Profitability Modeling in Agricultural Organizations

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Abstract. The studies were conducted in order to identify the main factors determining the profitability of financial activities included in the structure of agricultural holdings and self-managing agricultural enterprises of the Altai Territory. It is noted that in the agricultural sector of Russia, Ukraine and Kazakhstan, corporate (property) integration is developed, and in other countries, contractual integration is developed. The main stages of the development of integrated formations in the agricultural economy of the Altai Territory are described. The predominance in the structure of the parent companies of integrated formations of organizations of the agro-industrial complex, state and municipal management is revealed. Based on the statistical sample, economic groups, calculation of statistical indicators, the following was estimated. Self-managing entities in agriculture are characterized by higher efficiency of resource use and financial stability, a more diversified production structure (enterprises of agricultural holdings specialize in the production of milk, poultry, grain, sugar beets). Using the multiple regression method, models of the dependence of the profitability of financial activity on the fundamentals of financial and economic activity of the agricultural holdings and self-managing agricultural enterprises of the Altai Territory are built.

Keywords: Agro-industrial integration · Agricultural holdings · Financial condition · Altai Territory · Economic interest · Economies of scale · Multiple regression · Bankruptcy

1   Introduction

At all stages of agricultural development in Russia, quite a lot of attention was paid to research in the field of agro-industrial integration. In the planned economy of the USSR, under conditions of state ownership of the means of production, research was aimed at substantiating the mechanisms for increasing the efficiency of specialization, location and concentration of production within the framework of inter-farm cooperation and integration. O. A. Rodionova attributed the following principles to the basic principles of the development of inter-farm cooperation of this period: voluntariness; a scientific approach in choosing organizational forms; the economic independence of collective farms and state farms that are part of inter-farm and agro-industrial associations; democratic centralism in the organization of production activities management; a material interest of farms in improving the efficiency of social production; the achievement of a significant increase in the production and sale of agricultural products to the state; an increase in labor

productivity; and cost reduction (Rodionova, 2009).

At the present stage of development of agricultural production, the priorities are the justification of organizational and economic relations between the entities of holding formations in the agro-industrial complex, taking into account the nature of the contractual, property or associative relationships established between them. Under the contractual relationship system, the subjects interact on the basis of concluded agreements in which the main parameters of the products are fixed (production technology, price and delivery time, etc.). Abroad, contract integration is developed in the agro-industrial complex, with numerous family farms usually being combined into cooperatives (Altman, 2015; Ates et al., 2017; Bogdanov, Rodić & Vittuari, 2017; Fonte & Cucco, 2017; Micu, Stoian & Alecu, 2013).

In Russia, the contract form of integration began to develop in the mid-1990s. However, a more rigid model was later formed, namely the corporate one, in which the integrator company became the owner of the assets of the integrated organizations. As a rule, the reason for the rigid type of integration was the organization's need to form its own raw material base in the face of increased competition in the market and the high probability of bankruptcy for suppliers of raw materials (agricultural producers) (Chetverikov, 2009; Andriy, Wolz & Voigt, 2015; Wandel, 2011).

As N. I. Shagayda notes, "the phenomenon of agricultural holdings in the form in which they exist in Russia ... is only in Kazakhstan and Ukraine. In the world, agricultural holdings are found, but ... they mainly work on contracts with family farms" (Shagayda, 2015). If, in 2012, the share of the land bank of agricultural holdings in the agricultural lands of Ukraine was 13.7% (Chebotaryov, 2013), then in 2017, it amounted to about 33.3%.

2   Materials and Method

General scientific (abstraction, inductive, deductive, comparative analysis) and special approaches were used in the research process. The following special methods were used: comparison, monographic, balance sheet, normative, economic and statistical (statistical sample, economic grouping, multiple regression, and calculation of statistical indicators, including average, absolute, and relative values). For the analysis of statistical data, the Microsoft Office software package was used, including the analysis package.

To identify the main parameters of modeling the effectiveness of the financial activities of agricultural organizations that are part of horizontally or vertically integrated entities and self-managing entities, the following was done. The activities of 339 organizations were analyzed with an average annual number of employees of over 15 people having income during the analyzed period and a positive value of equity at the beginning of 2018. The effective indicator was the level of return on assets. The following indicators were chosen as factor indicators: autonomy coefficient, current liquidity ratio, asset turnover, cost recovery, income per 1 employee, budget funds for 1 employee, gross income per 1 employee, an average monthly wage, and share of income from crop production in total revenue.

The sources of statistical information were Rosstat, its territorial bodies, and data from the Ministry of Agriculture of the Altai Territory. Sources of information on the financial and economic activities of agricultural enterprises included data from the SPARK online publication, the "Rusprofile.ru" help system, and the "Corporate Information Disclosure Center" online publication.

3 Descriptive Analysis

In Russia, the prerequisites for the development of large integrated formations appeared during the construction of large processing plants; the creation of intensive agricultural organizations in pig and poultry farming; inter-farm cooperation between collective farms and state farms in the context of deepening specialization; and increasing concentration of production in the 1960s. A new stage of their formation is associated with the implementation of the main provisions of the Decree of the Government of the Russian Federation "*On the Procedure for the Privatization and Reorganization of Enterprises and Organizations of the Agro-Industrial Complex,*" dated September 4, 1992, No. 708. These provisions are aimed at the transfer of processing enterprises from state to private ownership.

Since 2001, there has been a deepening tendency toward the redistribution of property rights and the creation of integrated units in the processing industries. The most popular form of vertical integration in the Altai Territory was the acquisition of insolvent agricultural organizations by processing enterprises through the merger or redemption of part of their assets.

In total, in 2016–2018, 28 companies acted as integrators in the region, two of which were in the liquidation phase ("Klyuchevskoy Elevator" OJSC, HC "Izumrudnaya strana" LLC) as of May 1, 2019. The main types of activities were, as follows:

– *Agriculture,* including growing crops, annual crops, mushrooms and truffles, raising poultry, mixed farming/
– *Agribusiness (excluding agriculture),* including the production of flour from grain crops, wholesale of grain, seeds and animal feeds, wholesale of agricultural and forestry machines, management activities of holding companies.
– *State and municipal government,* including the activities of government and local self-government on issues of a general nature; the activities of state authorities of the constituent entities of the Russian Federation; state-owned property management.
– *Management consulting*, including business and management consulting;
– *Other areas*, including rental and management of own or leased real estate; open coking coal mining; site preparation; purchase and sale of land; chark production.

Holdings differ not only in activities but in scale. An example of a local, mainly agricultural holding of a regional scale is *"Rumb" LLC* (Barnaul city), which combines three grain-type agricultural organizations, a bakery, a feed mill, a poultry

farm, and three serving organizations. *"Sibirskoye postoyanstvo" LLC* (city of Barnaul) has a slightly smaller scale (municipal). This agricultural holding company unites only three organizations specializing in the cultivation of grain and annual crops, additionally including the production of bread and pastry.

4   Results

In 2017, agricultural enterprises that are part of integrated formations, concentrating 25.5% of employees and 13.6% of arable land, produced 28.2% of gross output, paid 30.2% of taxes and contributions, received 25.7% of budget funds (Table 1). In the structure of their marketable products, revenues from sales of poultry products, dairy cattle breeding, sugar beet production, grain field cultivation prevailed.

Table 1. The proportion of organizations that are part of the holdings, in terms of agricultural enterprises of the Altai Territory, %.

Indicators	2013	2017
The cost of gross agricultural output	38.3	28.2
The area of arable land	17.0	13.6
Number of employees	28.2	25.5
Revenue	36.3	30.5
Taxes, fees, contributions paid	34.8	30.2
Borrowed funds	39.5	25.1
Budget funds received	33.0	25.7

Source: Calculated by the authors according to the data of the SPARK network publication, the "Rusprofile.ru" help system, and the "Corporate Information Disclosure Center" network publication.

However, every fourth enterprise in the holdings belonged to the 4th or 5th class of financial stability. So, in 2017, due to available cash, agricultural enterprises as part of agricultural holdings could pay off no more than 21.1% of short-term debt (self-managing entities could pay off 29.0%). Due to the additional attraction of receivables and short-term financial investments, they could pay off no more than 57.2% (nonholding entities could pay off 94.2%). Current assets were only 83.7% higher than current liabilities, and in self-managing entities, current assets exceeded current liabilities by 3.1 times. The formation of assets was carried out mainly due to borrowed funds (Fig. 1).
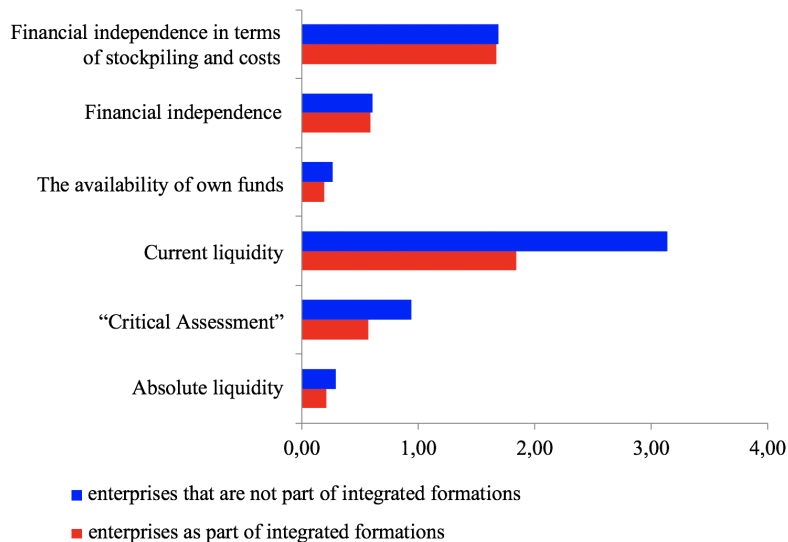
Financial independence in terms of stockpiling and costs

Financial independence

The availability of own funds

Current liquidity

"Critical Assessment"

Absolute liquidity

0,00   1,00   2,00   3,00   4,00

■ enterprises that are not part of integrated formations

■ enterprises as part of integrated formations

Fig. 1. The financial stability ratios of the activities of agricultural organizations of the Altai Territory in 2017.

5   Discussion

When modeling the relationship between factor (autonomy ratio, current liquidity ratio, asset turnover, cost recovery, income per 1 employee, budget funds for 1 employee, gross income per 1 employee, average monthly wage, share of income from crop production in total revenue) and effective (level of return on assets) indicators, it was found that all factors are significant, except for the factors "income per 1 employee" and "gross income per 1 employee." For the model of enterprises that are not part of the integrated formations, such factors as "current liquidity ratio" and "budget funds per 1 employee" also turned out to be insignificant. This confirms the earlier conclusions regarding the distribution of enterprises by participation in budgetary funds, as well as the ratio of own and borrowed funds.

The multiple correlation coefficient was 0.838–0.910 in the context of the models, which indicates the average tightness of the relationship between the level of cost recovery and the factors included in the model. The determination coefficient R^2 was 0.702–0.828, i.e., the obtained regression equations reflected the mathematical dependencies between the studied factors by 70.2–82.8%. This indicates a fairly high level of quality models (Table 2). The remaining 27.2–29.8% are random and not taken into account in the model of factors, which is not accidental since most of the dependencies formed in agriculture between financial and economic indicators are non-linear. The calculated value of the Fisher criterion F at the level of 24.7–71.7 significantly exceeded the table values and was equal to 1.969 and 2.009, which also indicates the recognition of the regression equations as statistically significant.

Table 2. The results of regression statistics modeling the return on assets of agricultural enterprises of the Altai Territory.

Indicators	Agricultural enterprises	
	included in the integrated formations	not included in integrated formations
Multiple R	0.910	0.838
R-square	0.828	0.702
Normalized R-square	0.795	0.690
Standard error	7.842	12.177
Fisher test F	24.661	71.700

As a result of assessing the statistical significance of factor signs using Student t-statistics, the following models of regression dependencies of the level of return on assets from the identified factors were obtained:

- For enterprises included in the integrated formations, the model is as follows:

$y = 6.734 \cdot x_1 - 0.125 \cdot x_2 + 10.665 \cdot x_3 + 0.038 \cdot x_5 + 0.074 \cdot x_7 + 0.266 \cdot x_8 + 0.021 \cdot x_9 + 36.045$

- For enterprises not included in integrated formations, the model is as follows:

$$y = 2.381 \cdot x_1 - 0.431 \cdot x_3 - 0.453 \cdot x_7 + 0.151 \cdot x_8 - 0.033 \cdot x_9$$

where

x_1 is the coefficient of autonomy;
x_2 is the current ratio;
x_3 is the asset turnover;
x_4 is the cost recovery;
x_5 is income per one employee;
x_6 is the budget for one employee;
x_7 is the gross income per one employee;
x_8 is the average monthly wage;
x_9 is the share of income from crop production in total revenue.

The coefficients of the equation show the quantitative effect of each factor on the effective indicator while the others are unchanged. So, for enterprises that are not part of integrated formations, an increase in asset turnover, gross income per employee, and the share of income from sales of crop products in total revenue negatively affect the change in return on assets.

6   Conclusion

The results obtained indicate a significant development of integrated formations in the Altai Territory. The agricultural enterprises included in their composition differ significantly in the depth of specialization and areas of activity from the average organizations in the region. In addition, every fourth enterprise in the holdings belonged to the 4th or 5th class of financial stability. The obtained regression models indicate a significant impact on the profitability of invested funds of the

level of financial independence obtained from the budgets of all levels of funds. Their use will allow counterparties and financial analysts—including commercial banks, the Ministry of Agriculture, and its territorial structures—to evaluate and predict the effectiveness of financial activities of agricultural organizations in the region on the basis of their membership in integrated structures.

Acknowledgment

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