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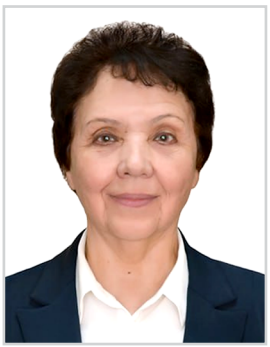

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# Development of sustainable agriculture through the agricultural incomes stabilization

**Abstract.** Sustainable agricultural development is a multidimensional concept that has gained great importance over time. Therefore, identifying the factors affecting each of the dimensions of sustainable agriculture is necessary and essential for proper planning. The main purpose of this research was to evaluate the environmental, social and economic impacts of modern agricultural development and its determinants from the perspective of the beneficiaries, so that the quantitative and qualitative process of these projects can be modified and revised. The method of this research is from the quantitative studies group and is of a descriptive type, controlling non-experimental variables, with an applied objective and collecting data using the survey technique. In this article, an attempt has been made to examine the factors affecting the four dimensions of sustainable agricultural development in Uzbekistan using statistical analysis and a sample of 118 farmers, randomly selected; and information obtained from completing a questionnaire in 2023-2024. The results showed that the average social sustainability indicators were 0.56, environmental sustainability 0.44, and economic sustainability 0.61. Finally, based on the results obtained, suggestions were presented for the success of implementing and operating such projects.

**Keywords:** Sustainable Agriculture; Stabilization; Agricultural Income; Profit; Economics; Environment; Social Sustainability; Farmer
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## 1. Introduction and Brief Literature Review

The international community has come to the conclusion that the establishment of a healthy life and food security for present and future generations depends on the protection of biological resources and the correct and rational management of these limited resources. Agriculture and its products play a fundamental role in the continuation of human life. In the global arena, a view of the developmental contexts of current advanced societies indicates that the origin of the development of many of these countries is the surplus production in the agricultural sector, which has become the basis for changes in the early stages of development (Kata & Wosiek, 2020). In developing and transitional countries, agriculture also plays a fundamental role in strengthening the foundations of their economy. Since this economic sector is important in terms of meeting people's food needs, providing raw materials for industries, employing individuals, and creating income, its stability and continued growth can be considered one of the major factors contributing to social stability and economic growth of society (Kata & Wosiek, 2020; Safarov et al., 2024). Efforts related to agriculture and sustainable rural development are centered around three basic axes, which include food security, employment and income generation in rural areas in order to eradicate poverty and preserve natural resources and the environment (Nursalim, 2021). In other words, this approach seeks to maximize the productivity of the agricultural sector's capacities and minimize the destructive environmental consequences. Thus, agricultural development should be shaped by relying on existing facilities and technology; it should be technically appropriate, economically justifiable, socially acceptable and environmentally desirable (Liu et al., 2024).

Chen et al. (2024) conducted a study to measure the mental and practical orientation of agricultural researchers towards the concept of sustainable agriculture. They showed that the research orientation of the respondents was mainly towards formulating research needs and issues in order to solve the problems and issues of the agricultural sector and also to benefit from the opinions and cooperation of researchers with different specializations and disciplines in carrying out such activities. Kamakaula et al. (2024) examined some of the potentials and bottlenecks facing the country's agricultural sector in relation to sustainable agricultural development and conclude that sustainable agricultural development also faces challenges.

Sustainable development in the agriculture, forestry and fisheries sector protects water resources, land, plants and plant genetics, is technically appropriate, economically viable and sustainable, commercially competitive, socially acceptable and supportive, environmentally compatible with the environment and conserving resources, and is not destructive (Bruinsma, 2017; Usmanova et al., 2020; Pretty & Bharucha, 2014). Accordingly, sustainable agriculture is a multidimensional and complex system that faces numerous challenges such as ensuring food security and health, employment, profitability, sustainable technologies, farmer empowerment, weak infrastructure, support services and green market system, natural resource and environmental issues, environmental hazards, especially water resource shortage and drought, limitations in increasing agricultural land area, population growth and urbanization, changing consumption patterns and consumer tastes, and various time and place conditions, to achieve sustainable development goals. This has demonstrated the necessity of determining an effective solution to respond to these challenges, and in this regard, adopting a sustainable income approach from sustainable agriculture has been emphasized.

## 2. Method

This study is a quantitative, descriptive, non-experimental, applied study with a survey method. Agriculture will account for more than a quarter of Uzbekistan's GDP in 2024, the highest in the region, and 20 percent of the active population is engaged in agriculture. Half of Uzbekistan's 40 million people live in rural areas, including 75% of the low-income population, which can improve the economic and livelihoods of a large segment of the population by stabilizing income and developing agriculture.

According to Figure 1, the determinants of agricultural development were categorized into three areas: economic (employment, income and development of related industries), social (migration, well-being and participation), and environmental (pollution prevention, soil and water quality), and then the questionnaire questions were completed in three areas by farmers. To do this, they were randomly selected in proportion to the number of farmers in each village, and the sample size was 118 according to the Cochran formula. Considering the need to collect information in a large volume and the advantages of the questionnaire, the survey technique and questionnaire tool were used in collecting information in this study. Based on the research objectives and the researchers' observations of the study area, an initial questionnaire was developed and provided to experts to confirm face validity. Necessary amendments were made based on their comments and suggestions, and a pilot study was conducted to verify the reliability of the measurement tool, and the average Cronbach's alpha coefficient was about 0.79. The amount of land owned by most of the sample members was equal to five hectares. The average gross annual income from agricultural activities was calculated to be about 11 thousand dollars. The cultivated area of 49.8% of the farmers in 2023 was less than five hectares and 0.4% more than 45 hectares. Also, the cultivated area of 45.7% of the farmers in 2024 was less than five hectares and 0.17% more than 45 hectares. In fact, the cultivated area of the respondents in the 2024 crop year has increased compared to their cultivated area in the 2023 crop year. The average age of the farmers in the study sample was estimated to be about 44 years and their average history of agricultural activities was estimated to be about 24 years. The main occupation of 88% of the respondents was agriculture and 29% of them were illiterate.

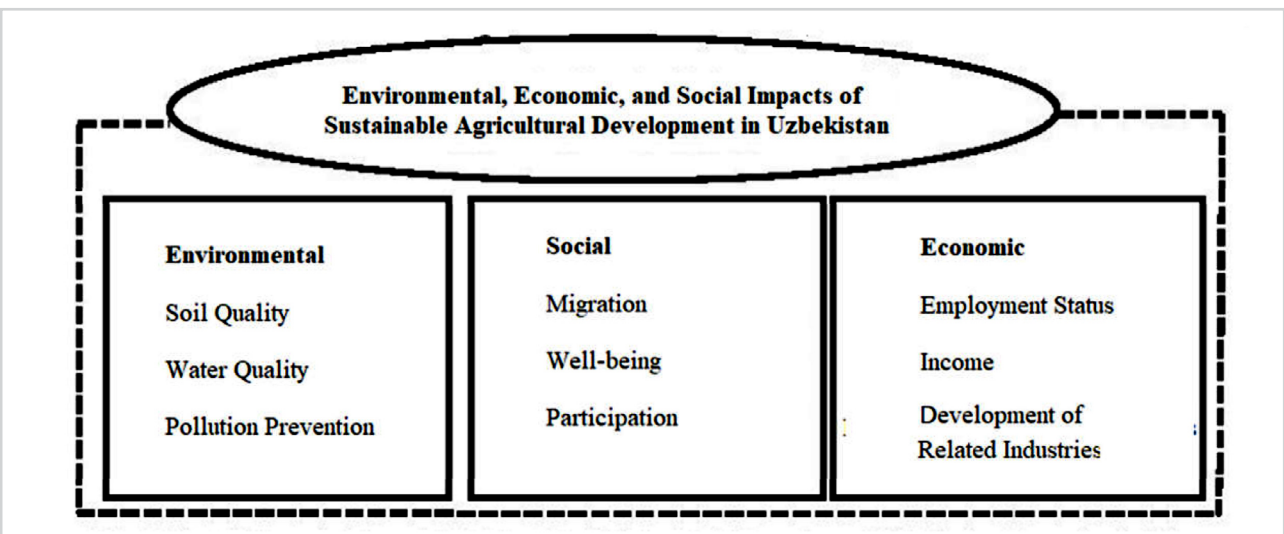


Figure 1:
**Sustainable Agricultural Development**
Source: Made by the authors

## 3. Results

According to the statistics of the last 5 years, agriculture in Uzbekistan constitutes the major part of the economy of Uzbekistan (30%) (Turakulovich, 2020) and as shown in Figure 2, the volume of this market is increasing. With the increase in the productivity of agricultural lands and the conversion of wasteland into productive lands in Uzbekistan, 300 hectares are added to agricultural fields annually, and for its sustainable development, three social, economic and environmental factors have been taken into account.

The range of environmental, social and economic impacts are defined between 0-100. In fact, the three variables of environmental impacts, social impacts, and economic impacts have been made equal by normalizing the data. Based on the results, the average environmental impact assessment was estimated to be 66.66 with a standard deviation of 7.92. Also, the minimum environmental impact assessment was 6.40 and the maximum was 89.60. Based on Figure 3, most respondents evaluated the environmental impacts of sustainable agricultural development as moderate and desirable. Respondents believed that sustainable agricultural development would improve the quality and quantity of water and soil quality, but regarding

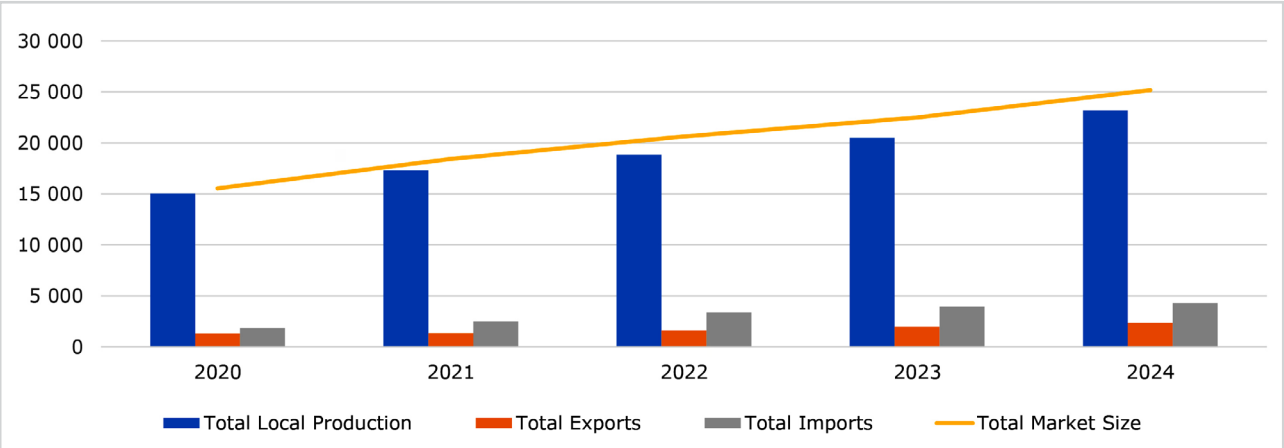


Figure 2:
**Agriculture Market Size, million USD**
Source: https://www.trade.gov/country-commercial-guides/uzbekistan-agricultural-sectors

habitats, they believed that plants and especially animals currently feed on the remaining water in traditional conditions.

Based on the collected results, the average social impact assessment was estimated to be 71.07 with a standard deviation of 7.03. Also, the minimum social impact assessment was 8.53 and the maximum was 96. According to Figure 3, most respondents evaluated the social impacts of sustainable agricultural development in the study area as moderate and desirable.

Based on the collected data, the average economic impact assessment was estimated to be 79.57 with a standard deviation of 7.56. Also, the minimum economic impact assessment was 12 and the maximum was 96. Based on Figure 3, most respondents assessed the effects of sustainable agricultural development on the economic situation of the region as moderate and desirable. The assessment of economic impacts was measured with items regarding employment status, income and development of agriculture-related industries, increased purchasing power and continuation of agricultural activity as a source of income in the future. Based on Figure 3, respondents believed that sustainable agricultural development will improve the economic conditions of the region compared to before the implementation of the project. These people believe that if these networks are developed appropriately, people will focus their activities on agriculture and their income will increase through this. Also, with the development of sustainable agriculture and the prosperity of agriculture, non-farmers will also migrate to the region as seasonal agricultural workers. As a result, the price and value of agricultural land and the purchasing power of the people will also increase.

Comparison of means using one-way analysis of variance test and post hoc test showed that there is no significant difference between the means of different groups of beneficiaries in different sections and their evaluation of social, economic and overall project effects, respectively,

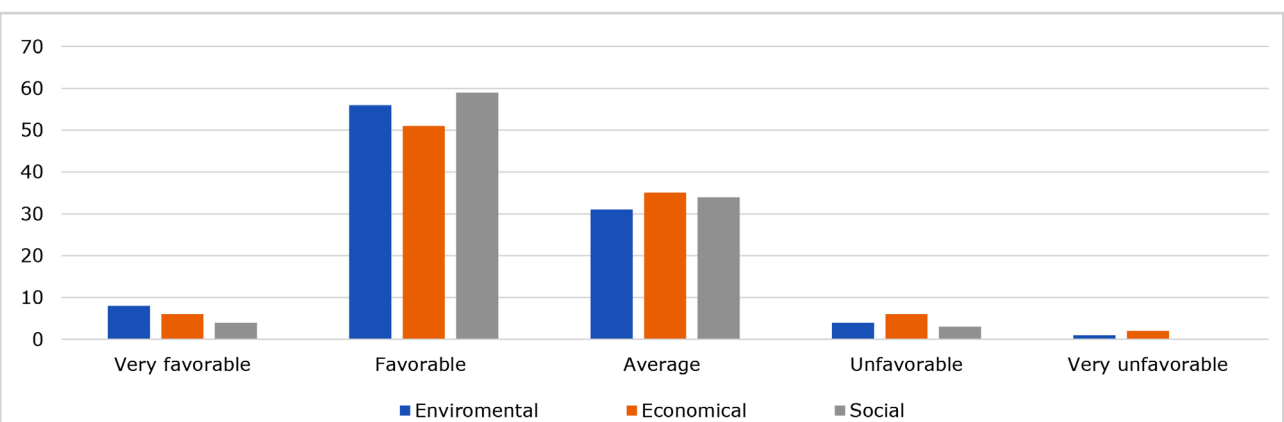


Figure 3:
**Evaluation of the economic-social-environmental impacts of sustainable agricultural development from the perspective of participants**
Source: Authors' findings

at the 0.001 level. The results of analysis of variance test between the dependent variable of impact assessment and location of the studied region showed that economic effect has the greatest impact on the perspective of the participants in the research, which could be due to the need of the society for improved economic conditions and the tangible economic results in the short term (Table 1).

Table 1:
**Results of the analysis of variance (ANOVA) test between the dependent variable of impact assessment and the location of the four dams in the study area**

| Effect | Sub variable | AVE | SD | Indicator | F-value |
|---|---|---|---|---|---|
| Economical | Employment | 79.1 | 7.89 | 0.61 | 4.5 |
| | Income | 81.1 | 7.65 | | |
| | Related Industries | 78.5 | 7.13 | | |
| Environmental | Soil Quality | 65.3 | 7.66 | 0.44 | 4.11 |
| | Water Quality | 68.9 | 8.11 | | |
| | Pollution Prevention | 65.8 | 7.98 | | |
| Social | Migration | 70.2 | 6.98 | 0.56 | 4.27 |
| | Well-being | 71.2 | 7.01 | | |
| | Participation | 71.8 | 7.10 | | |

Source: Authors' findings

Also, based on the findings of Table 2, there is a positive and significant correlation between the respondents' age, agricultural work experience, social participation, income level, attitude towards the future of agriculture and assessment of environmental impacts at the level of ($p$ = 0.05), and people who were older and had more agricultural work experience and those who had a more positive attitude towards sustainable agricultural development, a more positive attitude towards the future of agriculture and a more favorable attitude towards the agricultural economy, evaluated the environmental impacts of the project more positively. The results obtained regarding the relationship between age and environmental impacts are consistent with the results of Iofrida et al. (2020) research on the assessment of the social and economic environmental impacts of the olive cultivation development project from the perspective of olive growers.

Table 2:
**Pearson correlation coefficient test between the assessment of environmental, socio-economic effects of the sustainable agricultural development plan**

| Variable/ Correlation coefficient | Environmental | Social | Economic | Total |
|---|---|---|---|---|
| Age of respondent | 0.15 | 0.31 | 0.31 | 0.32 |
| Agricultural work experience | 0.14 | 0.32 | 0.35 | 0.29 |
| Social participation | 0.40 | 0.67 | 0.56 | 0.66 |
| Income level | 0.09 | 0.1 | 0.04 | 0.05 |
| Attitude towards the future of agriculture | 0.25 | 0.26 | 0.31 | 0.33 |

Source: Authors' findings

## 4. Conclusion

A look at the current state of agriculture in the global arena clearly shows that the viability of current agricultural production systems has been significantly challenged. Thus, attention to sustainable agricultural development is considered as one of the most important necessities of human life today. Therefore, in this article, the study and promotion of sustainable agriculture in Uzbekistan was examined from three perspectives: social, economic and environmental, and the importance of this concept was emphasized in the development of the country. The results showed that sustainable agricultural development can reduce possible environmental impacts in the long term by simultaneously increasing sustainable agricultural income and creating social value, and promote sustainable agriculture as the main driving force of the industry and economy of Uzbekistan. On the other hand, given the great emphasis of sustainable development on development that, in addition to being people-oriented and paying attention to economic profitability, is characterized by environmentalism, and preventing destruction and supporting management, preserving and improving the environment as the ecosystem of life of the present and future human generations have been the main emphases and the context for its emergence.

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