

# Necessity to Implement the Cluster Approach in the Intensive Development of Agro-Industrial Complex in Uzbekistan

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## Abstract

In the given article we consider the necessity of introduction of the cluster approach in agriculture taking into account specificity of a level of development of regions and branches. The advantages of clustering in agriculture for transition to an intensive level of development of agriculture are noted. The article considers the issue of ensuring the financial stability of enterprises of agro-industrial complex.

**Keywords:** cluster, small business, clustering, agriculture, efficiency, profitability, intensive growth, financial stability, production process, agro-industrial complex, competitiveness.

## I INTRODUCTION

Agriculture is one of the key sectors in Uzbekistan. It is the main branch of the Uzbek economy. It employs 44 per cent of the country's workforce and covers 17.6 per cent of the country's GDP. Arable land makes up 4.4 million hectares or about 10 per cent of the total area of Uzbekistan. In the conditions of market relations, agriculture is in a situation where the efficiency of the agro-industrial complex often drops. This is due to the wrong management system for the organization. Solving problems requires finding sources of financial resources, their rational distribution and effective use. Below the analysis will confirm the need for fundamental reforms in this industry, will show the ways to achieve stable financial growth of enterprises of the agro-industrial complex.

## II MATERIALS AND METHODS

The processes taking place in agriculture have

certain characteristics. Agricultural functions, which are one of the main instruments of the economy, are widely used in the analysis of agricultural production processes and resource efficiency. It is known from economic theory that the production function shows a mathematical relationship between resources, which occurs in the process of production and in general PR (production function) looks like this.

$$y = f(x_1, x_2, \dots, x_n) \quad (1)$$

where  $y$  - quantity of goods produced;  $x_i$  - resource usage.

The choice of PR (production function) depends on technological, physical, biological and agrotechnical characteristics of the modeling object.

In the agricultural sector, the production function is used in the form of Cobb-Douglas,

which shows the relationship between the production of the product and the factors affecting it.

It looks like this: 
$$y = a \prod_{i=1}^n x_i^{\alpha_i},$$

(2)

where  $y$  - cause factor;

$x_i$  - influence factors;

$\alpha, a_i$  - function parameters;

$\prod$  -reproduction operator

The parameters of this function are equal to the elasticity coefficients. The economic value of the elasticity coefficient is that it shows, if the influencing factor ( $x_i$ ) changes by one percent, how much the causal factor ( $y$ ) will change.

The production function can be used to evaluate the efficiency of certain production factors, the interaction of factors with other factors, and the development of technologies.

In most cases a two-factor multiplier model in the form of Cobb-Douglas can be used.

$$y = A \cdot K^{\alpha} \cdot L^{\beta},$$

(3)

Where,  $K$  - capital cost of production,

$L$  -labor costs,

$A, \alpha, \beta$  -calculation parameters

(3) In order to find unknown parameters in the model, you should first convert the model to a linear one.

For this purpose (3) you should find the logarithm of the left and right sides of the model.

As a result of logarithmization the following linear model will turn out:

$$\ln y = \ln A + \alpha \ln K + \beta \ln L, \quad (4)$$

As can be seen from the model (4), it became a linear additive model.

To find unknown parameters in the model, you should use the "least squares method". The essence of the "least squares method" is that the difference between the calculated values of the function and its actual values is the minimum sum of squares.

$$F(x) = \sum (y_{tm} - f(x))^2 \rightarrow \min \quad (5)$$

(4) To find unknown parameters in the model, the "system of normal equations" is formed as follows:

$$\begin{cases} n \cdot \ln(A) + \alpha \cdot \sum (\ln K) + \beta \cdot \sum (\ln L) = \sum (\ln y) \\ \ln(A) \cdot \sum (\ln K) + \alpha \cdot \sum (\ln K)^2 + \beta \sum (\ln L) \cdot (\ln K) = \sum (\ln y) \cdot (\ln K) \\ \ln(A) \cdot \sum (\ln L) + \alpha \cdot \sum (\ln L) \cdot (\ln K) + \beta \cdot \sum (\ln L)^2 = \sum (\ln y) \cdot (\ln L) \end{cases}$$

As a result of solving the system of these equations (4), unknown parameters of the model have been determined  $A, \alpha, \beta$ . The following production functions are used to determine the efficiency of agricultural production:

$$y = A \cdot K^{\alpha} \cdot L^{\beta} \cdot N^{\gamma},$$

(6)

Where,  $y$  - gross agricultural output, billion soms;

$K$  - value of fixed assets of agriculture, billion soms;

$L$  - number of employed in agriculture, thousand people;

$N$  - agricultural area, thousand hectares;

$A, \alpha, \beta$  - unknown parameters.

To determine the productivity of agricultural production in our country and the impact of resource consumption on gross agricultural output,

we use data for 2000-2017. The data are presented in Table 1 below.

Table 1

Dynamics of main agricultural indicators of the Republic of Uzbekistan for 2000-2017<sup>1</sup>.

Years	Cost of total agricultural production, billion soms, Y	Value of fixed assets of agriculture, billion soms, X1	Number of employed in agriculture, thousand people, X2	The area of agricultural crops, thousands of hectares., X3
1999	17650,7	450,4	3090,7	4012,1
2000	18300,5	1259,1	3032,0	3543,1
2001	19500,1	1332,1	3041,3	3800,0
2002	21021,7	2050,9	3023,0	4022,7
2003	22850,0	2323,7	3023,1	3234,8
2004	23112,2	3201,3	2823,3	3700,1
2005	24705,6	3253,0	2728,8	3676,7
2006	26275,5	5203,3	2770,8	3723,4
2007	27618,0	4302,2	3012,6	3453,3
2008	30121,7	7112,3	2700,7	3675,1
2009	31350,4	7246,2	3140,5	4014,5
2010	33488,2	10220,7	3223,4	3805,1
2011	36580,0	11267,2	3154,2	3850,2
2012	39438,6	13115,2	3250,3	3842,6
2013	41100,0	16214,8	3434,8	4017,2
2014	45156,5	18596,6	3599,5	4026,3
2015	43297,3	16400,0	3302,7	3898,3
2016	46078,4	17680,2	3550,6	4008,2
2017	47623,4	18765,1	3435,3	4016,7

<sup>1</sup>The table is based on Republic of Uzbekistan statistics.

Based on the data in Table 1, we make up the production function of the agricultural sector of Uzbekistan. For this purpose we first calculate the cost of logarithmic data, which are presented in Table 1. Because, as shown in the table, the data units are also different. First of all, let us determine the relationship between the factors. To do this, let us calculate the correlation coefficients between the factors. When calculating correlation coefficients, the following formula is used:

$$r_{xy} = \frac{\overline{xy} - \bar{x} \cdot \bar{y}}{\sigma_x \cdot \sigma_y}, \quad (7)$$

Where  $\sigma_x$  and  $\sigma_y$ , and accordingly are the standard deviations of the factors  $x$  and  $y$ .

Using the Excel spreadsheet, let us calculate the correlation coefficients between the factors (Table 2).

Table 2

Matrix of correlation coefficients calculated between gross agricultural output and influencing factors in the Republic of Uzbekistan.<sup>2</sup>

	Cost of total agricultural production, billion soms, <i>lnY</i>	Cost of fixed assets of agriculture, billion soms, <i>lnK</i>	Number of employed in agriculture, thousand people, <i>lnL</i>	The area of crops, thousands of hectares. <i>lnN</i>
Cost of total agricultural production, billion soms, <i>lnY</i>	1			
Cost of fixed assets of agriculture, billion soms, <i>lnK</i>	0,9716	1		
Number of employed in agriculture, thousand people, <i>lnL</i>	0,8038	0,7012	1	
The area of crops, thousands of hectares. <i>lnN</i>	0,5367	0,4176	0,5647	1

<sup>2</sup>The table was compiled by the author

By analyzing the correlation matrix between the factors, we will determine the following. First, let's analyze correlation coefficients. Private correlation coefficients are the relationship between the final factor ( $\ln Y$ ) and each influence factor ( $\ln K$ ,  $\ln L$ ,  $\ln N$ ). There is a strong correlation between the value of gross agricultural product ( $\ln Y$ ) and the value of fixed assets ( $\ln K$ ) (0.9716). There is also a strong correlation (0.8037) between the value of agricultural gross product ( $\ln Y$ ) and the number of employed people in agriculture ( $\ln L$ ). Further, there is a moderate correlation (0.5367) between the value of Gross Agricultural Product ( $\ln Y$ ) and cultivated area ( $\ln N$ ). In addition, the pairwise correlation coefficients between the factors shown in Table 2 are calculated. As can be seen from Table 2, there is an average correlation (0.7012) between the value of fixed assets ( $\ln K$ ) and the number of people employed in agriculture ( $\ln L$ ). There is a weak correlation (0.4176) between the value of fixed assets ( $\ln K$ ) and cultivated area ( $\ln N$ ). An average correlation (0.5647) exists between the number of agricultural workers ( $\ln L$ ) and cultivated area ( $\ln N$ ).

In general, there is a positive correlation between the studied factors of agricultural crops in the Republic of Uzbekistan. Thus, the presence of connection between the factors will serve as a basis for the creation of the production function of Cobb-Douglas in agricultural production. The production function of agricultural production of the Republic of Uzbekistan in the form of Cobb-Douglas looks as follows:

$$\ln y = \ln(-10,1003) + 0,244255 \ln K + 0,902269 \ln L + 1,332751 \ln N$$

$$(4,5487) \quad (0,0156) \quad (0,2682) \quad (0,6111)$$

(8)

$$R^2 = 0,9701; F = 245,816.$$

Consequently, the values of unknown parameters  $A, \alpha, \beta$  of the linear production function have been determined (8).

Now (8) model the left and right parts of the model (potentiation opposite to logarithmization) and convert it into a step function. In this, all logarithms disappear, the coefficients before the variables go to the variable level, and the sum of additive model (8) is transformed into a multiplicative model in the form of multiplication (9).

$$y = 0,00042 \cdot K^{0,244325} \cdot L^{0,903369} \cdot N^{1,332751}$$

$$(4,53) \quad (0,01) \quad (0,27) \quad (0,61)$$

(9)

$$R^2 = 0,9701; F = 245,816.$$

Coefficient 0.00042 shows the influence of those factors in the function of agricultural production of the Republic of Uzbekistan (9) that are not taken into account. The coefficient 0.2433254, calculated on the basis of the value of fixed assets in agriculture, is the elasticity coefficient, which shows that an increase in the value of fixed assets in agriculture by one percent leads to an average increase in gross agricultural output by 0.233254 percent. The increase in the number of employed in agriculture shows an increase in gross national product by 0.903369%. The increase in areas under crops by 1 per cent indicates an average increase in gross agricultural output by 1.322751 per cent.

If we consider the elasticity coefficients of each factor in the model, the share of fixed assets of the country in the production of the Gross Agricultural Product was 9.85%, employment was 36.39%, and the share of sown area was 53.76%.

### III RESULTS

This shows that 90% of the country's agricultural development depends mainly on the

application of extensive factors of production, i.e., by increasing the number of people employed in agricultural production and by expanding the area of agricultural crops. This indicates that it is necessary to switch to an intensive path of agricultural development.

The determination coefficient calculated by the

model (9) is 0.9701. This shows that 97% (9) of the gross agricultural output in the country depends on the factors included in the model (value of fixed assets, number of employees in agricultural production and area under crops). The remaining 3% are the results of unaccounted for factors.

Table 3

Dynamics of average and limit values of resources used in agriculture for 2000-2017

Years	Average return on assets, y/K	Average labor productivity, y/L	Average production cost per hectare, y/N	Maximum return on assets, dy/dK	Maximum labor productivity, dy/dL	Maximum production cost per hectare, dy/dN
2000	1,0011498	1,0008733	1,0008456	1,0002807	1,0007879	1,0009405
2001	1,00100026	1,0008968	1,0008762	1,0002442	1,000809	1,0009746
2002	1,00099322	1,0009039	1,0008797	1,0002425	1,0008155	1,0009785
2003	1,00097075	1,0009231	1,0008922	1,000237	1,0008327	1,0009923
2004	1,00095337	1,0009236	1,0008945	1,0002328	1,0008333	1,000995
2005	1,00091708	1,0009328	1,0009019	1,0002239	1,0008415	1,0010032
2006	1,00091682	1,0009325	1,0009003	1,0002238	1,0008413	1,0010013
2007	1,00087915	1,0009421	1,0009139	1,0002147	1,00085	1,0010165
2008	1,00087375	1,0009471	1,0009186	1,0002133	1,0008544	1,0010218
2009	1,00085575	1,0009529	1,0009186	1,0002089	1,0008596	1,0010217
2010	1,00085647	1,0009601	1,0009313	1,0002091	1,0008661	1,0010358
2011	1,00084086	1,0009617	1,0009396	1,0002053	1,0008676	1,0010451
2012	1,00083654	1,0009649	1,0009428	1,0002043	1,0008705	1,0010486
2013	1,00083098	1,00097	1,0009515	1,0002029	1,0008751	1,0010583
2014	1,00082243	1,0009761	1,0009609	1,0002008	1,0008806	1,0010687
2015	1,00081622	1,0009798	1,0009667	1,0001993	1,0008839	1,0010752
2016	1,0008175	1,0009763	1,0009576	1,0001996	1,0008807	1,0010651
2017	1,00081444	1,0009781	1,0009603	1,0001989	1,0008824	1,0010681

(The table was compiled by the author)

The table shows that in the period from 2000 to 2017 the average and limit values of return on

investment have been decreasing. This means that fixed assets in the country's agriculture are not



updated in time and new agricultural machinery and technology are not properly introduced. Of course, in this case it is difficult to speak positively about innovative development of agriculture.

However, despite this, the number of people employed in agriculture and the area of agricultural crops in Uzbekistan continues to increase. This indicates an extensive development of agriculture, with average growth rates of labor productivity slowing down. Of course, to prevent this, it is necessary to involve some agricultural workers in the processing of agricultural products or other sectors of the economy. The level of use of agricultural land in the country also requires the most efficient use. Thus, the production function in the form of Cobb-Douglas for agriculture shows that diversification of the agricultural sector in Uzbekistan, development of innovative technologies, as well as development of new models and innovations are required.

#### IV DISCUSSION

Everyone knows that globalization is the driving force of the modern world process, and as any complex phenomenon, not only presents new opportunities, but also great risks. And in this regard, Uzbekistan must effectively adapt to new challenges, forming a competitive national economy. In this regard, the transition to stable and sustainable development against the backdrop of increasing negative processes associated with instability in the world markets implies the formation of a stable level of registration of economic relations within the country [8]. That is why, first of all, in the conditions of further deepening of market reforms the issues of competitiveness and sustainability of economic development take priority both in theory and practice. The world practice shows that functioning of the most successful economic systems; high competitiveness and stable

economic growth provide factors stimulating the spread of new technologies [12].

Taking into account the fact that modern competitive advantages are almost fully provided by the advantages in production technologies, management, organization of goods promotion, successful development of competitiveness of the economic system is possible with the integrated use of cluster mechanism and modern concepts of innovative development. Clusters are formed where there is a "breakthrough" promotion in the field of technology and production technology and subsequent access to new "market niches" [8]. In this connection, many countries, both economically developed and only beginners, are increasingly using the "cluster approach" in support of the most promising areas and forms of business activity, in the formation and regulation of their national innovation systems [11]. Another important feature of the cluster in the general model of production-cooperative and other interactions between economic agents is the innovation orientation factor. The high competitiveness and sustainability of cluster economic systems are determined by the factors that stimulate the spread of new technologies, education, financing, public policy and industry. In the conditions of Uzbekistan, taking into account the territorial and sectoral peculiarities, it is necessary to assess the cluster potential in the agro-industrial complex of the national economy, namely, in the fruit and vegetable, grape and others. Taking into account the peculiarities of natural and climatic conditions, the agricultural sector has unique properties of agricultural products for export markets, historical experience in farming and other components of the cluster structure. The most important thing is not only to develop the right strategy for the cluster development of the country, but also to turn this strategy into a cordoned one, based on the action program of the state and local authorities, business entities, research and education sector and public

institutions [18]. It should be borne in mind that the regions of Uzbekistan should support clusters of small and medium-sized enterprises in the agro-industrial complex to create and develop clusters. In this regard, an important role will be played by the administration of regions, which will be able to make projections for the formation of clusters, taking into account the spatial location and specialization of agricultural production and organize contacts between entrepreneurs. Such organizational work will also contribute to the emergence of trust between the likely participants in the cluster [18]. The most difficult moment of cluster creation at the initial stage is to reach an agreement between entrepreneurs on the formation of its assets. The unifying factors of the economic interests of the cluster creation can become: conduction of the single price policy on the commodity market, expansion of the volume of goods and services production by its participants, introduction of innovative technologies as a result of integration and cooperation of production and sale of goods on commodity markets. Above all, the clustering of agricultural production in the regions of countries is linked to the need to take into account regional specialization (for example, in the south more attention should be paid to meat and cotton production). The right combination of activities in the agro-industrial system on a cluster basis will ensure competitive advantage and its sustainability through the use of innovation, modern machinery and technology. It should be noted that the establishment of a cluster will have a significant impact on the transition to intensive agricultural development in the following ways [12]:

- will set new rules for competition;
- changes the structure of the industry;

- creates a competitive advantage by giving clusters new opportunities to outperform competitors in performance;
- sets the direction and order of changes in business processes, in particular, through the organization of agricultural clusters;
- creates conditions for the necessity of constant increase of profitability and efficiency of enterprises, introduction of innovations;
- constant search for new technologies that save energy resources;
- continuous professional development of employees.

In addition to the active implementation of the cluster approach in agriculture, the need to ensure the financial stability and sustainability of agro-industrial enterprises plays an exceptional role. Why? Financial stability is the most pressing and important issue for each enterprise. High financial stability is the key to survival and the basis for the stable position of enterprises in a market economy [11]. If a company is financially stable, profitable and solvent, it has significant advantages over other enterprises, competitors of the same economic sphere to attract investors. An enterprise is more independent from unexpected changes in market conditions when its financial stability is higher, which reduces the risk of being on the verge of bankruptcy. The level of financial stability is the main indicator of successful functioning of farmer enterprises. In other words, the main idea here is to switch to intensive growth in agriculture, in addition to implementing the cluster approach, it is necessary to ensure financial stability of agricultural enterprises. These two basic components are the guarantee of the development of the agricultural sector. If the cluster approach ensures the transition to an intensive level of development in agriculture, and ensuring the financial stability of agricultural



enterprises will create a stable income and a high level of profitability. The level of financial sustainability is the main indicator of the success of enterprises [1]. The stable financial position of enterprises is achieved with the sufficiency of equity capital. At present, under conditions of economic transformation, Uzbek agricultural producers need to monitor their financial stability. Unfortunately, to this day there is no single interpretation of the term "financial stability". Not many economists have devoted their research to considering the financial stability of agricultural enterprises. Financial stability is characterized by financial independence, and the ability to maneuver their own funds, and satisfactory financial security of production development, as well as the state of productive potential. The analysis and assessment of the financial stability of agricultural enterprises are expressed in the ability to predict the risks of activities and prevention, in identifying the dependence of the subject on borrowed funds and property to pay their debts. However, unfortunately, no single method of financial stability assessment has been developed, taking into account the specifics of the agricultural sector. The difficulty may cause the choice of the method of analysis of agricultural enterprise sustainability, as economists have not developed a single approach to the assessment of indicators. The authors of specialized literature offer the following approaches: evaluation of absolute indicators and analysis of coefficients, these methods are offered not only as separate methods, but also in aggregate [18]. The problem of calculation of absolute and relative indices of financial stability acquires special urgency. Absolute indices of financial stability are the indices characterizing the state of reserves and their provision with the sources of formation, the generalizing index of this method is surplus or lack of sources of funds for formation of reserves. The relative degree of financial stability of an enterprise is determined with the help of financial

coefficients [1]. Their practical utility lies in the quick possibility to assess the existing situation of an enterprise. At the same time, it should be taken into account that they are not of universal importance and often depend on the sectoral identity of enterprises. There are external and internal factors in the economy that influence the financial stability of enterprises in agriculture. The success of entrepreneurship directly depends on the choice of products or services to be provided. It is important not only to choose what to produce, but also to determine the technology of production, as well as the model of management and organization of production. The problem for agricultural producers is the dependence of the production of goods on natural and climatic phenomena, which is an external factor affecting the financial stability. Therefore, the production of agricultural goods is one of the most risky industries in the economy, as there is a huge risk of high losses due to weather conditions. The solution is, of course, insurance, which in turn requires a special approach to development in the agricultural sector. Also, an important factor affecting the financial stability of the organization is the optimal composition and structure of assets. Stability and production efficiency of the company are dependent on the quality of asset management, that is, how many working capital is involved in production and what exactly, what is the value of assets in cash and reserves. Producers of agricultural goods are characterized by significant amounts of current assets, due to the gap between costs and income generation, as well as a high share of non-current assets. A significant factor of financial stability of agricultural producers is the composition and structure of financial resources [11]. The more a company has its own financial resources and profits, the more confident it feels in its sphere. Enterprises in the sphere of agriculture are characterized by a high level of borrowed funds. This issue is solved at the level of the state by means of subsidizing

production. An important external factor affecting the financial stability of agricultural enterprises is the intensification of competitive struggle and falling demand. Therefore, there is a need for government support in this case, taking into account the specifics of medium and small businesses: assistance in creating a cluster approach, subsidizing, preferential lending, leasing and co-financing. If the level of interest rate in lending is reduced, the advantage in leasing is the installment payment for equipment, accelerated depreciation of received equipment. Therefore, the economic and financial stability of any enterprise depends on the general political stability, on the attitude of the state to business activities, on its stimulating character. Thus, the reserves of growth of financial stability of agrarian enterprises are hidden, first of all, in the solution of the following problems, such as price instability on the markets of agricultural products, insufficient level of export growth, low profitability, which does not allow the growth of expanded reproduction, poor access to sales of products, insufficient level of sales cooperation, high risks of profit loss due to natural and climatic factors, etc.

## V CONCLUSION

The cluster approach provides advantages of solving all the above problems related to the financial stability of agricultural enterprises. Correct problem setting, differentiation of the cluster taking into account its specifics by regions and sectors, development of the national methodology to ensure the financial stability of the agro-industrial complex will contribute in the future to the transition of agriculture to a higher, intensive level of development.

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