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| RESEARCH ARTICLE

Estimating Agricultural Sustainability of Sholgara District Using the Analytical Hierarchy Process

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| ABSTRACT

This research aims to evaluate the sustainability of standard agricultural systems in 5 important villages of the Sholgara district of Balkh province of Afghanistan. To evaluate the sustainability of agriculture in each village, three main environmental, economic, and social criteria were determined, and each criterion is composed of several sub-criteria; in total, 18 sub-criteria were considered. Data was collected in the form of a questionnaire from farmers and experts. To complete the questionnaire, farmers were selected by stratified random sampling, and 110 questionnaires were conducted from the villages of the Sholgara district. The data needed for this evaluation for standardization in the agricultural sustainability model, for weighting the criteria and sub-criteria of agricultural sustainability, a questionnaire was designed by experts and using the opinions of experts in agricultural economics, promotion and education of agriculture and agriculture, the ranking of sustainability criteria and sub-criteria was done. Moreover, by using Analytical Hierarchy Process, the agricultural sustainability status of the villages of the Sholgara district was calculated. The results of the economic, social, and environmental sustainability analysis of Khowja Askandar were selected as the most sustainable village with a weight of 0.237. The villages of Boyni Qara, Aghar Saye, Bauragai, and Qurbaqqa Khana, with weights of 0.199, 0.197, 0.195, and 0.173, respectively, are in the priorities of sustainability. Based on the sustainability sensitivity analysis, increasing the weight of the social and environmental components of sustainability to the level of 0.38 and 0.33 will increase the level of sustainability of Aghar Saye village, and increasing the weight of the economic part of sustainability did not change the priorities. The results of this research make it possible to know the importance of various parameters affecting sustainability, to evaluate the sustainability, and to compare the villages of the Sholgara district with good accuracy so that practical steps can be taken in applying appropriate policies to improve the sustainability of agriculture.

| KEYWORDS

Agricultural Sustainability, Analytical Hierarchy Process, Sholgara District, Environmental Sustainability, Economic Sustainability, Social Sustainability

| ARTICLE INFORMATION

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1. Introduction

The farmer's sustainability is considered an essential prerequisite for the long-term profitability of agriculture. According to experts, an agricultural system is sustainable if it is environmentally sound, economically sustainable, and socially just (Dantsis et al., 2010). Despite the many definitions of sustainability, different standards and methods are proposed to measure sustainability. Selection and weighting criteria are crucial to determining sustainability on different scales. Considering the necessity of land preparation in the agricultural sector and the importance of environmental issues in the agricultural sector, it is necessary to determine the level of sustainability on different farm, regional, national, and international scales (Mustajoki et al., 2020). Afghanistan is one of the countries that have biodiversity and different weather and climate conditions. Accordingly, it seems necessary to identify the specific characteristics of each region to achieve sustainable development. Also, with the increase in agricultural production using modern technologies, although part of the population's needs has been met, over time, natural resources have been associated with risks such as soil erosion, water pollution caused by excessive use of chemicals, and environmental destruction. Various studies have evaluated the sustainability of agriculture based on economic, social, and environmental aspects, but the most crucial issue in evaluating the sustainability of agriculture is the selection of criteria. The criteria for measuring agricultural sustainability should have two important features, firstly, they should show the movement towards sustainable development, and secondly, they should be able to be calculated in the studied area.

Roy and Chan (2012) investigated the sustainability of agriculture in China and emphasized considering economic, social, and environmental criteria with specific weight. In the field of examining the economic aspect of agricultural sustainability, most of the studies have focused on profitability. Mc-Donald and Smith (1998) showed that profitability criteria such as income and profit are primary sustainability criteria. Production costs, product prices, and net income were the criteria used by them. Routary and Zhen (2003) introduced the criteria of crop productivity, gross margin of agriculture, benefit-cost ratio, and per capita grain production in the farm as economic sustainability criteria. Rezaee et al. (2014) used the parameters of gross agricultural margin, gross yield, agricultural diversity, farm size, agricultural machinery, and the number of plots to investigate the sustainability of agriculture from the economic aspect in the east of the Zayandeh River basin. Also, Widayati et al. (2017) used economic criteria, including income, productivity, and technical efficiency, to evaluate agricultural sustainability in potato cultivation. Mutayasira et al. (2018) evaluated the economic sustainability of the agricultural system in Ethiopia by using data coverage analysis and criteria of farm size, market access, access to off-farm income, and agricultural loans. Mucharam et al. (2019) considered rice productivity and gross yield economic criteria. Most studies emphasize awareness as a critical criterion in investigating the social aspect of agricultural sustainability. Social criteria measure the ability of farmers to deal with specific conditions. Routary and Zhen (2003) introduced farmer awareness and knowledge, access to resources, and the ability to provide food as social criteria that ensure the sustainability of agriculture. Also, Rezaee et al. (2014) considered age, level of education, integrated agriculture, household size, and employment of agricultural activity as social criteria determining the sustainability of agriculture.

The summary of the conducted studies shows which are among the most important criteria that determine the sustainability of agriculture. The selection and weighting of criteria is the most crucial factor in sustainability evaluation. Considering that agriculture is the main activity in the Sholgara district and the production of agricultural products is inevitably affected by natural disasters, it is necessary to study the sustainability of agriculture to achieve sustainable development. On the other hand, excessive use of chemical fertilizers and pesticides has caused an increase in various diseases in these areas. In addition, the organic matter of agricultural soils has decreased significantly in this district, which shows the necessity of evaluating the sustainability of agriculture. This research aims to evaluate crops' economic, social, and environmental sustainability in the Sholgara district. The partial goals are: measuring and evaluating economic sustainability, measuring and evaluating social sustainability, measuring and evaluating environmental sustainability, and determining the most sustainable region.

2. Literature Review

Roy and Chan (2012) investigated the sustainability of agriculture in China and emphasized considering economic, social, and environmental criteria with specific weight. In the field of examining the economic aspect of agricultural sustainability, most of the studies have focused on profitability. Mc-Donald and Smith (1998) showed that profitability criteria such as income and profit are primary sustainability criteria. Production costs, product prices, and net income were the criteria used by them. Routary and Zhen (2003) introduced the criteria of crop productivity, gross margin of agriculture, benefit-cost ratio, and per capita grain production in the farm as economic sustainability criteria. Rezaee et al. (2014) used the parameters of gross agricultural margin, gross yield, agricultural diversity, farm size, agricultural machinery, and the number of plots to investigate the sustainability of agriculture from the economic aspect in the east of the Zayandeh River basin. Also, Widayati et al. (2017) used economic criteria, including income, productivity, and technical efficiency, to evaluate agricultural sustainability in potato cultivation. Mutayasira et al. (2018) evaluated the economic sustainability of the agricultural system in Ethiopia by using data coverage analysis and criteria of farm size, market access, access to off-farm income, and agricultural loans. Mucharam et al. (2019) considered rice productivity and gross yield economic criteria. Most studies emphasize awareness as a critical criterion in investigating the social aspect of agricultural sustainability. Social criteria measure the ability of farmers to deal with specific conditions. Routary and Zhen (2003) introduced farmer awareness and knowledge, access to resources, and the ability to provide food as social criteria that ensure the sustainability of agriculture. Also, Rezaee et al. (2014) considered age, level of education, integrated agriculture, household size, and employment of agricultural activity as social criteria determining the sustainability of agriculture.

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3. Methodology

3.1 Research Area

Sholgara is a district in the southern part of Balkh Province, Afghanistan. Sholgara, just south of Mazar-I-Sharif, is strategically located at the crossroads between several districts: Sangcharack, Kishindih, and Dar-I-Suf.

The population of the Sholgara district is about 110,600 people, of which 40% are Tajiks, 20% Pashtuns, 20% Hazaras, and 20% Uzbeks. The people of this district are primarily engaged in agriculture, and the most important agricultural products are rice, wheat, and corn.

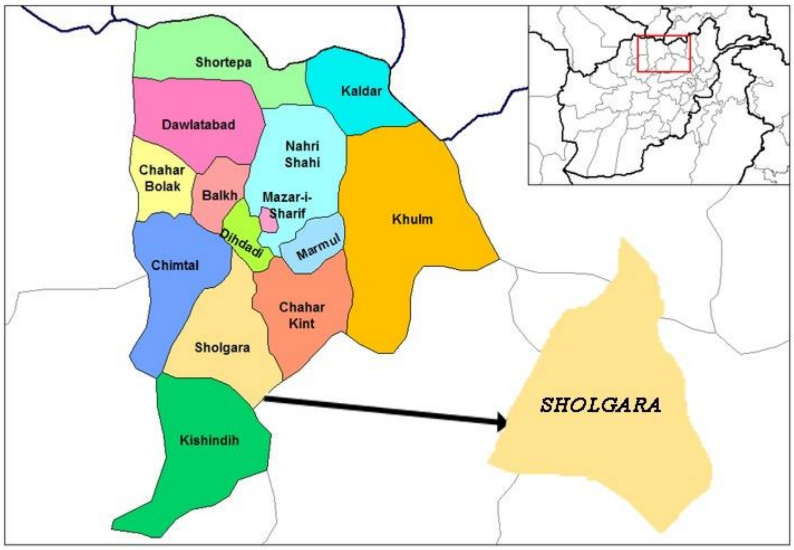

Figure 1- Map of the Sholgara District

3.2 Multicriteria Decision Analysis

The multi-criteria decision-making method (MCDA) is a suitable criterion for analyzing complex problems by combining quantitative data and qualitative opinions of experts. In addition, this technique can make decisions with multiple criteria through different features to select independent options (Rezaee et al., 2014). Various studies have used the multi-criteria decision-making method to evaluate agricultural sustainability (Mouron et al., 2012). Analytical Hierarchy Method (AHP) is one of the comprehensive and standard methods of designed systems. The application of the MCDA method is based on the final value model, which relies on experts' opinions to derive priorities (Saaty, 2008). In this research, the AHP technique is used for evaluating and prioritizing products due to the ability to perform pairwise comparisons and collect different sustainability features. Using AHP requires going through five steps. 1- Creation of a decision tree with selected criteria for economic, social, and environmental separation; 2- Pairwise comparisons of criteria; 3- Compatibility calculation that should be evaluated after each paired comparison of criteria and options, 4- Creating a numerical value for each criterion. The numerical value is calculated by collecting the attributes for the decision options (Saaty, 2008). The numerical value based on equation (1) is:

$$V(x) = \sum_{i=1}^{n} W_i V_i(X_i) \qquad (1)$$

Where v is the value function of each index as a result of each xi, n is the number of indices; wi is the weight of each index, xi(vi) is the rank of each product according to each index i, which is obtained by using average values. Index value functions and weights have values between zero and one. The weights show the relative importance of each criterion by normalization. 5-Sensitivity analysis, which is done by changing the weights of criteria. The selection criteria were based on the review of sources, experts' opinions, and calculation ability in the region. For weighting and ranking of the criteria, the average opinions of experts in economics and the promotion of agriculture, environment, and agriculture were used. Also, all parameters are calculated for one hectare. The overall economic, social and environmental sustainability score was obtained based on the relationships (2) to (5) (Dantsis et al., 2010).

$$ECS = \sum_{i}^{4} a_i * ECS_i \quad (2)$$

$$ENS = \sum_{i}^{4} a_i * ENS_i \quad (3)$$

$$SS = \sum_{i}^{4} a_i * SS_i \quad (4)$$

$$TS = \sum_{i}^{4} a_i * TS_i \quad (5)$$

Based on the mentioned relations, ai is the share of cultivated area for each product, i is products, and ECS1, ENS1, SS1, TS1 are the economic, environmental, social, and total sustainability scores for each product. Also, information related to the research variables was obtained by completing the questionnaire from 110 farmers. This research used a simple random sampling method, and Cochran's formula was used to determine the sample size. Excel and Expert Choice 11 software were used for data analysis.

4. Results and Discussion

4.1 Decision-Making Tree

The decision-making tree related to choosing the most sustainable village and determining the level of economic, social, and environmental sustainability is shown in the figure below.

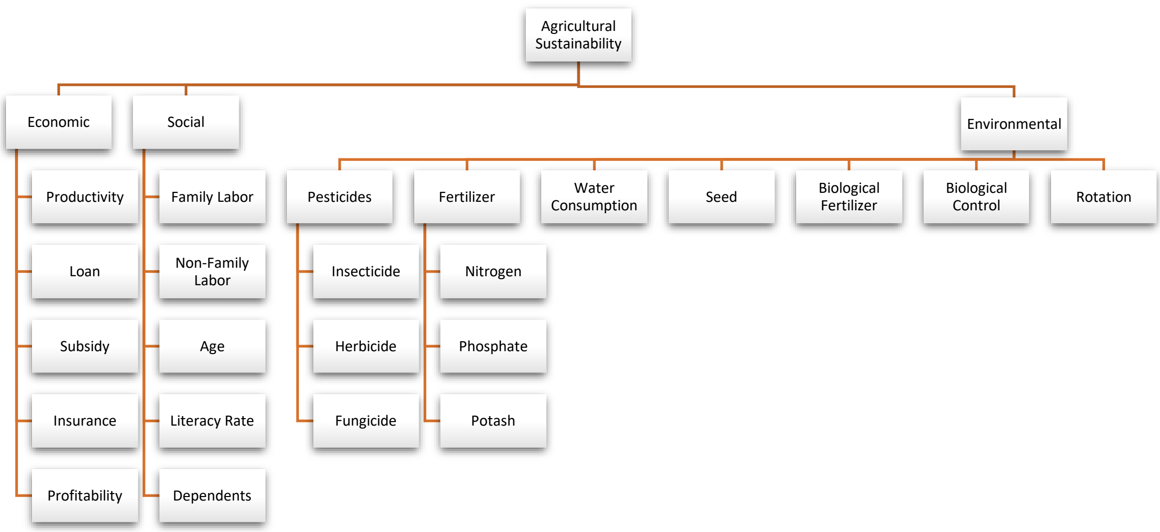

Figure 2- Agricultural sustainability decision tree of Sholgara district

4.2 Specifications, Ranking, percentage and importance of Sustainability Criteria and Sub-Criteria

The criteria and sub-criteria were developed by reviewing the sources. Also, to weigh the criteria and sub-criteria that determine the sustainability and their importance percentage, the opinions of experts in agricultural economics, extension, and education of agriculture and agriculture who were active in the field of sustainability have been used. The weight of three economic, social, and environmental criteria in the overall sustainability was considered as 67.4, 10, and 22.6, respectively, based on the prioritization of experts.

The effect direction of each criterion and sub-criteria are shown in table (1). Among the mentioned indicators, fertilizers, pesticides, irrigation water consumption, the introduction of machinery and the age of the negative effect and modified seeds, biological fertilizer, biological control, rotation, yield, loan, insurance, subsidy, profitability, labor force Family, non-family workforce and the number of dependents have a positive effect on sustainability.

Table 1- Environmental, economic, and social sustainability indicators of the Sholgara district

Criteria	Criteria (1)	Criteria (2)	Scale	Direction	Rank	%	Description
Environmental (22.6)	Fertilizer	Nitrogen	Kg/ha	-	3	13.9	Consumption During Growth
		Phosphate	Kg/ha	-			
		Potash	Kg/ha	-			
	Pesticide	Insecticide	L/ha	-	1	30.5	Consumption During Growth
		Herbicide	L/Ha	-			
		Fungicide	L/ha	-			
	Water Consumption	-	M^3/ha	-	4	9.1	Consumption During Growth
	Machine Entry	-	No	-	2	15.9	Machine Entry During Growth
	Modified Seed	-	%	+	8	6.3	The Percentage Usage of Modified Seeds
	Bio-Fertilizer	-	%	+	7	7.8	The Percentage Usage of Bio-Fertilizer
	Bio-Control	-	%	+	6	7.8	The Percentage Usage of Bio-Control
	Rotation	-	%	+	5	8.9	The Percentage Usage Rotation
Economic (67.4)	Productivity	-	Kg/ha	+	2	24.8	Production Per hectare
	Loan	-	Rials	+	4	8.3	Amount of Loan Received
	Subsidy	-	Rials	+	3	8.4	Amount of Subsidy Received
	Insurance	-		+	5	5.9	The Area of Insured Land
	Profitability	-	Rials/ha	+	1	52.6	Profit Per Hectare
Social (10)	Family Labor	-	L/ha	+	4	16.9	Family Labor Working on Farm
	Non-Family Labor	-	L/ha	+	5	8.1	Non-Family Labor Working in Farm
	Age	-	%	-	3	18.4	Age of Farmer
	Literacy Rate	-		+	1	30.6	Education Level of Farmer
	Dependents	-		+	2	26	Number of Dependents

Source: Research Findings

The weight and importance percentage of each criterion are shown in table (1). To weigh the criteria and sub-criteria that determine the sustainability and their importance, the opinions of experts in agricultural economics, extension, and education of agriculture and agriculture who were active in the field of sustainability have been used. The weight of three economic, social, and environmental criteria in total sustainability was considered as 67.4, 10, and 22.6, respectively, based on the prioritization of experts.

According to experts, from the economic aspect, profitability is the most influential factor in determining sustainability. Based on the social aspect, the farmer's level of education is the most influential factor in determining sustainability and based on the environmental aspect, pesticides rank first in agricultural unsustainability.

4.3 Economic sustainability

The economic criteria determining agricultural sustainability are yield, loan, subsidy, insurance, and profitability. All the mentioned criteria had a positive effect on sustainability, and according to experts, profitability had the most significant effect (52%), and insurance had a minor effect (0.059%) on economic sustainability.

Based on the economic sub-criterion, Khowja Askandar was the most sustainable village, with a score of 0.249, and Qurbaqqa Khana was the most unsustainable village, with a score of 0.16.

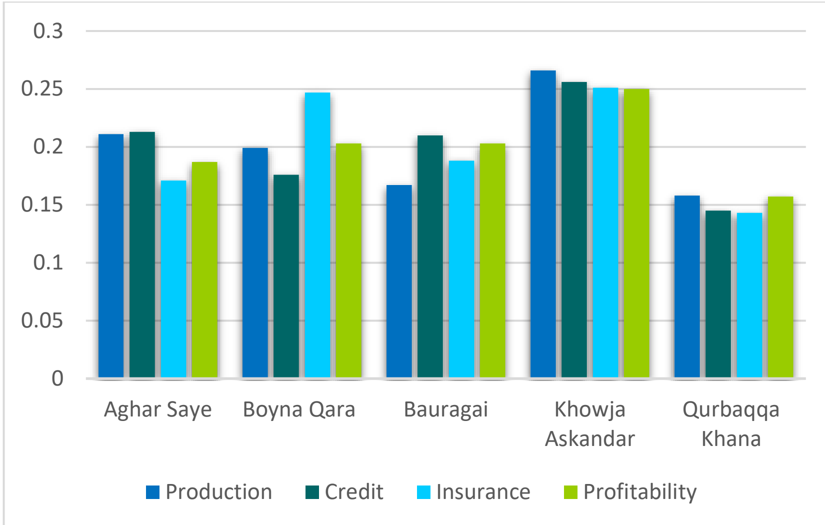

Figure 3- Prioritizing the economic sustainability of the villages of the Sholgara district

As shown in Figure (3), according to the performance sub-criterion, Khowja Askandar has the highest score of 0.266, and Qurbaqqa Khana has the lowest level of sustainability with 0.158. According to the loan sub-criterion, Khowja Askandar had the highest level of sustainability with a score of 0.256, and Qurbaqqa Khana had the lowest level of sustainability with a score of 0.145. Based on the subsidy sub-criterion, all villages had the same level of sustainability. According to the sub-criterion of insurance, Khawaja Askandar has the highest level of sustainability with a score of 0.251, while Qurbaqqa Khana has the lowest level of sustainability with a score of 0.143. According to the sub-criterion of profitability, Khowja Askandar has the highest level of sustainability with a score of 0.25, while Qurbaqqa Khana has the lowest level of sustainability with a score of 0.157.

4.4 Social Sustainability

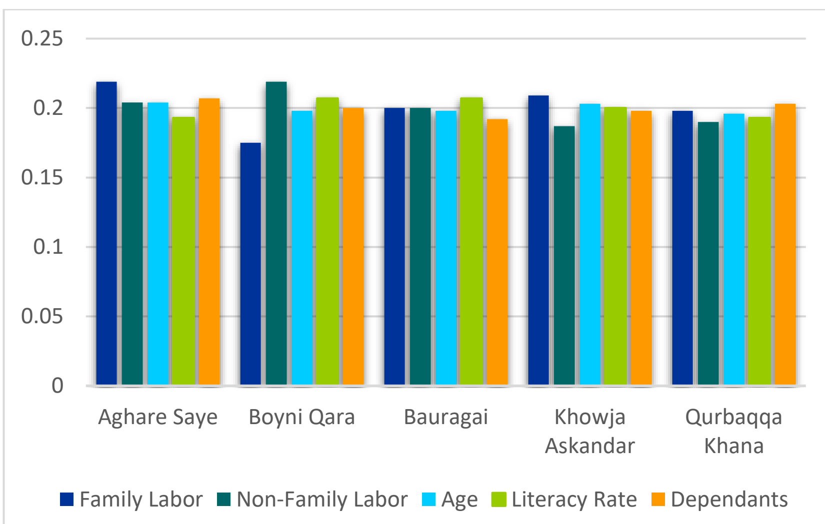

Figure 4- Prioritization of social sustainability of Sholgara district

4.5 Environmental sustainability

Based on the environmental sustainability criteria, the house frog with a weight of 0.216 has the highest level of sustainability. Aghar Saye, Khowja Askandar, Bauragai, and Boyni Qara are in the following priorities with scores of 0.202, 0.201, 0.198, and 0.185, respectively.

As seen in Figure (5), according to the sub-criterion, poison has the most significant impact on the level of environmental sustainability and has allocated 30.5% of the share of environmental sustainability. Based on the herbicide sub-criterion with zero inconsistency rate, Aghar Saye 0.205 has the highest level of sustainability, and the frog house has the lowest level of sustainability at 0.195. Based on the sub-criterion of insecticide with zero incompatibility rate, Khowja Askandar has the highest level of sustainability at 0.212 and Qurbaqqa Khana at 0.187. According to the sub-criterion of fungicide with zero incompatibility rate, Khowja Askandar has the highest level of sustainability of 0.206, and Qurbaqqa Khana has the lowest sustainability of 0.192.

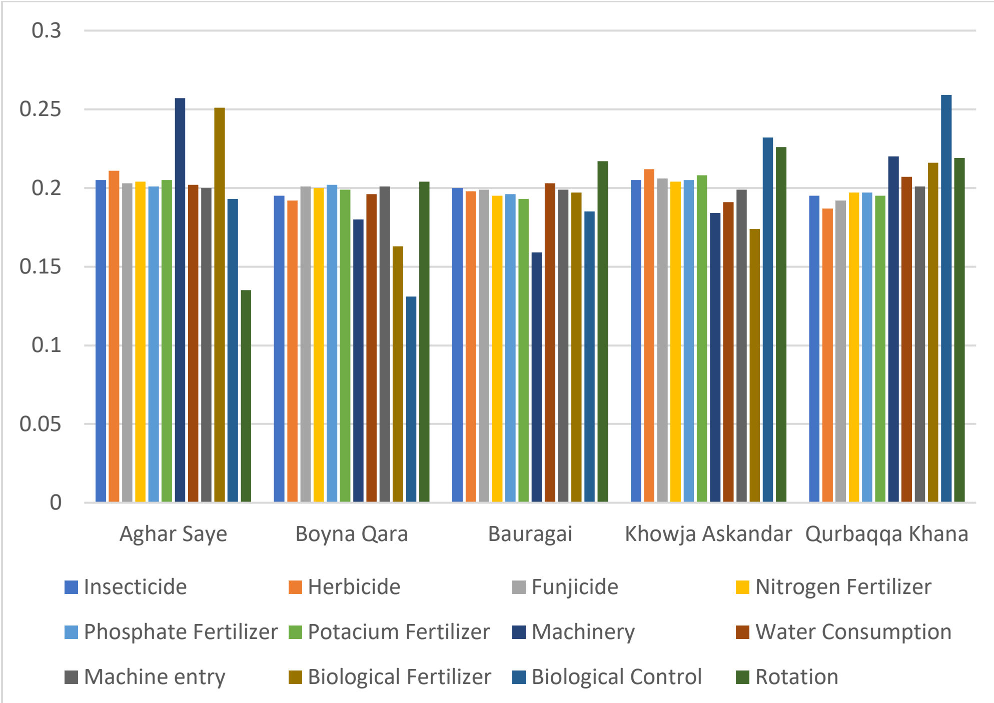

Figure 5- Prioritization of environmental sustainability of Sholgara district

Based on the sub-criterion of nitrogen fertilizer with zero incompatibility rate, Aghar Saye 0.204 has the highest level, and Bauragai 0.195 has the lowest level of sustainability. Based on the sub-criterion of phosphate fertilizer with zero incompatibility rate, Khowja Askandar has the highest level of unsustainability at 0.205 and Bauragai at 0.196. Based on the sub-criterion of phosphate fertilizer with zero incompatibility rate, Khowja Askandar has the highest level of sustainability at 0.208 and Bauragai at 0.193. Based on the sub-criterion of mechanized cultivation with zero incompatibility rate, Aghar Saye has the highest level of sustainability at 0.257, and Boyni Qara has the lowest sustainability at 0.18.

Based on the water consumption sub-criterion with zero inconsistency rate, Qurbaqqa Khana has the highest level of sustainability at 0.207 and Khowja Askandar at 0.191. Based on the sub-criterion of the number of machines entering with zero inconsistency rate, Boyni Qara has the highest level of sustainability at 0.201, and Bauragai has the lowest sustainability at 0.199.

Based on the modified seed sub-criterion, which has a minor effect of 0.063 on the sustainability level, the sustainability level is the same in all villages. According to the sub-criterion of biological fertilizer with zero incompatibility rate, Aghar Saye has the highest sustainability level of 0.251, and Khowja Askandar has the lowest sustainability level of 0.174. Based on the sub-criterion of biological control, with a zero-incompatibility rate, the house frog has the highest sustainability level of 0.259, and the lowest level of sustainability is 0.131. Based on the sub-criterion of crop rotation with zero inconsistency rate, Khaja Iskandar has the highest level of sustainability at 0.226 and Aghar Saye at 0.135.

4.6 Total sustainability

Five villages of the Sholgara district were selected as desired scenarios, and sustainability prioritization was done for these villages. According to figure (6) and based on economic, social, and environmental criteria, Khowja Askandar was selected as the most sustainable village with a weight of 0.236. The villages of Boyni Qara, Aghar Saye, Bauragai, and Qurbaqqa Khana are among the following priorities for the sustainability of the Sholgara district. An inconsistency rate of 0.08 was obtained to determine sustainability.

Figure 6- Determining the most sustainable village in the Sholgara district

The contribution of each economic, social, and environmental criteria to the sustainability of villages is shown in figure (6). The importance of each sustainability criterion (economic, social, and environmental) has been considered to be 0.674, 0.1, and 0.226, respectively. According to the diagram mentioned, the villages are almost in the same range with slight differences in terms of social, economic, and environmental sustainability. Combining three effective sustainability criteria, Khowja Askandar village is the highest priority.

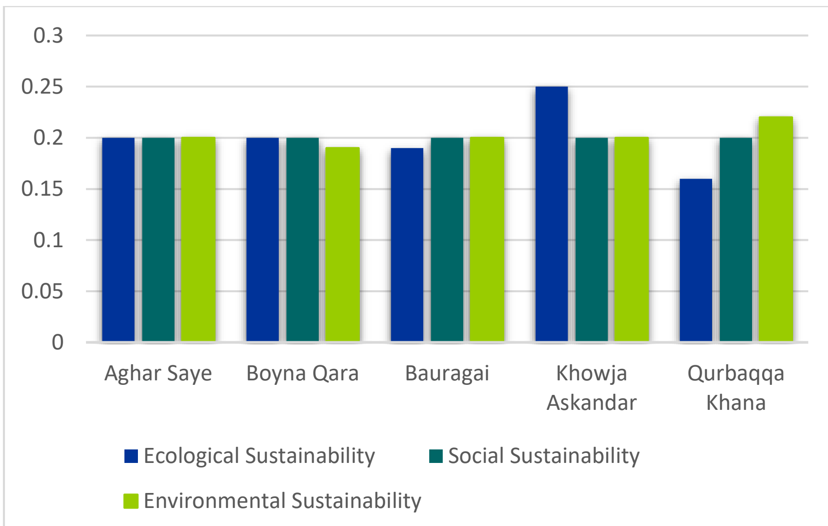

Figure 7- Prioritizing the sustainability of villages in the Sholgara district based on economic, social, and environmental criteria.

4.7 Sensitivity analysis of agricultural sustainability performance

The sensitivity analysis of model performance is shown in Figure (8). By increasing the weight of the economic criterion, there is no change in prioritizing the sustainability of the villages, and still, Khaja Iskandar has more sustainability than other villages.

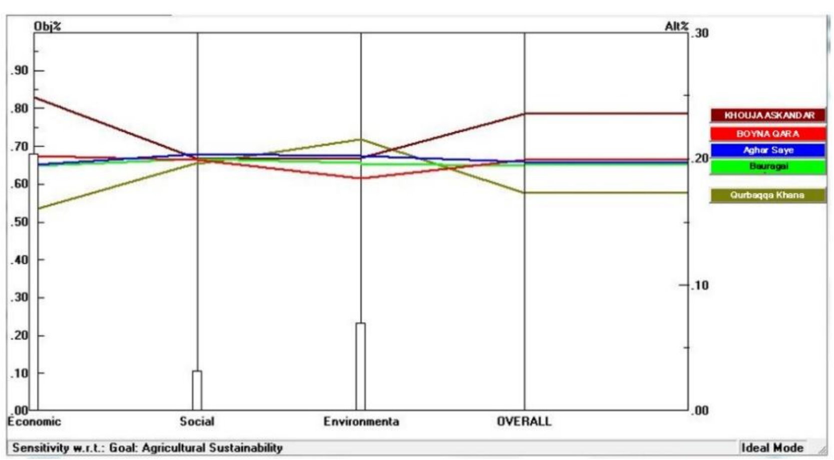

Figure 8-Sensitivity analysis of agricultural sustainability performance in the Sholgara district

Increasing the weight of the criterion of the social component of sustainability to the level of 0.38 will increase the sustainability level of Aghar Saye village. Increasing the weight of the environmental criterion of sustainability up to the level of 0.33 increases the sustainability level of Aghar Saye village.

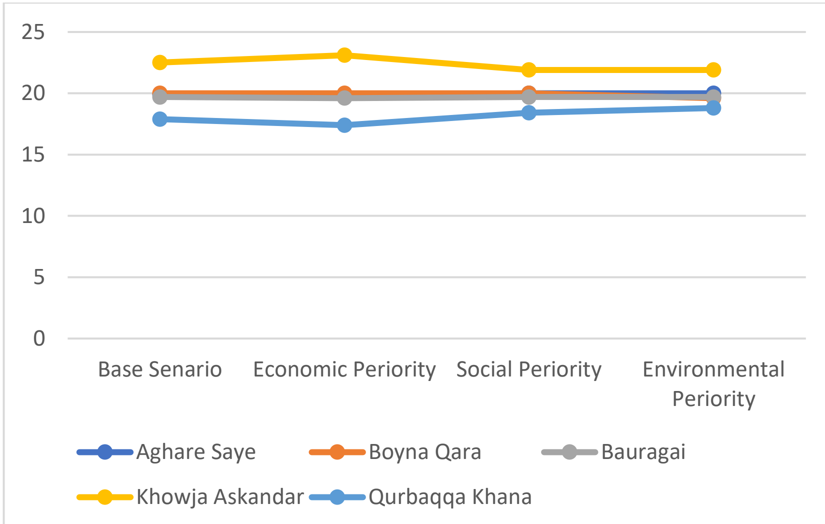

Figure 9- Sensitivity analysis at the level of criteria

In the basic scenario, the weight of all criteria is considered (0.33). In other scenarios, the weight of one criterion is 0.5, and the other criterion is 0.25. By equalizing the weight of economic, social, and environmental criteria, the sustainability of Aghar Saye village increased. In the following scenarios, only the sustainability of Aghar Saye village will change.

5. Conclusion

To evaluate agricultural sustainability in the Sholgara district, in the present study, a combined economic, social, and environmental criterion with weights determined based on the opinion of sustainability experts was used at the village level, which studies by Mustajoki et al. (2020), Mucharam et al., (2019), Zulfiqar (2019), Mutyasira et al., (2017), Widayati et al., (2018) and Rezaee et al., (2014) calculated sustainability by using an aggregated criterion. To evaluate the sustainability of agriculture from the economic aspect, profitability criteria, loans, subsidies, insurance, the villages are almost in the same range with slight differences in and performance considered, which is consistent with the study of Rezaei et al. (2014), Zhen and Routary (2003). The profitability criterion indicates the farm's survival, which is the core of agricultural sustainability and the priority of farmers (Roy and Chan (2012). According to the research results, this criterion has the highest weight of economic sustainability. The performance of agricultural products shows the productivity of the land. Because the farmers in the Sholgara district are primarily small owners, they have difficulty providing cash flow during the cultivation period, so loans and subsidies play an essential role in economic sustainability. By increasing the margin and gross value of agriculture, sustainability will increase, and as a result, the profitability and economic sustainability of the farm will increase. Based on the economic sub-criterion, Khowja Askandar was the most sustainable village, with 0.249, and Qorbaqqa Khana was the most unsustainable village, with 0.16.

To evaluate social sustainability, criteria of age, workforce, education, and the number of dependents were selected. The high age shows the physical disability of the farmer and the need for labor. Also, with increasing access to family labor, production unit managers have less reliance on mechanical and biological technologies, and with growing farmers' education levels, awareness, knowledge, managerial activities, and access to information increase. In the current study, the level of education has been assigned the first rank in social sustainability, and the study of Rezaee et al. (2014), Widayati (2017), and Roy & Chan (2012) confirms this result. With the increase in the number of household members in agricultural activities, the tendency to migrate to cities decreases and increases sustainability. The social criterion had a minor contribution to the sustainability of the entire agricultural sector of the Sholgara district. According to experts, the literacy rate had the most significant impact (30 percent), and the non-family workforce had the most negligible impact (8.1 percent) on social sustainability. According to the social sub-criterion, Aghar Saye had the highest level of sustainability with 0.204 and Qorbaqqa Khana with 0.197.

To evaluate the sustainability of agriculture from the environmental aspect, the criteria of fertilizer consumption and poison consumption, the amount of irrigation water consumption, and the entry of machinery into the farm were used according to the study of Rezaee et al. (2014), and Roy & Chan (2012). Excessive use of machinery leads to soil compaction. In addition, fertilizers and pesticides play a significant role in managing pests and weeds, strengthening the soil, increasing root penetration in the soil, and increasing production. But on the other hand, their indiscriminate consumption affects the quality of the produced product and provides the basis for disrupting the ecosystem's natural balance in a way that leads to a decrease in organic matter and soil fertility. Also, fertilizers enter underground water, agricultural products, and consequently human food, leading to unsustainability. Considering that the effect of the amount of water consumed during the growth period is negative on sustainability, insecticides are the most critical factor in agricultural sustainability and overall sustainability. According to experts, pesticides can affect the sustainability of the environment much more than fertilizers, and among the pesticides, the use of insecticides will have the most significant effect on the level of sustainability, which can be seen from the study. Rezaee et al., (2014) and Dantsis et al., (2010) are consistent. Based on the environmental sustainability criteria, the Qorbaqqa Khana, with a weight of 0.216, has the highest level of sustainability. Aghar Saye Khowja Askandar, Bauragai, and Boyni Qara are in the following priorities with scores of 0.202, 0.201, 0.198, and 0.185, respectively. In general, the results of this research provide the possibility of knowing the importance of different parameters affecting sustainability, evaluating sustainability, and comparing the villages of the Sholgara district with the desired accuracy so that a practical step can be taken in applying appropriate policies to improve the sustainability of agriculture.

In this research, we have faced problems such as the lack of accessible and usable scientific resources, the lack of necessary funds to carry out and advance the work, the lack of cooperation between the farmers and the researcher, and the lack of work similar to this research in Afghanistan. Considering that improper use of chemical fertilizers and pesticides are among the factors that threaten sustainability, ecological sustainability, and environmental pollution, their proper control and management are suggested to strengthen agricultural sustainability. In this regard, it is necessary to provide the optimal amount of consumption of these inputs to farmers and to make alternative inputs (green and animal manure) available to farmers at a reasonable price. Also, the method of integrated pest management to reduce the consumption of chemical poisons to the minimum possible amount in return for paying more attention to agricultural and biological control methods and the use of low-risk and selective chemical poisons as the best way to control pests in the treatment of increasing pest density is considered to be placed. Such research should be carried out on a wider scale, and in this way, more knowledge of the regions can be obtained so that related government organizations can take action to improve and increase the food security of households.

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References

[1] Dantsis, T. Douma. C. (2010). A methodological approach to assess and compare the sustainability level of agricultural plant production systems. *Ecological Indicators10(2)*: 256-263.

[2] Mouron, P.. Heijne. B. (2012). Sustainability assessment of crop protection systems: Sustain OS methodology and its application for apple orchards. *Agricultural Systems113(0)*: 1-15.

[3] Mucharam, I., Rustiadi, E., & Fauzi, A. (2019, December). Development of sustainable agricultural indicators at provincial levels in Indonesia: A Case study of rice. In IOP Conference Series: *Earth and Environmental Science, 399(1)*, 20-54.

[4] Mustajoki, J., Saarikoski, H., Belton, V., Hjerppe, T., & Marttunen, M. (2020). Utilizing ecosystem service classifications in multi-criteria decision analysis–Experiences of peat extraction case in Finland. *Ecosystem Services, 41*, 101-109.

[5] Mutyasira, V., Hoag, D., Pendell, D., Manning, D., and Melaku B. (2018). Assessing the relative sustainability of smallholder farming systems in Ethiopian highlands, *Agricultural Systems, 167* 83-91.

[6] Rezaee, A., Mortazavi, S., Peykani, G., and Khalilian, S. (2014). Evaluation and Comparison of the Sustainability Level of Agronomy Crops under Drought Condition by Using MCDA in the East of Zayandeh-Rud River Basin. *Journal of Environmental Studies, 40(2)*, 529-540. (in Persian)

[7] Roy, R., & Chan, N. W. (2012). An assessment of agricultural sustainability indicators in Bangladesh: review and synthesis. *The Environmentalist, 32(1)*, 99-110.

[8] Saaty, T. L. 2008. Decision-making with the analytic hierarchy process. *International Journal of Services Sciences1(1)*: 83-98.

[9] Smith, C. S., & McDonald, G. T. (1998). Assessing the sustainability of agriculture at the planning stage. *Journal of environmental management, 52(1)*, 15-37.

[10] Widayati, T, and Waridin Y E. (2017). Strategies for Environmental, Economic, and Social Sustainability of Potato Agriculture in Dieng plateau Central Java Indonesia. *Journal of Environmental Management & Tourism; Craiova. 81(17)*: 259-269.

[11] Zhen L, and Routray JK. (2003). Operational indicators for measuring agricultural sustainability in developing countries. *Environ Manage 32(1)*:34–46.

[12] Zulfiqar, F., & Thapa, G. B. (2017). Agricultural sustainability assessment at a provincial level in Pakistan. *Land use policy, 68*, 492-502.