THE ROLE OF INNOVATION IN INCREASING TOMORKA FARM INCOMES

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Abstract. *In this scientific research, the role and importance of using innovations in the income from tomorka farm activities in rural areas is studied. Also, the "The Innovation use index" is developed using factor analysis to assess the impact of the use of innovations on the income from tomorka farm activities. The influence of the innovation index on the income from tomorka farm activities is determined to be statistically significant at 1 percent (p<.01). Particularly, it is based that, a 1% increase in the index of the use of innovations to increase the income from tomorka farm activities by 32.9%. Based on the results of the analysis, proposals were made to increase income from tomorka farm activities in rural areas and to introduce opportunities for using innovations.*

Key words: *tomorka farm, non-farm, Innovation use index, factor analysis.*

1. Introduction. Populations suffering from hunger or malnutrition, with low or no income from their labor, can have a significant impact. Whereas, for the normal growth and development of the population, to live an active and healthy life, it is necessary to provide enough food products(Pelletier *et al.*, 2016). However, 45 percent of the world's population lives in rural areas, and most of them rely on income from agricultural activities. In this regard, diversification of risks in agricultural activities, seasonal income changes and financing of production resources are important for the sustainable development of production efficiency. Also(Müller and Campos, 2021), attracting innovations to the agricultural sector and financial support from the government will have a positive effect on the increase in the quantity and quality of the products obtained from the activity. While(Hasanov and Sanaev, 2018), the decision to engage in non-farm activities and the income coming from it affects agricultural activities. At the same time, although families grow agricultural products in their household for their own consumption and for the market, in families with a large number of family members, they rely on income from non-farm activities to meet their food and non-food needs(Lanjouw P., 2001).

However, the growth of non-farm sectors in rural areas also affects agricultural activities. That is, according to the results of a scientific study conducted by E. Giannakis and others(Giannakis, Efstratoglou and Antoniades, 2018) in households of the rural area of Cyprus, they found out that there is an inverse relationship between the arable land in farmers' or peasant farms and the probability of participation in non-agricultural activities. Also, according to the results of scientific research by S. Haggblade and others(Haggblade, Hazell and Reardon, 2010), in rural areas, households with less than 0.5 hectares of income

from non-agricultural activities make up to 30-90 percent, and households with little or no arable land rely on sources of income from non-agricultural activities. However, agricultural activity includes the production of agricultural products (crops, livestock) in the course of agricultural activities using production factors (natural resources)(Reardon, Berdegué and Escobar, 2001). However, innovations introduced into agricultural activities(Ermakova, 2021) have an impact on the increase in income from activities.

The share of tomarka farms in the production of agricultural products in Uzbekistan is 70.1%, which plays an important role in the country's economy. Today, the number of homesteads is more than 5 million, 1.5 times more than in 2000. The land area used for agriculture in Uzbekistan(*Agricultural statistics*, 2021) is 3686.7 thousand hectares, 13.0% of which is arable land used by homesteads.

Tomorka farming(*Law of the Republic of Uzbekistan. About the farm(tomarka)*, 2021) is a labor activity related to agricultural production on private homestead land plots for family economic activity, cultivation (processing) for sale on the market. Tomorka farming is not considered an entrepreneurial activity; it is not required to be state registered. However, a person may receive the status of a self-employed person in accordance with the legislation on employment. However, 26.9% of the working-age population in Uzbekistan is engaged in agricultural activities, and in 2020, compared to 2017, employment decreased by 3.1%. The decrease in the employment of the population in agricultural activities is related to the decrease in the size of agricultural arable land, which has decreased by 3.3% over the last 4 years. Although it is observed that the agricultural arable land has decreased, the volume of agricultural products and their value have increased over the years (2017-2020). The increase in the volume of agricultural products is related to the attraction of innovations in the field. In particular, in 2017, 66.7 percent of technological innovations were involved in agricultural activities by agricultural entities, and in 2020, this figure was 90.4 percent. Basically, innovations introduced by agricultural subjects are agricultural machinery, technologies related to the implementation of agrotechnical activities, innovative technologies related to crop irrigation. However, the involvement of such innovative technologies in agricultural activities are carried out by farm or agro cluster entities.

However, the owners of farm land in Uzbekistan are small farm subjects that grow agricultural products. It is important to introduce innovations in agricultural activities, which are the use of innovations by the owners of the agricultural land, such as irrigation of crops, fruitful new varieties of fruits and vegetables and potatoes, and cultivation of plant products from cultivated fields in all seasons. Also, the use of livestock with high productivity in livestock farming activities by the landowners can have a positive effect on the increase in the volume of products obtained from the activity.

The purpose of the scientific research work is to make an economic assessment of the impact of the innovations used by the estate owners on the income from the estate business and to make scientifically based proposals.

The scientific research work was based on survey data obtained from 1428 homestead land owners who operate in rural areas of Samarkand region.

2. Material and methods

2.1. Materials. A social survey was conducted to study the activities of tomorka farms. The survey was conducted from March 10 to August 24, 2021, and a total of 1428 respondents from 14 districts of Samarkand region participated. In this case, a questionnaire was conducted among the landowners located in the district, but not included in the neighborhood of the central city of the district(Saydullaeva, 2021). The agricultural products grown on homesteads in the research object, especially the crops obtained from plant growing, are grown for the consumption of family members. However, the needs of family members for agricultural products are met at the expense of vegetable, potato, fruit and grape products grown on homesteads. Surplus of consumption of family members is sold for income. However, family members are engaged in agricultural activities, the main income of families is income from agricultural activities. In this process, agricultural products used for sale and for family needs were taken to determine the income from tomorka farm activities. In this case, the agricultural products used for family needs in homesteads, which are vegetables, potatoes, fruit and grape products, were expressed at the market price. According to the approach, when agricultural products are not grown on the cultivated area of the tomorka farm, how many soums will be spent for the needs of family members. In total, the incomes from household activities of 1428 respondents were taken in the value index, and their average income is 14,531 thousand soums (Table 1).

Table 1

Descriptive Statistics of tomorka farms activities

Variable	Obs	Mean	Std. Dev.	Min	Max
Income	1428	14.531	5.458	3.3	37.5
Inn_irrigation	1428	.344	.475	0	1
Inn_veg_var	1428	.548	.498	0	1
Inn_fruit_var	1428	.506	.5	0	1
Inn_greenhouse	1428	.297	.457	0	1
Inn_ped_cattle	1428	.2	.4	0	1
Age	1428	48.1	6.87	27	60
Male	1428	.832	.374	0	1
Education	1428	1.926	.685	1	3
Non-farm	1428	.543	.498	0	1
Cropland	1428	7.323	2.438	3	18
Family_members	1428	5.588	1.229	2	11
3_year_members	1428	.272	.445	0	1
log_Income	1428	2.598	.413	1.194	3.624

Innovations used by tomorka farm land owners, which are the use of modern technologies in crop irrigation, high-yielding varieties of vegetables and fruits, and the

presence of closed space and productive livestock in tomorka farms, were taken as dummy variables.

2.2. Methods. In scientific research, the standard deviation of different values of the independent variable or the variation of the relationship between them causes the problem of heteroskedasticity and multicollinearity(Daoud, 2018). In order to partially eliminate the problem of heteroskedasticity, we introduce a new variable, innovations used by landowners, which use dummy indicators. This new variable represents the index of the use of innovations in household activities of 1428 respondents. Factor analysis(Rummel, 1988) was used to create the index of the use of these innovations.

First, the Kaiser-Meyer-Olkin (KMO=0.568) test(Kaiser, 1974) was conducted to determine the suitability of factor analysis for the variables used in agricultural activities, which represent innovations. In this case, the statistic is a measure of the ratio of variance between variables that may be the total variance. Also, according to the results of Bartlett's test(Bartlett, 1937), H0: the fact that the variables are not related to each other is explained by the condition that p value is less than 10%, 5%, and 1%. According to the result of Barlett's test, the variables representing the use of innovations in agricultural activities are not related (p=0.0000). Determinant of the correlation matrix(Bartlett, 1951) is explained by multicollinearity between variables greater than 0.0000001. However, the multicollinearity between the variables representing the innovations used in tomorka farm activities explains 0.890.

The results were obtained in the STATA-16 program package using the multivariate linear regression model in the economic evaluation of the influence of independent variables on the income from household activities. The "robust" command was used in the STATA-16 program package in order to strengthen the variables and eliminate multicollinearity when obtaining the results. Here, the marginal effect of the index of use of innovations on the income from household activities was determined.

3. Results. According to the results of the analysis, independent variables explain 50.7 percent of the changes in the dependent variable (R-squared=0.507). The functional equation is statistically significant (Prob > F 0.000) and at least 1 of the independent variables affects the dependent variable. However, the change of the income from tomorka farm activities is influenced by the use of innovation index, tomorka farm area, employment of the owner of the tomorka farm land in non-farm activities, education, gender, age, number of family members and family members under 3 years of age 1 percent (p<.01) is statistically significant. In this case, the influence of independent variables on the dependent variable is statistically significant.

However, the presence of children under the age of 3 in the family members has a negative effect on the increase in income from household activities. That is, the presence of 3-year-old children in the family has a statistical significance of 1 percent (p<.01) on the income from household activities, and it reduces the income from household activities by

7.9 percent. In this case, it is possible to limit the labor costs of family members in the homestead or the expenses spent on the homestead. However, the busyness of working-age family members with raising children up to the age of 3 limits the labor consumption in the cultivation of agricultural products in homesteads. However, sending children older than 3 years to kindergarten, which can have a positive effect on the increase in income from household activities. An increase in cultivated area by 1 hectare in tomorka farms increases the income from the activity by 8.3 percent. However, there is no possibility to increase the cultivated area due to the limited amount of cultivated land in the regions. However, in order to reduce poverty in the rural areas, to increase the employment of the population and their well-being, the government is allocating 15 hectares of arable land for long-term use, but not exceeding 10 years.

Use of resources, in which the limitation of land resources forces the intensive use of arable land(Pardaev, K. 2021). However, the intensive use of open spaces is related to the innovative technologies involved in the activity. In particular, a 1% increase in the index of the use of innovations by the landowners increases the income from the estate by 32.9%. However, the use of innovations by homestead land owners depends on the level of education and income of family members. In particular, an increase in the level of education of tomorka farm land owners by 1 unit increases the income from tomorka farm activities by 22.1 percent. In this case, it is required to increase the literacy of the landowners in the field of agriculture and livestock.

In homesteads, the employment of the head of the family in non-farm activities increases the income from homestead activities by 16.8%. However, the head of the family's employment in non-farm activities depends on the number of family members. In particular, the limitation of labor costs in farm activities, which the heads of families focus on the income from non-farm activities. However, an increase in the number of family members by 1 person increases the income from tomorka farm activities by 2.5%.

Innovations used in farm activities or the innovation index have a positive effect on the increase in income from tomorka farms (Figure 1).
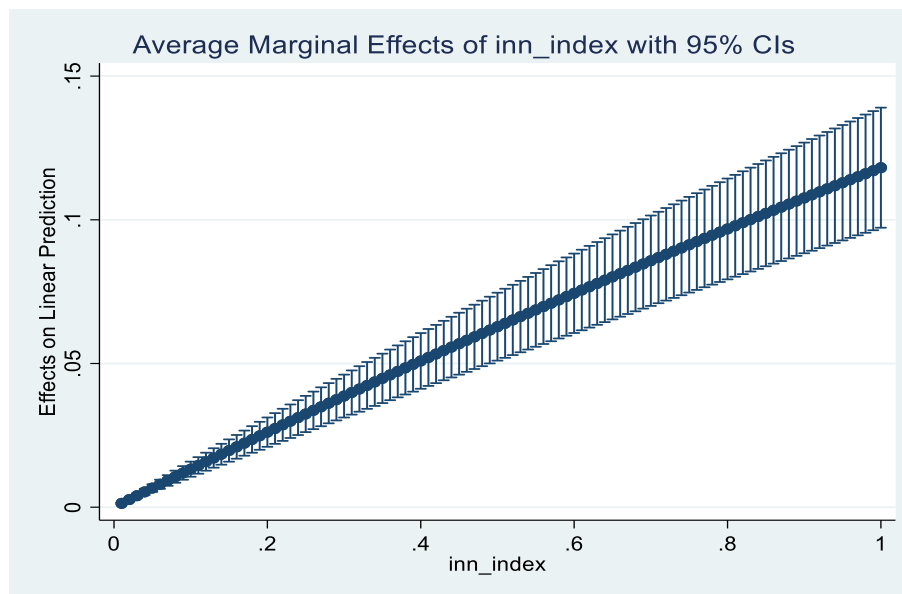
Figure 1. The relative marginal effect of the index of use of innovations on the income received from household activities

However, we cannot say that homestead landowners have effectively used innovations such as crop irrigation, high-yielding vegetable and fruit varieties, greenhouses, and productive livestock. Based on the results of the analysis, the innovation use index has a significant impact on the increase in income from household activities. In particular, the relative marginal effect of the index of use of innovations on the income from household activities confirms this.

Conclusion and suggestions. In the economy of Uzbekistan, agriculture is important in supplying industry with raw materials, meeting the population's demand for food products, and providing employment for rural residents. In particular, the agricultural products grown in the homestead economy, which, in addition to meeting the demand for food products of the family, are their source of income.

In the economic analysis of the impact of innovation on the income from tomorka farm activities, the data of the rural areas in Samarkand region was analyzed. 1428 respondents or landowners took part in the social survey. The results of the analysis showed that there is an opportunity to increase the income from tomorka farm activities in the rural areas of Samarkand region.

The size of tomorka farm land is important in increasing the income of the residents of rural areas from tomorka farm activities. However, the limited amount of arable land in tomorka farms, the use of innovations in activities is important. In this case, the homestead requires the use of new technologies by the landowners, which include crop irrigation, high-yielding vegetable and fruit varieties, greenhouses, productive livestock and other innovations. However, the effect of the use of innovation index on the income from farm activities is statistically significant at 1 percent ($p < .01$), and an increase in the use of innovation index by 1 percent increases the income from the activity by 32.9 percent. Also,

the increase of the income from tomorka farm activities is statistically significant in 1 percent (p<.01) of tomorka farm area, occupation of the tomorka farm land owner in non-agricultural activities, education, gender, age, and number of family members. Although the presence of members under 3 years of age in the family household is statistically significant at 1 percent (p<.01), it has a negative effect on the increase in income from household activities.

Nowadays, the reforms carried out by the government, which reduce poverty in rural areas and provide long-term arable land to the population, are important for improving the welfare of the population. However, it is necessary to develop a system to support or encourage the use of innovations in homestead tomorka farms and arable land allocated to them for a long time.

REFERENCES:

1. Agricultural statistics (2021). Available at: https://stat.uz/uz/default/press-relizlar/7658-2021-yil.

2. Bartlett, M. S. (1937) 'The statistical conception of mental factors', British journal of Psychology, 28(1), p. 97.

3. Bartlett, M. S. (1951) 'The effect of standardization on a χ 2 approximation in factor analysis', Biometrika, 38(3/4), pp. 337–344.

4. Daoud, J. I. (2018) 'Multicollinearity and Regression Analysis', Journal of Physics: Conference Series, 949(1). doi: 10.1088/1742-6596/949/1/012009.

5. Ermakova, A. M. (2021) 'Features of introduction of innovative means in production activity of the agricultural enterprise', IOP Conference Series: Earth and Environmental Science, 723(3). doi: 10.1088/1755-1315/723/3/032070.

6. Giannakis, E., Efstratoglou, S. and Antoniades, A. (2018) 'Off-farm employment and economic crisis: Evidence from Cyprus', Agriculture (Switzerland), 8(3), pp. 1–11. doi: 10.3390/agriculture8030041.

7. Haggblade, S., Hazell, P. and Reardon, T. (2010) 'The Rural Non-farm Economy: Prospects for Growth and Poverty Reduction', World Development, 38(10), pp. 1429–1441. doi: 10.1016/j.worlddev.2009.06.008.

8. Hasanov, S. and Sanaev, G. (2018) 'Non-farm employment trends and policy in rural areas of Samarkand region (Uzbekistan)', (176). Available at: www.iamo.de/en.

9. Kaiser, H. F. (1974) 'An index of factorial simplicity', Psychometrika, 39(1), pp. 31–36. doi: 10.1007/BF02291575.

10. Lanjouw P., F. G. (2001) 'Rural Strategy Background Rural Non-Farm Activities and Rural Development From Experience Towards Strategy', Strategy, pp. 1–68.

11. Law of the Republic of Uzbekistan. About the farm(tomarka) (2021). Available at: https://lex.uz/pdfs/5351489.

12. Müller, M. L. and Campos, H. (2021) Open Innovation and Value Creation in Crop Genetics, The Innovation Revolution in Agriculture. doi: 10.1007/978-3-030-50991-0_3.

13. Muratov, S. A. (2021) 'THE ECONOMIC ASSESSMENT OF FACTORS AFFECTING SMALL HOUSEHOLD (TOMORKA) IN RURAL AREAS AND THEIR INCOME', Irrigation and Melioration, 2021(3), pp. 45–51.

14. Pardaev, K. (2021) 'SMALLHOLDERSPREFERENCES FOR CONTRACT DESIGN ATTRIBUTES, A CASE OF SAMARKAND PROVINCE', Экономика и образование, (5), pp. 59–66.

15. Pelletier, B. et al. (2016) 'Linking rural livelihood resilience and food security: an international challenge', Food Security, 8(3), pp. 469–476. doi: 10.1007/s12571-016-0576-8.

16. Rummel, R. J. (1988) Applied factor analysis. Northwestern University Press.

17. Saydullaeva, F. J. (2021) 'MAIN DIRECTIONS OF FOOD SECURITY IN UZBEKISTAN (THE CASE OF SAMARKAND PROVINCE)', Irrigation and Melioration, 2021(3), pp. 39–44.