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Research Paper Economics

Analysis and Structure of the Basic Equations of the Agrarian Sector of Azerbaijan's Regions

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ABSTRACT

This article deals with questions of choice of linear and industrial economics and mathematical equations for the agricultural sector of economy. In the model of the agricultural sector of Azerbaijan a variety of linear equations and production functions which can be used to predict the development of rural regions of Azerbaijan are built.

KEYWORDS : linear function, multiple regression, production function, factors of production and growth, the mathematical model of the economy

INTRODUCTION

Currently in Azerbaijan at the state level the problems of sustainable development of rural areas recognized, as evidenced by the recognition of the national interest of food provision of the country and in these conditions, taking measures of state support for agriculture and social development of the village.

It is obvious that in the process of design of the new rural development policy Azerbaijani territorial model should be preferred, assuming the process of its design more complex and detailed. Rural development is a process of multi-level and multi-dimensional with many participants and mutual responsibility of government, science, business and civil society to ensure a decent quality of life for the rural population. It is also a process of long and controversial, and should remain on the agenda of the central, regional and local authorities for many decades as an urgent problem.

In modern conditions of development of agrarian economy the problems of developing a strategy of rural development at the regional level is an important and urgent task of scientific research. It should be noted that so far the world has not formed a unified methodology and methodological approaches to the treatment of formation of strategy of development of rural areas.

However, in our view, the use of simulation methods in the development of alternative scenarios for the development of rural areas can effectively design a balanced development of production and social spheres and to identify possible conditions to achieve growth in the rural economy, improving the quality of life of the rural population. The new paradigm of the socio-economic development of rural areas determines the use of modern methods of modeling and forecasting, namely the construction of econometric models.

Effective planning, forecasting of economic growth and development, including the agricultural sector, increasing competitiveness, standard of living, especially in the regions of the country are among the main tasks of the government. Using mathematical modeling helps to identify and describe the most important, significant economic ties objects to estimate the parameters of the economy. Plural-linear production functions and are used as a useful tool to carry out analytical calculations to determine the effectiveness of the use of economic resources and the expediency of their further involvement in the production, to predict the volume of output, GDP incomes of the agricultural sector and to control the reality of the projects in this area.

Types of presentation of economic and mathematical equations

In theory, economic-mathematical analysis developed many kinds of equations, each of which has its own characteristics and applicability. However, all this diversity is traditionally divided into several major classes covering most types of economic processes.

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \ldots + \beta_k X_{ki} \qquad (1)$$

Specifically, the multiple regression model with five explanatory variables:

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + \beta_5 X_{5i} (2)$$

Production function - it is economic and mathematical quantitative relationship between the quantities of production, factors of production (waste of resources, the level of technology and others.) Per unit time.

In general, the production function is written in following way:

$$Y_i = f(X_1, X_2, \ldots, X_n)(3)$$

Where - the volume of production, - the factors of production.

The foregoing description of functional relationships is an overview of major, the most frequently mentioned in the literature models. Many of them have been successfully applied in practice for solving various problems, not only at the macro and micro levels. Thus, for example, works of Western authors M.Brauna, I.Heddi, G.DillonG.Tintera and others devoted to the analysis of the economy based on the production function of the Cobb-Douglas. Their work tasks affect both the level of industries and the level of enterprises and associations and agriculture, in some cases even moving to a three-factor and multifactor models.

Statistical data for econometric equation

The complexity of the agro-economic processes and their dependence on a number of factors, operating with varying degrees of intensity and in a different direction on the results of production, does not allow to know in advance which model what it is expedient to describe the function of a particular process.

The initial basis for calculation are the statistics for 2005 - 2013 years. (Table 1,2,3).

When selecting economic indicators for a more detailed reflection of the development of the regional economy, we stopped on a choice of the following: Revenues from the sale of agricultural enterprises, incomes of regions, the share of agricultural GDP, the total income of ag-

ricultural enterprises, agricultural production and regional GDP. A growth factors including the number of agricultural enterprises, investment in fixed capital of agriculture, fixed assets of agriculture, economy and labor costs and the area of suitable land agriculture.

Table 1.
The main socio-economic indicators of agricultural districts

Years	Proceeds from the sale	Income of people	Share of GDP	Total income	Gross production	Regional GDP	Enterprise	Investment in fixed capital	Fixed funds	Labor costs	The area of suitable land
	chiliad manat	chiliad manat	chiliad manat	chiliad manat	chiliad manat	chiliad manat	Unit	million manat	chiliad	man-day	ha
	Y_1	Y_2	Y_3	Y_4	Y_5	Y_6	X_1	X_2	X_3	X_4	X_6
2005	5872	3776,1	1145,5	14757	79683	4273,6	1782	40,7	172139	4264	197072
2006	13889	4757,5	1329,3	21561	103790	4660,7	1951	58,3	198953	4769	199056
2007	20575	6772,8	1854,8	39085	139035	6204,2	2178	243,3	218905	4985	189036
2008	25756	9540,6	2236,0	50101	160464	8606,9	2258	336,5	234017	5166	168529
2009	29089	10477,7	2179,5	67149	175461	8282,1	2392	266,6	305257	4864	183134
2010	22286	11829,1	2344,6	71604	187694	9732,7	2043	431	388100	3980	184632
2011	34209	14379,6	2643,5	71623	198806	12631,9	1917	437,3	372289	3602	183904
2012	44252	16150,1	2813,7	86045	263180	14480,1	1774	648,8	389033	3880	189885
2013	47259	16890,3	3057,8	91903	304766	15415,3	1669	574,3	377524	3511	195635

Source: http://www.stat.gov.az/

Table 2.
The main socio-economic indicators of agricultural districts **(2005=100)**

Years	Proceeds from the sale	Income of people	Share of GDP	Total income	Gross production	Regional GDP	Enterprise	Investment in fixed capital	Fixed funds	Labor costs	The area of suitable land
	Y_1	Y_2	Y_3	Y_4	Y_5	Y_6	X_1	X_2	X_3	X_4	X_6
2005	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0
2006	236,5	126,0	116,0	146,1	130,3	109,1	109,5	143,2	115,6	111,8	101,0
2007	50,4	179,4	161,9	264,9	174,5	145,2	122,2	597,8	27,2	16,9	95,9
2008	438,6	252,7	195,2	339,5	201,4	201,4	126,7	826,8	135,9	121,2	85,5
2009	95,4	277,5	90,3	455,0	220,2	193,8	134,2	655,0	177,3	114,1	92,9
2010	379,5	313,3	204,7	485,2	235,6	227,7	114,6	1059,0	225,5	93,3	93,7
2011	582,6	380,8	230,8	485,3	249,5	295,6	107,6	1074,4	216,3	84,5	93,3
2012	753,6	427,7	245,6	583,1	330,3	338,8	99,6	1594,1	226,0	91,0	96,5
2013	804,8	447,3	266,9	622,8	382,5	360,7	93,7	1411,1	219,3	82,3	99,3
Source: http://www.stat.gov.az/											

Table 3.
The main socio-economic indicators of agricultural districts **(*Ln*)**

Years	Proceeds from the sale	Income of people	Share of GDP	Total income	Gross production	Regional GDP	Enterprise	Investment in fixed capital	Fixed funds	Labor costs	The area of suitable land
	Y_1	Y_2	Y_3	Y_4	Y_5	Y_6	X_1	X_2	X_3	X_4	X_5
2005	4,60517	4,60517	4,60517	4,60517	4,60517	4,60517	4,60517	4,60517	4,60517	4,60517	4,60517
2006	5,46595	4,83628	4,75359	4,98429	4,86984	4,69227	4,69592	4,96424	4,75014	4,71671	4,61512
2007	3,91999	5,18962	5,08698	5,57935	5,16192	4,97811	4,80566	6,39326	3,30322	2,82731	4,56331
2008	6,08359	5,53220	5,27402	5,82747	5,30529	5,30529	4,84182	6,71756	4,91192	4,79744	4,44852
2009	4,55808	5,62582	4,50314	6,12030	5,39454	5,26683	4,89933	6,48464	5,17784	4,73708	4,53152
2010	5,93885	5,74716	5,32155	6,18456	5,46214	5,42803	4,74145	6,96508	5,41832	4,53582	4,54010
2011	6,36750	5,94227	5,44155	6,18477	5,51946	5,68901	4,67842	6,97952	5,37667	4,43675	4,53582
2012	6,62486	6,05842	5,50370	6,36836	5,80000	5,82541	4,60116	7,37406	5,42053	4,51086	4,56954
2013	6,69059	6,10323	5,58687	6,43423	5,94673	5,88805	4,54010	7,25212	5,39044	4,41037	4,59815
Source: http://www.stat.gov.az/											

SOME ECONOMETRIC EQUATIONS AND ANALYSIS OF THE RESULTS OF THE AGRARIAN SECTOR OF AZERBAIJAN'S REGIONS

Multiple regression provides a more appropriate reflection of the economic phenomenon.

The calculations we obtained the following equation:

Proceeds from the sale	k.	(-0,592)	(0,859)	(0,759)	(0,129)	(-0,044)
	t-st.	(-2,077)	(2,126)	(-0,482)	(1,125)	(-0,567)
	ss..	(5,406)	(0,217)	(1,527)	(2,473)	(16,837)
Income of people	k)	(-0,304)	(0,966)	(0,833)	(-0,009	(--0,191)
	t-st.	(0,285)	(2,559)	(1,139)	(-0,295)	(0,226)
	ss..	(1,844)	(0,074)	(0,521)	(0,843)	(5,743)
Share of GDP	k.	(-0,478)	(0,895)	(0,602)	(-0,209)	(---0,161)
	t-st.	(-2,283)	(1,355)	(0,049)	(-0,787)	(-1,655)
	ss..	(1,303)	(0,052)	(0,368)	(0,596)	(4,059)
Share of GDP	k	(-0,164)	(0,948)	(0,819)	(-0,019)	(-0,236)
	t-st.	(2,016)	(3,063)	(1,547)	(-0,403)	(1,157)
	ss..	(2,353)	(0,095)	(0,664)	(1,077)	(7,329)
Share of GDP	k	(-0,359)	(0,945)	(0,739)	(-0,076)	(-0,066)
	t-st.	(0,701)	(3,018)	(-0,338)	(0,660)	(1,285)
	ss..	(1,727)	(0,069)	(0,488)	(0,790)	(5,379)
Regional GDP	k	(-0,410)	(0,962)	(0,802)	(-0,030)	(-0,124)
	t-st.	(-0,497)	(2,389)	(0,484)	(0,012)	(0,056)
	ss..	(1,575)	(0,063)	(0,445)	(0,720)	(4,904)

In the first parentheses below the regression coefficient is the value of the correlation coefficients in the second parentheses, and in brackets the third of its standard error. The variables, and either alone (the significance of the regression coefficients) and jointly (the significance of the coefficient of determination) have a significant impact on the change in the variable, и. The inclusion in the analysis of the variables, and significantly increases the proportion of explained variance. The coefficients of multiple determination R^2=0,939247, R^2=0,963944, R^2=0,932434, R^2=0,972722, R^2=0,937056, R^2=0,953889 suggests that changes in sales revenue, income of the population GDP, total revenue, gross output, regional GDP to a large extent determined by the variation of the number of enterprises, investment in fixed assets, fixed assets, labor costs, an area of suitable land. The value of the coefficient of determination indicates that the variation of resultant variable to 93.9%; 96.3%; 93.2%; 97.3%; 93.7% and 95.3%, respectively, accounted for in the model explains the factors. The rest of the variation is due to the influence of unaccounted factors.

Have inequality led to the conclusion that the link between the model included in the productive and factorial indicators is strong.

An analysis of the equations shows that:
Growth of the company at 1% at an unchanged level, other factors cause a decrease in proceeds from sales by 11.23% share in GDP by 2.98%, the regional GDP by 0.78%, increase incomes by 0.53%, the total revenue 4.74% of gross production by 1.21%;

Increased investment in fixed assets by 1% at an unchanged level of other factors leads to growth in revenue from the sale of 0.46%, incomes by 0.18% share in GDP by 0.07%, the total income of 0.29% Gross production at 0.21%, the regional GDP by 0.15%;

The growth of fixed assets 1% at an unchanged level, other factors cause a decrease in revenue from the sale of 0.73% of gross production by 0.16%, the regional GDP by 0.22%, increase incomes by 0.58% stake of GDP by 0.02%, the total dohod1,03% ,;

The growth of agricultural land by 1% at an unchanged level, other factors cause a decrease in the share of GDP by 6.72%, proceeds from the sale to 9.55%, increase incomes by 1.29%, the total income of 8.48% of gross production 0.52% regional GDP by 0.27%

Attempts to build a single-factor production functions for some economic proved meaningless, since in the equations, whose coefficients are found by the least squares method, the exponents were negative. Therefore, these production functions for the analysis of economic dynamics in this case cannot be applied.

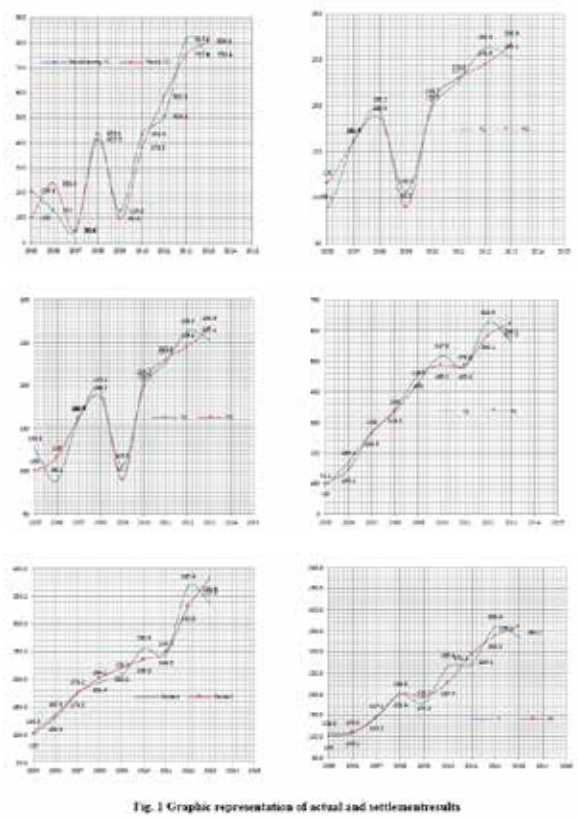

Fig. 1 Graphic representation of actual and settlementresults

The combined effects of all these factors on agricultural output completely in the following regression equation:

Proceeds from the sale	k..			(0,585)	(0,501)	(-0,138)
	t-st.			(2,896)	(2,545)	(1,112)
	s.s.			(0,275)	(0,403)	(5,337)
Income of people	k.	(-0,132)	(0,961)	(0,621)	(0,103)	(-0,331)
	t-st.	(0,114)	(4,086)	(0,761)	(0,019)	(0,818)
	s.s.	(0,453)	(0,121)	(0,257)	(0,268)	(1,529)
Share of GDP	k.			(0,791)	(-0,203)	
	t-st.			(3,273)	(0,725)	
	s.s.			(0,111)	(2,138)	
Share of GDP	k.		(0,016)	(0,973)	(0,544)	(0,032)	(-0,379)
	t-st.		(3,509)	(6,667)	(0,852)	(0,198)	(2,721)
	s.s.		(0,371)	(0,099)	(0,209)	(0,219)	(1,251)
Share of GDP	k.		(0,943)	(0,551)	(-0,213)		
	t-st.		(10,145)	(1,866)	(2,856)		
	s.s.		(0,042)	(0,054)	(0,737)		
Regional GDP	k.		(0,934)	(0,632)	(0,114)	(-0,263)	
	t-st.		(2,945)	(0,396)	(0,181)	(1,140)	
	s.s.		(0,153)	(0,326)	(0,341)	(1,621)	

The coefficients of multiple determination R^2=0,722054, R^2=,988212, R^2=0,655833, R^2=0,99448, R^2=0,968776, R^2=0,966459 suggests that changes in sales revenue, income, population, GDP, total revenue, gross output, regional GDP to a large extent determined by the variation of the number of enterprises, investment in fixed assets, fixed assets, labor costs, an area of suitable land. The value of the coefficient of determination indicates that the variation of resultant variable to 72.2%; 98.8%; 65.6%; 99.5%; 96.9% and 96.6%, respectively, accounted for in the model explains the factors. The rest of the variation is due to the influence of unaccounted factors.

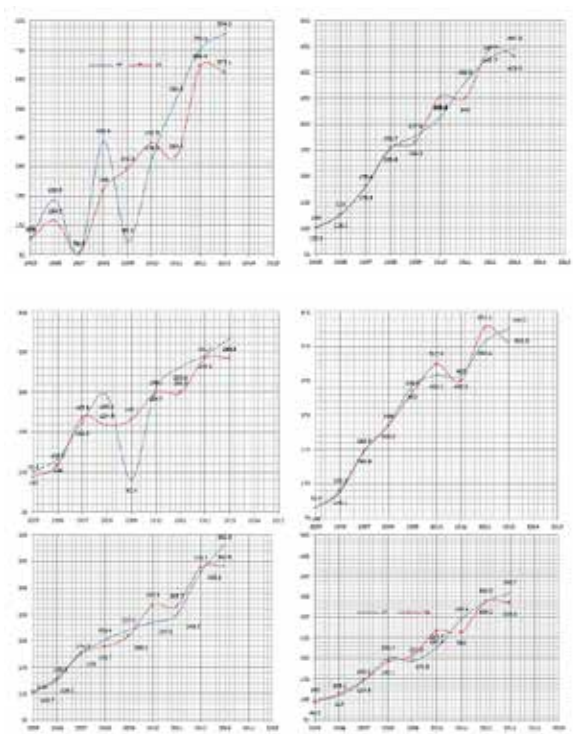

Fig. 2. Graphic representation of actual and settlementresults

Have inequality led to the conclusion that the link between the model included in the productive and factorial indicators is strong.

An analysis of the equations shows that:

Growth of the company at 1% at an unchanged level of other factors causing the growth of incomes of the population leads to 0.05%, the total income of 1.30%;

Increased investment in fixed assets by 1% at an unchanged level of other factors leads to growth in revenue from the sale of 0.79%, population's income at 4.49%, the share in GDP by 0.36%, the total income of 0.66% Gross production at 0.43%, the regional GDP by 0.45%;

The growth of fixed assets 1% at an unchanged level of other factors causing the growth of incomes by 0.19% share in GDP by 1.55%, the total income of 0.18% of gross production by 0.10%, the regional GDP 0.12%;

Increase labor costs by 1% at an unchanged level of other factors leads to growth in revenue from the sale of 1.02%, income of the population is 0.01%, the total income of 0.04%, the regional GDP by 0.06%;

The growth of agricultural land by 1% at an unchanged level of other factors causing the growth of revenue from the sale of 5.93%, incomes 1.25% share in GDP by 1.55%, the total income of 3.40% of gross production 2.11%, the regional GDP of 1.85%;

CONCLUSION

Despite the considerable amount of work and achievements in the field of economic and apparatus of mathematical equations, science occasionally encounters a number of serious criticism, calling into question the appropriateness of their use. Such whenever refuted and disproved, reducing differences to clarify the issues of adaptation theory and practice, one of which is the problem of choosing a mathematical model for the investigated economic object. It is understood that there is no universal model, and probably cannot be, and the choice of a functional relationship develops highly influenced by factors resulting from the objectives and the peculiarities of each specific task.

It is important to emphasize that in subsequent stages of the study can be used the methods of optimization and simulation and practical results in conjunction with the use of statistical modeling will help develop an integrated approach for the formation of a unified development strategy for rural areas at the regional level. In our view, the use proposed in this article methodological aspects of modeling application can serve as the basis not only for the formation of strategy of development of rural areas, but also for the development of economic and mathematical models of rural areas.

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