

# Management of grain production in modern conditions

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**Abstract.** The paper outlines the role of grain-producing companies in the agrarian sector of Ulyanovsk Oblast. It determines basic competitiveness factors of grain-producing companies in the region. An agricultural enterprise devoted to crop production of the region was assessed to provide an overview of its internal and external environment in modern conditions. The SWOT and PEST analysis tools were used therewith. The overview evaluated the efficiency of grain production at the enterprise, determined a break-even point and margin of financial stability. This allowed the enterprise to be classified as financially unstable with a moderate bankruptcy risk. The paper also discusses the role of innovations (through the introduction of new promising and region-bound grain varieties and the use of highly-efficient liquid fertilizers) and their contribution to the development of grain production and increase in financial stability of the enterprise.

## 1 Introduction

Ulyanovsk Oblast is one of the important agrarian regions in Russia. It primarily specializes in crop production. Grain production is one of the priority sectors of crop production and the entire agrarian sector. Almost all agricultural companies of the region are involved in grain production.

The competitive capacity of grain-producing companies in Ulyanovsk Oblast is largely determined by the following: 1) fluctuations on the national grain market; 2) dynamics of regional demand for grains, which is constrained by slow animal husbandry and shrinking household demand due to higher incomes and changed food preferences; 3) price fluctuations in the energy market as expenses for fuels and lubricants account for a significant share in the cost of grain; 4) integration and concentration of capital as the profitability of vertically integrated grain producing companies is 15–20 % higher than the industry average; 5) the state of regional market infrastructure (facilities for refinement, storage, transportation of grain, marketing, lending, management and marketing consulting); 6) development of risk leveling system for business entities to provide fully insurance and risk hedging; 7) participation of local, regional and federal authorities regulating production volumes, directions of grain flows, prices, export and import of grain in the regional market.

## 2 Materials and methods

A. Alabushev, A. Altukhov, V. Butkovsky, A. Vasyutin, A. Gordeev, I. Koshkarev, V. Nechaev, O. Charykova, R. Shepitko and others addressed the current state and

development of grain production. In their studies they highlighted the theoretical and methodological basis of the problem under consideration. However, many topical issues concerning management of grain production in modern conditions remain insufficiently explored, and that substantiated the goals and objectives of the study.

General scientific methods, SWOT analysis, PEST analysis, and methods of marginal analysis were used in the study.

The object of the study was OOO Irek, Melekessky District, Ulyanovsk Oblast, an agricultural company specializing in grain production.

The SWOT analysis showed that the company has all necessary conditions for the effective development of the grain industry, namely a favorable geographical position, economic potential, natural and labor resources, well-developed business infrastructure, and competent administration (Table 1) [1].

One of the main factors stimulating the development of grain farming is the climatic potential that contributes to the efficient management of agrarian production.

Table 2 shows the results of the PEST analysis.

The degree of impact was evaluated on a scale: high, medium, low. The level of impact ranged from –5 to +5. Weight assignment was based on the importance of certain factors, while a comprehensive assessment of all factors is equal to 1.

The data in Table 2 indicate that economic factors have the greatest impact on the activities of the company. They accounted for 39 % of the total factor impact. Economic factors are followed by technological factors with a share of 26 %. Social and political factors are equally important and therefore should not be overlooked. All macroenvironmental factors facilitate the

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organization’s performance. Hence, it is important to timely assess their impact and changes.

**Table 1.** SWOT analysis of Irek performance

Favorable factors (opportunities) State support. Participation in nationwide projects. Increase in market opportunities. Enabling transport and geographical position. Well-developed communications framework. Collaboration with agricultural educational institutions. Credit availability. Subsidies or grants.	Unfavorable factors (threats) Zone of risky agriculture. Dependence of production on climate. Unstable agrarian market. Price disparity. Inadequate financing to agrarian society. Decrease in purchase prices for grain. Rise in prices for fuel and spare parts. Limited demand. Inflation rate. New competitors. Need to master new technologies.
Strengths Sufficient amount of agricultural machinery. Extended reproduction of fixed assets. Intensive industry development. Highly qualified administration. Strong competitive position. Proximity of markets. Adequate labour resources. Low staff turnover. Effective incentive scheme. High quality products.	Vulnerabilities Reliance on external funds. Machine and tractor wear. Equipment procurement under finance lease or on credit. High cost of production. Decrease in grain production efficiency.

The analysis of grain production at OOO Irek indicates that throughout the research period, grain production at the enterprise is cost-effective (Table 3).

During 2015–2017, the production cost decreased by 14.46 %, the total cost of 1 decitonne of grain decreased by 12.95 %, and the average selling price of 1 decitonne decreased by 10.4 %.

An outstripping reduction in total cost compared to a drop in the cost of 1 decitonne of grain led to an increased sales profit by 73.1 %. The profitability of grain production increased by 3.02 %, sales – by 2.76 %

Economic activity at an enterprise calls for the management to make managerial decisions. To do this, there are some management accounting tools, one of which is break-even analysis [2].

A break-even analysis is used to establish what will happen to financial results when the level of production activity at an organization changes [3].

The analysis is valuable in that it links the decision making on cost management with production growth, prices and revenue [4].

First of all, cost management is necessary to maximize profits, improve financial conditions, boost the competitiveness of products and organization’s effectiveness, and reduce the risk of bankruptcy. With this in view, it is recommended to conduct a regular financial analysis in order to minimize total costs.

**Table 2.** PEST analysis into macro-environmental impact on Irek performance

Factors	Degree	Level	Weight assignment
<b>Social</b>			<b>0.19</b>
people’s attitude to work and living standards	High	+5	0.055
level of education	High	+5	0.060
labor mobility	Medium	+2	0.020
demographic structure of society	Medium	+3	0.025
customs and traditions	Low	-4	0.015
shared societal values	Low	-4	0.015
<b>Technological</b>			<b>0.26</b>
opportunities for product improvement	High	+5	0.08
opportunities for new products	High	+5	0.09
modernization of technology and marketing of manufactured products	High	+5	0.09
<b>Economical</b>			<b>0.39</b>
inflation rate	High	+5	0.047
GDP rate	Medium	+2	0.025
refinance rate	High	+5	0.040
unemployment rate	Medium	-5	0.023
workforce productivity	High	+5	0.045
salary level	High	+5	0.039
credit availability	High	+5	0.044
degree of competition	High	+5	0.038
tax system	High	+5	0.044
<b>Political</b>	High		<b>0.16</b>
legislative change	High	+5	0.034
domestic and foreign policies of the state	High	+5	0.036
legal protection	High	+5	0.035
public control over the activities of the legal system	High	+5	0.030
dynamic character of the legal system	Medium	+2	0.025
Total	X	X	1.000

The break-even point is computed in terms of total revenue and total costs. For this calculation, it is important to distinguish variable and fixed costs. It should be born in mind that variable costs vary depending on the volume of outputs (raw materials, materials, components, job wages, technological energy, etc.). In turn, fixed costs do not depend on the volume of production output (in particular, these are the costs of

repair and maintenance of equipment and buildings, rental and leasing payments, heating and lighting costs, time wages, etc.) [5].

**Table 3.** Economic efficiency of grain production at OOO Irek

Indicators	2015	2016	2017	Deviation (+,-)
Grain yield, dt/ha	14.3	20.2	25.6	11.3
Labor costs for the production of 1 decitonne of grain, man-hour/dt	0.5	0.1	0.3	-0.2
Production cost of 1 decitonne of grain, RUB	610.35	500.22	522.11	-88.24
Total cost of 1 decitonne, RUB	583.28	560.38	507.75	-75.53
Selling price of 1 decitonne, RUB	601.13	583.36	538.64	-62.49
Profit (loss) on sales of 1 decitonne, RUB	17.85	22.98	30.89	13.04
Profitability (loss) of costs, %	3.06	4.10	6.08	3.02
Return on sales, %	2.97	3.94	5.73	2.76

The break-even point (BEP) (in terms of Unit Sales) can be calculated as:

$$BP = R * FC / (R - VC), \quad (1)$$

Where R is revenue generated,

VC is Variable Costs,

FC is Fixed costs,

BP is break-even point in terms of Unit Sales [6].

The stability of a business determines the margin of safety, i.e. the extent to which sales exceed the threshold of profitability, otherwise referred to as margin of safety. Margin of safety shows how much a business can reduce the sales of goods without incurring losses. The extent by which current or projected output exceed break-even output is the margin of safety. Margin of safety is the most important indicator that enables a business to know what the exact amount it has gained or lost is and whether they are over or below the break-even point [7].

A break-even point calculation for grain production at OOO Irek is presented in Table 4.

Thus, the calculated break-even point by value shows that with the prevailing ratio of fixed and variable costs, the company needs to produce and sell grain in the amount of no less than RUB 18,724 thousand. With such a volume of sales, the company will fully cover all total costs through the revenue, without any profit or loss. In fact, OOO Irek sold grain in the amount of RUB 24,409 thousand in 2017, which is RUB 5,685 thousand more than the break-even point.

The calculated percentage of safety margin shows that the company can reduce grain revenue by 23.29 % before it reaches the break-even point.

In addition, using the calculated margin of safety, we can consider the likelihood of bankruptcy risk of the enterprise and its financial stability (Table 5).

The calculations indicate that the company is characterized by a moderate risk of bankruptcy. During the reporting period, the company is financially fragile.

**Table 4.** Break-even point of grain production at OOO Irek

Indicators	2017
Fixed costs – total, RUB, in thousands	10167
Variable costs – total, RUB, in thousands	11164
Variable costs per 1 decitonne of grain, RUB	249.18
Production output, decitonne	44803
Revenue, RUB, in thousands	24409
Selling price of 1 decitonne, RUB	538.64
Marginal revenue – total, RUB, in thousands	13245
Marginal revenue per 1 decitonne of grain, RUB	295.63
Margin ratio	0.543
Break-even point:	
- by volume, decitonne	34391
- by value, RUB, in thousands	18724
Margin of safety:	
- by value, RUB, in thousands	5685
- %	23.29

**Table 5.** Correspondence of safety margin to the level of bankruptcy risk and financial stability

The value of safety margin	Level of bankruptcy risk and financial stability
0.5–0.8	A company is financially sound. The risk of bankruptcy is minimal.
0.2–0.5	A company is financially fragile. The risk of bankruptcy is moderate.
<0.2	A company is in financial difficulty. The risk of bankruptcy is high.

In this regard, the need for developing measures to increase grain production, improve its quality and reduce the cost of production per unit is quite obvious.

### 3 Results and discussion

Currently, an increasing number of agricultural enterprises are aware of the significant role of innovation so as to succeed and enhance their competitiveness. In reliance on the existing opportunities, agrarians are seeking to introduce new technologies, acquire advanced equipment that aids to reduce costs and improve the quality of products [8].

In modern conditions, one of the important factors contributing to the sustainability of grain production is the implementation of innovative projects, in particular, the introduction of new promising and released varieties of highly productive cereals. According to empirical studies, new varieties and high-quality seeds can encourage extra grain yields in the amount of 15–20 %. Different cultivars vary in yield and grain quality, which determines their effectiveness for production. However, these natural indicators reflect only one side of the efficiency achieved.

In a market economy, when cultivar changes is the only factor for many producers to optimize grain

production, there is a need for an economic assessment of each variety cultivated, with respect to its quantitative and qualitative indicators [9].

In this regard, OOO Irek is proposed to grow Volzhskaya 100 winter wheat varieties. A study of the production potential showed that Volzhskaya 100 has high yield capacity. In 2008 the maximum grain yield was harvested at the Shchigrovsky variety section of the Kursk region – 95.4 dt/ha. In 2013, Volzhskaya 100 was studied under the State test system in 24 experiments and showed a yield of 42.6 dt/ha.

It is proposed to grow this variety on an area of 400 hectares. Given that the seeding rate is 2.2 dt/ha, the need for seeds will be 880 dt.

In addition, it is advisable to use a fertilizer KAS-32 in autumn – for the primary cultivation to produce winter grain. It is possible to order KAS-32 with a door-to-door delivery from OAO KuibyshevAzot, the manufacturer of mineral fertilizers.

The results of the activities are presented in Table 6.

**Table 6.** Break-even forecast of grain production at OOO Irek

Indicators	Actual 2017	Plan 2020	Deviation, ±
Fixed costs, total, RUB, in thousands	10167	10167	-
Variable costs – total, RUB, in thousands	11164	11981	+817
Variable costs per 1 decitonne of grain, RUB	249.18	253.71	+4.53
Production output, decitonne	44803	47223	+2420
Revenue, RUB, in thousands	24409	26493	+2084
Marginal revenue – total, RUB, in thousands	13245	14512	+1267
Marginal revenue per 1 decitonne of grain, RUB	295.63	307.31	+11.68
Margin ratio	0.543	0.548	+0.005
Break-even point: - by volume, decitonne	34391	33084	-1307
- by value, RUB, in thousands	18724	18553	-171
Margin of safety: - by value, RUB, in thousands	5685	7940	+2255
- %	23.29	29.97	+6.68

## 4 Conclusion

The implementation of the proposed measures resulted in a breakeven point reduction in volume terms by 1307 decitonne. This means that OOO Irek will need to produce and sell less grain to fully cover the costs. Margin of safety will absolutely increase by RUB 2,255 thousand or 6.68 %.

Thus, the “costs – volume – profit” analysis is an analysis of the behavior of costs, which is based on the relationship of costs, revenue (income), output and

profit. It is a tool for management planning and control. These relationships form the basic model of financial activity, which can be used for short-term planning and evaluation of alternative solutions [10].

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