MODELING AND FORECASTING SUSTAINABLE ECONOMIC DEVELOPMENT OF AGRIBUSINESS ENTITIES

Bekmirzayev Mirzohid Adashaliyevich
Namangan Institute of Engineering and Technology, Namangan, Uzbekistan
E-mail: mirzo1979@umail.uz

Abstract
This article econometrically models the sustainable economic development of agribusiness entities, in particular, farms, which are its leading link, and predicts sustainable development in the future.

Keywords: agriculture, agribusiness, sustainable development, land, water, resources, prospects.

Our country has created a fairly solid resource base, legal, organizational, economic, and institutional base to ensure sustainable development of farms. Sustainability can be achieved in the agricultural sector, primarily through the use of efficient land and water management practices. The most effective form of organizing this process is the priority development of farms, the formation of reliable systems and mechanisms of logistics and financing following the principles of a market economy, their effective functioning is an important factor in ensuring sustainable development of farms. In particular, the difficult situation created by today's coronavirus pandemic calls for more sustainable farm development. This is because a significant part of the population's needs for food and industrial raw materials is grown on farms. In this regard, it becomes relevant to study the factors affecting the sustainable development of farms following the requirements of today and their effective use.

To determine the significance of the share of farms in GDP in the agrarian economy of the Namangan region, it is advisable to calculate the impact of investments in fixed assets on employment and development of the industry in the last 2005-2019 years and their efficiency.

To do this, the gross agricultural output produced by farms - GAO, the number of people employed in the sector – NPES and fixed capital investment-FCI the econometric model can be defined in the Eviews program. The degree of correlation of the initially selected factors is determined (Table 1).

Table 1 The ratio of factors affecting the volume of products produced by farms

	YFXM	*TBS*	*AKI*
YFXM	1		
TBS	0,902294	1	
AKI	0,978998	0,740896	1

According to the table, the influence of both factors ($r_{YFXM,TBS}$=0,9023) and ($r_{YFXM,AKI}$=0,979) on the volume of gross agricultural output produced by farms - YFXM - is very closely related and between them $r_{TA}\leq 0$. that under condition 8 ($r_{TBS,AKI}$=0,7409) multicollinearity is absent.
Determination of the regression equation between the resulting and influencing factors and checking the significance of the parameters based on the Student's t-test and the regression equation based on Fisher's criteria, the presence of autocorrelation based on the Durbin-Watson values, as well as the adequacy and reliability of the model is determined by the Akaike Schwarz and Hannan-Quinn criteria purposefully First of all, since the index of the selected factors is in different units, we can logarithm each factor and create a table of regression equations (Table 2).

Table 2 The regression equation for the volume of products produced on farms and its estimation table

Dependent Variable: YFXM				
Method: Least Squares				
Date: 07/03/21 Time: 18:55				
Sample: 2005 2020				
Included observations: 16			t_{table}=2,160369	
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNTBS	-0.31291	0.175227	-1.78575	0.0279
LNAKI	0.61487	0.061463	10.0039	0.0000
C	6.538768	0.881538	7.417452	0.0000
R-squared	0.899953	Mean dependent var		6.902941
Adjusted R-squared	0.884562	S.D. dependent var		0.917721
S.E. of regression	0.311807	Akaike info criterion		0.674495
Sum squared resid	1.263906	Schwarz criterion		0.819355
Log-likelihood	-2.395960	Hannan-Quinn criteria.		0.681913
F-statistic	58.46973	Durbin-Watson stat		1.870443
Prob(F-statistic)	0.000000	F_{table}=19,4189		

According to the data in the table, since a = 0.05, the number of people employed in the sector – TBS (t_{TBS}=-1,786) t_{table}> $t_{reports}$ is negligible, since t_{table} = 2,1604 at df = 13. It is advisable to check the parameters of the equation according to the criteria MARE<10 and TIC<1. According to the results of the study, the parameters are significant under the condition MARE = 9,316<10 and TIC = 0.05<1. Since F_{table} = 19.42 F_{report} = 58.47> Equation (2.1) is significant from Ftable and DW = 1.87≤2 is adequate:

$$LnYFXM = 0{,}61487LnAKI - 0{,}31LnTBS + 6{,}54 \qquad (2.1)$$

the equation is significant and reliable and adequate.

Of course, to ensure the accuracy and reliability of the logarithmic equation, it is advisable to potentiate the regression equation (2.1), according to which (2.1) is the equation

$$YFXM = \frac{AKI^{0{,}61487} * e^{6{,}54}}{TBS^{0{,}31291}} \qquad (2.1^*)$$

will look like. If we interpret equation (2.1 *) - economically, then the study shows that if we take into account the current saturation of demand for labor on farms in the Namangan region, according to the model, if the number of employees in the network is reduced by thousand units, the income of farms will increase by another 3.4 billion soms and the volume of investments in fixed assets will increase by 1 billion soms. By increasing the volume of gross output of farms by another 5.9 billion soms.

In the current context of globalization, we consider it appropriate to determine the influence of the values determined based on reports on land fertility and water consumption food security, population growth, and declining arable land are in turn driven by the need to improve soil fertility and water use efficiency, as well as to maintain sustainable intensive agricultural activities to maintain ecosystem services to maintain high yields. land plot in good (clean) reclamation condition, 150 farms. To do this, we use a dynamic change analysis process in 2005-2019. And we will investigate the correlation between the initially selected factors and the resulting factor and factors (Table 3).

Table 3 The correlation coefficient of the selected factors

	YFXM	*TEM*	*ShEM*	*U*	*SS*
YFXM	1				
TEM	0,744397	1			
ShEM	-0,80214	-0,41053	1		
U	0,923621	0,565276	-0,7292	1	
SS	-0,92424	-0,47117	0,678255	-0,74426	1

According to the results of the table, the net sown area (r_{YT} = 0.7444) of the selected farms concerning the result coefficient, an increase in soil fertility (r_{YU} = 0.9236) to the correct and saline land area with high density (r_{YS} = -0.80214), water consumption (r_{YS} = -0.92424) is inversely proportional to density. There is also no multicollinearity in the relationship between the selected arable land area with an arable land area - *TEM*, saline land area - *ShEM*, land fertility - U, and water consumption. Continuing the process, it is necessary to test the regression equation, which will be determined based on the criteria, and the results of this test can be seen in Table 4 below.

Table 4 (2.2*)- the results of the criterion regression equation

Dependent Variable: LNYFXM				
Method: Least Squares				
Sample: 2005 2019				
Included observations: 15				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNTEM	-2.686012	5.036049	-0.533357	0.6054
LNSHEM	0.003448	1.980370	0.001741	0.9986
LNYerU	5.406782	0.829437	6.518620	0.0001
LNSS	-3.459073	0.998285	-3.465016	0.0061
C	10.26271	23.61249	0.434631	0.6731
		t=	2,228139	
R-squared	0.994072	Mean dependent var		13.79972
Adjusted R-squared	0.991700	S.D. dependent var		0.967890
S.E. of regression	0.088177	Akaike info criterion		-1.757746
Sum squared resid	0.077751	Schwarz criterion		-1.521730
Log-likelihood	18.18310	Hannan-Quinn criteria.		-1.760261
F-statistic	419.2085	Durbin-Watson stat		1.910760
Prob(F-statistic)	0.000000	F=	3,47805	

According to the table, all parameters except the U parameter are insignificant since tfable = 2.201 at df = 11 when a = 0.05. Therefore, it is advisable to check the significance of these parameters according to the criteria MARE <10 and TIC <1 (Figure 1).

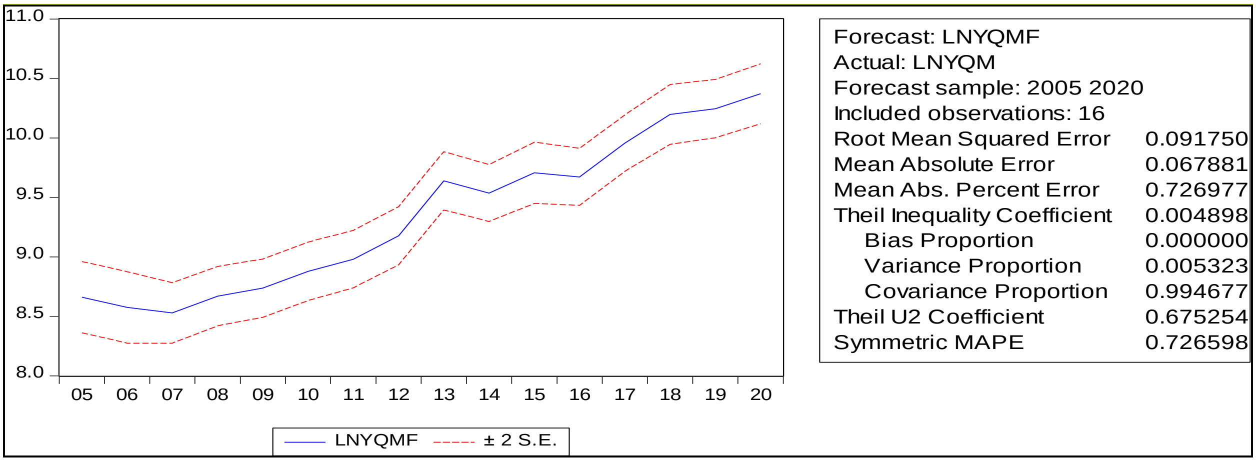

Figure 1. Checking the importance of the parameters

Based on the test results, since MARE = 0.73 <10 and TIC = 0.0049 <1, all parameters are significant. Since $k_1 = 11$ and $k_2 = 4$ at a = 0.05, $F_{table} = 5.9358$ and $F_{report} = 268.37$, and DW = 1.975≤2,

$$YFXM = \frac{TEM^{3.04} * YerU^{2,96} * e^{20,4}}{ShEM^{0,75} * SS^{5,84863}} \qquad (2.2^*)$$

the equation is significant, reliable, and adequate. If we give an economic interpretation of this (2.2*) - regression equation, then the increase in the area of clean land by one thousand hectares under this defined model will increase the volume of gross farm output to 88.3 mln. soms. Also, if the land productivity is increased by 1 hectare/quintal, the gross output of farms will increase by an additional 224.7 mln. soms. Based on the results of the identified model, it should be noted that currently it is necessary to improve water consumption and land reclamation on saline lands, respectively, if water consumption is reduced by one thousand cubic meters, the gross yield of farms will increase by 42.3 mln. soms, if the reduction of saline lands by one thousand hectares is achieved, the gross harvest will increase by 69.8 mln. soms.

At present, it is found that water consumption in farms of Namangan region is wasted, and an increase of one thousand cubic meters will lead to a 3.5-fold decrease in the gross yield of farms.

From this (based on the above (2.1*) econometric model), the general conclusion of the study is that farmers can increase the number of jobs in the sector, increase investment in fixed assets, improve land reclamation, increase their productivity and reduce water consumption and reduce salinization, it is possible to increase the volume of products produced on farms.

Of course, in addition to the objectives and guidelines for sustainable development of these identified farms, it is also important to deliver products to their consumers. In this regard, based on the order of the Agency for Restructuring of Agricultural Enterprises under the Ministry of Agriculture of the Republic of Uzbekistan and financial support from IFAD, 39.4 million US dollars were allocated for the Agricultural Development Program for 2017-2023, aimed at improving the living standards of the rural population. by interacting with commercial farmers and facilitating market access. This, in turn, requires farms to improve economic cooperation and strengthen ties with adjacent farms.

Based on the results of the study, we draw up a forecast based on two scenarios of expected results from the consistent implementation of the stated tasks and recommendations. To do this, first of all, the gross agricultural output produced by farms based on the above (2.1) econometric model - YQXM, the number of people employed in the sector - TBS, and the main fixed capital investment - AKI prediction is performed from t = 17 using a system of time change models:

$$YFXM = \frac{AKI^{0,61487} * e^{6,54}}{TBS^{0,31291}} \qquad (2.1^*)$$

Number of people employed in the sector - TBS =-87,4+30,9*t;

Fixed capital investment - AKI =-50,5+32,9*t.

Table 5

Scenario 1 (according to the effect of employed in the sector and the impact of fixed capital investments) forecast

Years	The volume of farm products, bill. som	Number of employed, thousand people	Fixed capital investment bill. som
2022	4933,9	468,8	541,7
2023	5015,8	499,7	574,6
2024	5094,8	530,6	607,5
2025	5171,2	561,5	640,4

According to the table, in 2022, 468.8 thousand people will work in the farms of the Namangan region and earn 541.7 billion soms. By attracting investments, the volume of agricultural production increased by 4933.9 billion soms.

By 2025, this figure will increase by 6.7% compared to 2022 and will reach 5,171.2 billion. The volume of investments in the industry increased by 28.2%, and the volume of investments in fixed assets - by 25.9% to 561.5 thousand soms and 640.4 billion soms, respectively.

Also, the reclamation status selected in the second scenario was clean land area - TEM, saline land area - ShEM, land fertility - U, and water consumption - SS. The change in the volume of farm products determined from the relationship between is carried out using the following system of models:

$$YFXM = \frac{TEM^{3.04} * YerU^{2,96} * e^{20,4}}{ShEM^{0,75} * SS^{5,84863}} \qquad (2.2^*)$$

Based on the above regression equation, from a system of equations expressed by a time-dependent change in the factors influencing it:

lean land area – TEM = 176,4+1,3*t;

Saline land area – ShEM = 71,0-0,5*t;

Farm productivity – U = 83,2+2,6*t;

Farm water consumption – SS = 1030,2-13,7*t

forecasting for Scenario 2 using the forecast and identifying the results from both scenarios and developing proposals and recommendations for the sustainable economic development of farms based on the conclusion (Table 6).

Table 6 Scenario 2 (on the effect of clean land area, saline land area, productivity, and water consumption) forecast

Years	The volume of farm products, bln. sum	The arable land of farms, thousand hectares	Saline crop area of farms, thousand hectares	Increase in soil fertility, ha / c	Water consumption in agriculture, million cubic meters m3
2022	6916,9	199,8	62,0	130,0	783,6
2023	8343,8	201,1	61,5	132,6	769,9
2024	10071,6	202,4	61,0	135,2	756,2
2025	12166,3	203,7	60,5	137,8	742,5

According to scenario 2 in the table, in 2022, as a result of work to improve land reclamation in farms of the Namangan region, the saline land area will be 62.0 thousand hectares, clean land - 199.8 thousand hectares, reservoirs. consumption in farms - 783.6 million. The volume of agricultural production increased by

6916.9 billion soms with a decrease in yield to 130 thousand tons per hectare expected equal to the som.

By 2025, water consumption will be reduced by 6.9% and saline land area by 3.2% compared to 2022, respectively, to 742.5 mln. m3 and 60.5 thousand hectares, increasing the net area of farms by 2.6% and land productivity by 8.2%, the volume of farm products increased by 2.1 times and amounted to 12166.3 billion soms.

Conclusion

Based on the foregoing:

- The formation of various forms of ownership in the economy, including the characteristics of agricultural production, the laws of development of an entrepreneurial activity, the desire of producers to demonstrate freedom of management, private interest, and initiative are the objective basis for new forms of management in agriculture. The market economy serves as the basis for the organization of farm activities, which is one of the most effective forms of management. The main purpose of assessing the performance of farms should be not only to assess the effectiveness of these farms, but also to formulate effective roadmaps and opportunities to ensure their economic sustainability.
- Solving regional problems at the republican and sectoral levels for sustainable development of agriculture, qualitative reform of labor and economic relations to achieve economic development, interregional, interdistrict integration of material and natural resources, consistent use of modern methods and technologies of management based on the system can only be achieved.
- The work on the development and efficiency of agriculture in Namangan region is bearing fruit. Based on the results of an econometric analysis of sustainable economic development of farms in the study, given the current saturation of labor demand in farms in the Namangan region, according to the model, if the number of jobs in the industry is reduced by one thousand units, farm income will increase by 3.4 billion. soms and increase the volume of investments in fixed assets by 1 billion soms. By increasing the volume of gross output of farms by another 5.9 billion soms.
- According to the model found in the study, an increase in the area of clean land per thousand hectares will increase the gross agricultural output to 88.3 million

hectares soms. Also, if the productivity of the land increases by 1 ha / c, the gross output of farms will increase by another 224.7 million soms. Based on the results of the identified model, it should be noted that currently, it is necessary to improve water consumption and reclamation of saline lands, and if water consumption is reduced by one thousand cubic meters, the gross yield of farms will increase by 42.3 mln. soms, if the reduction of saline lands by one thousand hectares is achieved, the gross harvest will increase by 69.8 mln. soms.

- Looking at the results of both scenarios, it is now recommended to increase the share of employment and investment in fixed assets in scenario 1 for the sustainable economic development of farms, which, in turn, will accelerate the level of development. However, it should be noted that to ensure sustainable development, of course, it is advisable to consistently implement the proposals and recommendations given in scenario 2.

References

1. Adashalievich, B. M. (2019). Socioeconomic importance of sustainable farming development. *ACADEMICIA: An International Multidisciplinary Research Journal*, *9*(7), 76-82.
2. Бекмирзаев, М. А., & Иномов, Ж. Г. (2016). Развитие сельского хозяйства в Республике Узбекистан и результаты его реформирования. In *СОВРЕМЕННОЕ ЭКОЛОГИЧЕСКОЕ СОСТОЯНИЕ ПРИРОДНОЙ СРЕДЫ И НАУЧНО-ПРАКТИЧЕСКИЕ АСПЕКТЫ РАЦИОНАЛЬНОГО ПРИРОДОПОЛЬЗОВАНИЯ* (pp. 3615-3618).
3. Mahkamov, I., Bekmirzayev, M., & Madaminjonov, O. (2019). PRODUCTION OF FOOD AND VEGETABLE PRODUCTS AND DEVELOPMENT OF RECYCLING. *Central Asian Problems of Modern Science and Education*, *3*(4), 123-128.
4. Maxkamov, I., Bekmirzayev, M., & Madaminjonov, O. (2019). Prospects for the development of growing and processing of fruit and vegetable products. *Scientific Bulletin of Namangan State University*, *1*(1), 92-97.
5. Бекмирзаев, М. А., & Иномов, Ж. Г. (2016). ОБЕСПЕЧЕНИЕ РЕСУРСАМИ АГРОПРОМЫШЛЕННОГО КОМПЛЕКСА В УСЛОВИЯХ МОДЕРНИЗАЦИИ ЭКОНОМИКИ. In *ПРИОРИТЕТНЫЕ НАПРАВЛЕНИЯ*

РАЗВИТИЯ СОВРЕМЕННОЙ НАУКИ МОЛОДЫХ УЧЁНЫХ АГРАРИЕВ (pp. 1115-1118).
6. М. Бекмирзаев. (2022). Тадбиркорликни ривожлантириш асосида камбағаллик даражасини камайтириш йўналишлари. *Архив научных исследований*, *2*(1). извлечено от http://journal.tsue.uz/index.php/archive/article/view/2105
7. Бекмирзаев , М. А. (2022). ФЕРМЕР ХЎЖАЛИКЛАРИНИ БАРҚАРОР ИҚТИСОДИЙ РИВОЖЛАНТИРИШ ИСТИҚБОЛЛАРИНИ ПРОГНОЗЛАШ. *Архив научных исследований*, *2*(1). извлечено от http://journal.tsue.uz/index.php/archive/article/view/2207
8. Бекмирзаев М. (2022). НАМАНГАН ВИЛОЯТИДА АГРОБИЗНЕС СУБЪЕКТЛАРИ БАРҚАРОР ИҚТИСОДИЙ РИВОЖЛАНИШИНИНГ ПРОГНОЗИ. *Архив научных исследований*, *2*(1). извлечено от http://journal.tsue.uz/index.php/archive/article/view/1142
9. Adashalievich, B. M. (2022). Specific Features of Innovative Development of Private Entrepreneurship in the Context of Digitalization of the Economy. *European Scholar Journal*, *3*(2), 88-93.
10. Adashaliyevich, B. M., & O'g'li, I. M. (2022). Promoting sustainable development of small business. *Asian Journal of Research in Business Economics and Management*, *12*(4), 5-9.
11. Бекмирзаев, М. А., & Холиков, Ж. Т. У. (2022). ВАЖНОСТЬ РАЗВИТИЯ СФЕРЫ УСЛУГ В РЕСПУБЛИКЕ УЗБЕКИСТАН. In *Colloquium-journal* (No. 4 (127), pp. 18-21). Голопристанський міськрайонний центр зайнятості.
12. М.А.Бекмирзаев. Перспективы устойчивого экономического развития субъектов агробизнеса. Научно образовательный электронный журнал "Образование и наука в XXI веке". ООО "Моя профессиональная карьера". 2021 октябрь. Выпуск 19 (том 2). стр. 746-754.
13. Bekmirzayev Mirzohid Adashaliyevich. Development of Agricultural Infrastructure and Material Logistics Support of Farms // Journal of Economics, Finance and Management Studies. September 2021. Article DOI: 10.47191/jefms/v4-i9-21, Impact Factor: 6.228. pg 1762-1766.
14. Bekmirzayev M.A. Factors of Sustainable Economic Development of Agricultural Businesses // International Journal of Advanced Science and

Technology. pp. 46-52. www.sersc.org/journals/index.php/IJAST/article/view/19947

15. Bekmirzayev M.A. (2019). **Ensuring stability of agriculture based on the development of the farm economy of the republic of Uzbekistan** // Indo – Asian Journal of Multidisciplinary Research (IAJMR). pg 1788-1793. DOI: 10.22192/iajmr.2019.5.4.5 (ISI Impact Factor – 3.652; Global Impact Factor – 0.454).

16. BEKMIRZAYEV M. **Distinctive features of sustainable farming development** // ORGINIZED BY GLOBAL RESEARCh NETWORK" LLC AND IDEAS LAB // International conference on **sustainable development and economics.** pg 154-158. june 24-25, 2019.

17. Бекмирзаев М., Иномов Ж., Таджиев А. Реформирование сельского хозяйства в Республике Узбекистан // «Дни науки – 2017» сборник научных трудов по результатам II международной научно-практической интернет-конференции «экономика и право: становление, развитие, трансформация», Российская Федерация, г. Макеевка, 2017, 28 апрель, с. 59-60.

18. Бекмирзаев, М. (2012, July). Проблемы стабильного развития фермерских хозяйств в Узбекистане и пути их решения. In *Десятые Ознобишинские чтения: Сборник материалов Международной научнопрактической конференции, Российская Федерация, Изна-Самара: ПГСПА* (pp. 4-5).

19. Бекмирзаев, М. А. (2022, June). ФЕРМЕР ХЎЖАЛИКЛАРИНИ БАРҚАРОР РИВОЖЛАНИШИДА ИННОВАЦИЯЛАРДАН ФОЙДАЛАНИШ. In *Conference Zone* (pp. 158-162).

20. Bekmirzayev Mirzohid Adashaliyevich. The econometric analysis and forecast of factors of sustainable economic development of agribusiness entities. International Journal of Trend in Scientific Research and Development (IJTSRD) Volume 6 Issue 3, March-April 2022 Available Online: www.ijtsrd.com e-ISSN: 2456 – 6470. Impact Factor 6.410. pg 351-357.

21. M.A.Бекмирзаев. Этапы устойчивого развития фермерских хозяйств. “Zamonaviy ta‘lim tizimini rivojlantirish va unga qaratilgan kreativ g‘oyalar, takliflar va yechimlar” mavzusidagi 33-sonli Respublika ilmiy-amaliy on-line konferensiyasi materiallari to’plami, Farg’ona, BestPublication, 2022 yil, 15 mart, 118-120 betlar.

22. Бекмирзаев Мирзохид Адашалиевич, Анасов Абдурауф Аъзамхон угли, Юлчибаев Бекмурод Дилшодбек угли. Фактор устойчивого развития сельского хозяйства. Международная научно-практическая конференция «Инновационные подходы в современной науке». РУДН. Том 4. Москва. 1 май 2022 г. Сборники научных работ. стр 64-69.
23. Mexribonu Adashaliyeva, Mirzoxid Bekmirzayev, Onaxon Bekmirzayeva. TRAINING OF QUALIFIED SPECIALISTS IS A CHALLENGING PROBLEM. Международный научный журнал «Научный импульс». № 3 (100), часть 1. Октябрь, 2022.