

SIZE MATTERS: FARM LAND OPTIMIZATION IN BUKHARA

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ABSTRACT

The efficient utilization of resources and effective functioning of farms in most cases dependent from the size of land plots allotted to them the research found. This research scientifically justifies the reduction of number of farms from 6,693 to 2,465 in Bukhara region using the economic and mathematical methods. Comparative analysis of indicators for the neighboring Khorezm and Ferghana region is conducted using the *case method*, and foreign experience in this area (Holland, France, USA, Italy) has been studied. Several factors have been researched and econometric models have been developed (using the multifactor function) to establish the most suitable average size of land plots for Bukhara region (which is 60-70ha).

JEL CLASSIFICATION & KEYWORDS

■ D24 ■ O13 ■ O18 ■ Farm ■ Total Sales ■ Land Plot Optimization
 ■ Average Productivity ■ Economic Efficiency ■ Land Productivity
 ■ Optimal Model ■ Global Integration Process ■

LITERATURE REVIEW

In his work titled "World Financial and Economic Crisis: Ways and Measures to Overcome It in Uzbekistan's Conditions" Mr. Islam Karimov, President of the Republic of Uzbekistan stated: "Our experience gained over the past period call for resolution of a number of important issues, namely issues related to ensuring the farms' sustainability and, most importantly, increasing their efficiency with the view of further development of private farms. Experience of a majority of currently functioning farms evidences that small size of lands allotted to them at the initial stage of private farms formation limited the farms' production profitability. The practice is showing that farms with limited capacity and opportunities are not capable of turning into a reliable basis for provision of themselves with necessary machinery, working capital, having creditworthiness, and, most importantly, cost recovery and increasing the profitability" [1, page 23], [2, page 11].

Scientific research is being conducted in order to study this urgent issue in Uzbekistan. Namely, such researches may be divided into several groups:

- farms as an ownership form and theoretical principles of their development [8,9,10] have been studied by A. Ulmasov, Sh. Shodmonov, S. Gulomov, M. Sharifkhujayev, and A. Abdurakhmonov.
- issues of economic and mathematical modeling of the farms' activity and forecasting of their future productivity [3,4,7] are explained in works of T. Shodiev, M. Irmatov, B. Salimov, K. Safaeva and I. JumaeV;
- issues of agricultural infrastructure and production [5,6] are reflected in the research of B. Berkinov, T. Farmonov, and R. Khusanov;
- development of socio-economic forecasts for agriculture [3,4,9] are studied by S. Gulomov, B. Khodiev, N. Makhmudov and A. Abdullaev.

- issues of labor organization and wage management at farms [5,6,8,10,11] are studied by A. Abduganiev, K. Abdurakhmonov and A. Abdullaev.

Despite these researchers have performed numerous results on the issues of farm establishment, management and forecasting, there are no sufficient research developments related to optimal size of the farms under current market conditions and during financial crisis as well as on regional level. Optimization has so far been approached from the qualitative viewpoint, while no quantitative measurements, expert methods have been applied in previous researches.

INTRODUCTION

The step-by-step reforms in agrarian sector in Uzbekistan aims to formation of new farm management system which ultimately leads to ensure food security and dynamic development of agricultural sector during the global integration process[1,2].

Share of agricultural products produced by the farms in 2008 is accounted for 26.4 percent of the gross regional product (with 100 percent of cotton and watermelons, 57 percent of wheat, 51 percent of fruits and grapes, 91 percent of meat, 98 percent of raw silk, and 3.4 percent of eggs are produced at private farms). Despite the increase portion of private farm sector they have vast unutilized opportunities. The state policy towards optimization of the farmers' land plots is proved by statistical analyses of farming experience.

The empirical study of current farming in Bukhara region shows that 13.8 percent of 15,460 private farms in 2007 (with average 2.3 ha of cropping area and 1-2 farm workers) were produced by 12-14 percent below against of large farms, and labor productivity was less by 22-24 percent. High labor productivity and profit per hectare exceeded by 3 times in region level in farms with average land area under crops 80-90 ha (and more than 40 workers) the study

Branches	Prior to optimization	Average area under crops, ha	After optimization	Average area under crops, ha	Difference, +,-	Average area under crops, ha
	number		number		number	
Cotton and wheat production	7 936	23.7	3 790	49.6	-4 146	+25.9
Vegetable and watermelon production	1 101	2.1	186	5.1	-915	-3
Viticulture and horticulture	5 976	2.2	1 986	6.5	-3 990	+2.3
Cattle-farming	819	8.8	682	10.6	-137	+1.8
Other specialization	76	0.3	49	0.5	-27	+0.2
Total	15 908	13.3	6 693	31.6	-9 215	+18.3

showed (tables 2 and 3). An average size farms (with average number of workers 8-9 and land area of 24.3 ha) productivity of cotton was less by 0.7 tons than that of region level (3,01 ton/ha), wheat productivity – by 1.6 tons (5,1 tons/ha) or per hectare profitability was by 9.5-10 times less than that of large farms (70-80 ha). (Table 1.)

The analyses prove ineffectiveness of running farms on small areas of land allotted for private farms before the optimization program. Effective functioning of farms is related to the size of land plots. The comparative study of farming in advanced countries shows that, farms with land area of 100 ha constitute 50 percent in the USA, farms with land area of 40-100 ha constitute 42 percent in Holland and farms with land area of 10-16 ha constitute 32 percent in Denmark where farms with land area of 16-42 ha constitute 43 percent of total farms in Uzbekistan. In regional level, farms with land area of 50 ha constitute 57 percent in Bukhara[12].

The statistical analysis of profitability in different size farms in Bukhara region found that profitability in farms with allotted land area of 60-70 ha. reaches 40-50 percent, this indicator is equal to just 10-19 percent at farms with land area of 20-30 ha. Small farms (with 5-15 ha) constituting 28 percent of total farms and their profitability is just 5 percent. The hypothesis stating that regional conditions significantly affect the optimal size of private farms has been applied and it has been tested in empirical research. Average quadratic divergence amounted to 30 ha and variation percentage amounted to 20 percent. These values are calculated using the following formulas:

Variation value $x_{\min} - x_{\max}$. Standard quadratic deviation

$$\sigma_x = \sqrt{\frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n}}. \text{ Variation ration } v = \frac{\bar{x}}{\sigma} \cdot 100, \text{ where}$$

\bar{x} is average area.

THE ANALYSIS OF CURRENT SITUATION

The hypothesis that effective functioning of farms is dependent on the size of land plots allotted to them is analyzed in our previous studies [11]. Reduction of the number of farms from 6,693 to 2,465 in Bukhara region is scientifically justified using the economic and mathematical methods. (Table 2.)

Average land area, ha	Share of the farm numbers, %		Average per hectare earnings, (UZS thousand)	
	2007	2009	2007	2009
Up to 10	9.6	0.02	4	19
X.20	19.3	0.07	45	81
20 - 30	15	0.41	171	194
30 - 40	27.1	1.8	241	268
40 - 50	11.3	3.6	348	374
50 - 60	11.6	39.1	356	371
60 - 70	5.3	34.5	369	391
70 - 80	0.7	11.6	351	378
Above 80	0.1	8.9	342	349

In the course of validating the scientific hypothesis, primary attention was paid to proposal of the most suitable econometric model for optimization of farm areas based on long-term experiences and conclusions. Complex nature of

the issue necessitated the application of several methods and their synthesis in the course of research.

Statistical surveys and interviews have been undertaken at typical 574 farms out of 6,693 farms existing in the Bukhara region, which were diverse by land area, machinery, production infrastructure, water supply, soil properties. Obtained data have been summarized by groups. Average indicators such as area productivity, cattle productivity, cost recovery, funds efficiency, per hectare revenue and profits have been identified for each group with increase or reduction of units of statistical sum of stability of statistical values.

With the view of conducting the comparative analysis using the *case method*, indicators for the neighboring Khorezm and Ferghana region have been selected and compared with those for Bukhara region, and foreign experience in the area (Holland, France, USA, Italy) has been studied. It has been established through comparative studies that the most suitable average size of land plots for Bukhara region is 60-70ha.

Several factors have been researched and econometric models have been developed using the econometric method of study. Farm size has been considered as a multifactor function:

- *Positive factors*: soil and water conditions, population density in the region; capacity to purchase or lease large modern machinery; irrigation and ameliorative conditions, financial resources for their rehabilitation; opportunities for development of production infrastructure; use of modern agricultural machinery; level of organization of production; opportunities for exporting the farms' products.
- *Negative factors*: high degree of soil salinity; low production output; insufficient or limited property pledge as a security for leasing; high per unit organization and administrative expenses; limited capacity to purchase agricultural machinery and processing equipment.

Multifactor production function has been developed based on these factors, and econometric model solutions have been generated. Suitable option has been selected taking into account the impact of internal, external and incidental factors.

The following results have been generated using the above research methods:

Given scarcity of land, water, financial, material and technical and labor resources in the region, a model, which is based on effective farm management system and effective operation mechanism has been developed. Highest efficiency (40-50 percent profitability) has been achieved. New methodology of optimal decision-making has been developed. Sources of continuous revenue generation at farms during the year have been identified. The need for financial reserves for application of advanced agricultural techniques and purchase of modern agricultural machinery will emerge in farms. Possibility of year-by-year improvement of soil structure and ecological situation has studied. New aspects of the farms' entrepreneurial activity will provide continuous around-the-year employment of workers has been ensured.

CONCLUSION

Econometric methodology used in research and results create a scientific basis for dynamic reforming of farms in line with market conditions.

The elimination of scarcity of financial resources, the increase of labor productivity, introducing advanced agricultural technology can be achieved when size of a farm's lands is about 60-70 ha the research found. Opportunities for rendering of services and establishment of processing enterprises through consolidation of disposable resources a farms will expand and their dependence on monopolistic enterprises will be reduced and the increase level of employment, and ultimately solution of social issues in rural areas will be facilitated by farm land optimization process's.

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