrepreneurship education. Journal of Entrepreneurship Education, 22 (4).*
16. *Durmanov, AS, Tillaev, AX, Ismayilova, SS, Djamalova , XS, & Murodov , SM ogli . (2019). Economic-mathematical modeling of optimal level costs in the greenhouse vegetables in Uzbekistan. Espacios, 40 (10).*
17. *Shulga, O., Nechyporuk, L., Slatvitskaya, I., Khasanov, B., & Bakhova, A. (2021). Methodological aspects of crisis management in entrepreneurial activities. Academy of Entrepreneurship Journal, 27 (SpecialIssue 4), 1–7.*
18. *Durmanov, A., Bartosova, V., Drobyazko, S., Melnyk, O., & Fillipov, V. (2019). Mechanism to ensure sustainable development of enterprises in the information space. Entrepreneurship and Sustainability Issues, 7 (2), 1377–1386. https://doi.org/10.9770/jesi.2019.7.2(40)*
19. *Khaustova, Y., Durmanov, A., Dubinina, M., Yurchenko, O., & Cherkesova, E. (2020). Quality of strategic business management in the aspect of growing the role of intellectual capital. Academy of Strategic Management Journal, 19 (5), 1–7.*
20. *Durmanov, A., Umarov, S., Rakhimova, K., Khodjimukhamedova, S., Akhmedov, A., & Mirzayev, S. (2021). Development of the organizational and economic mechanisms of the greenhouse industry in the Republic of Uzbekistan. Journal of Environmental Management and Tourism, 12 (2), 331–340. https://doi.org/10.14505//jemt.v12.2(50).03*
21. *Umarov, SR, Durmanov, AS, Kilicheva, FB, Murodov, SMO, & Sattorov, OB (2019). Greenhouse vegetable market development based on the supply chain strategy in the Republic of Uzbekistan. International Journal of Supply Chain Management, 8 (5), 864–874.*
22. *Nurimbetov, T., Umarov, S., Khafizova, Z., Bayjanov, S., Nazarbaev, O., Mirkurbanova, R., & Durmanov , A. (2021). Optimization of the main parameters of the support-lump-breaking coil. Eastern-European Journal of Enterprise Technologies, 2 (1–110), 27–36. https://doi.org/10.15587/1729-4061.2021.229184*
23. *Durmanov, A., Bayjanov, S., Khodjimukhamedova, S., Nurimbetov, T., Eshev, A., & Shanasirova, N. (2020). Issues of accounting for organizational and economic mechanisms in greenhouse activities. Journal of Advanced Research in Dynamical and Control Systems, 12 (7 Special Issue), 114–126. https://doi.org/10.5373/JARDCS/V12SP7/20202089*

24. *Durmanov, A., Li, M., Khafizov, O., Maksumkhanova, A., Kilicheva, F., & Jahongir, R. (2019). Simulation modeling, analysis and performance assessment. In International Conference on Information Science and Communications Technologies: Applications, Trends and Opportunities, ICISCT 2019 . Institute of Electrical and Electronics Engineers Inc. https://doi.org/10.1109/ICISCT47635.2019.9011977*
25. *Durmanov, A., Tulaboev, A., Li, M., Maksumkhanova, A., Saidmurodzoda, M., & Khafizov, O. (2019). Game theory and its application in agriculture (greenhouse complexes). In International Conference on Information Science and Communications Technologies: Applications, Trends and Opportunities, ICISCT 2019 . Institute of Electrical and Electronics Engineers Inc. https://doi.org/10.1109/ICISCT47635.2019.9011995*
26. *Akmal Durmanov et al 2022 IOP Conf. Ser.: Earth Environ. sci. 1043 012022*
27. *Rashid Khakimov et al 2022 IOP Conf. Ser.: Earth Environ. sci. 1043 012043*
28. *Ravshan Nurimbetov et al 2022 IOP Conf. Ser.: Earth Environ. sci. 1043 012006*
29. *Fatima Nazarova (2023). Cultural cooperation of the countries of the region in the format of regular and systemic relations and development of the historical and cultural potential of central asia in modern conditions. International Journal of Asian Economic Light (JAEL), 11(2), 1-8*
30. *Krutov, A., Azimov, A., Ruziev, S., & Dumanov, A. (2019). Modelling of turbidity distribution along channels. In E3S Web of Conferences (Vol. 97). EDP Sciences. https://doi.org/10.1051/e3sconf/20199705046*
31. *Menglikulov, B., Umarov, S., Safarov, A., Zhyemuratov, T., Alieva, N., & Dumanov, A. (2023). Ways to increase the efficiency of transport logistics - communication services in Uzbekistan. In E3S Web of Conferences (Vol. 389). https://doi.org/10.1051/e3sconf/202338905036*
32. *Durmanov, A., Madumarov, T., Abdulkhayeva, G., Shermukhamedov A., & Baltashov S. (2023). Environmental aspects and microclimate in greenhouses in the republic of Uzbekistan. In E3S Web of Conferences (Vol. 389). https://doi.org/10.1051/e3sconf/202338904002*