ECONOMIC FEASIBILITY OF ORGANIC AGRICULTURE IN THE BELGOROD REGION

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Abstract: *The problem under study is due to the need to increase cereals production in the Belgorod Region and Russian Federation. The article aims to substantiate the scale of organic farming of grain crops to fulfill the Food Safety Doctrine, produce organic foods and expand the area under autumn wheat cultivated organically. The problem is studied using statistical economic methods, selective detailed analysis and expert evaluation. In the Belgorod Region, cereals are grown by approximately one hundred agricultural enterprises. The share of these crops in the Region is the greatest making about 60% of the cultivated area. The sustainable and efficient development of grain growing needs support of the federal and regional governments. To fulfil it, the Belgorod Region Government approved the program of development of the cultural sector (Resolution No. 331pp(nn) of 8 October 2007). Under the present tough economic conditions, more attention is paid in Russia to a broader implementation of power-saving technologies in crop raising and harvesting their goal being to ensure a competitive production through regulated factors. Such technologies are based on concentration of all the factors including new breeds and varieties, fertilisers, growth regulators, new devices and other production resources ensuring the highest possible payback with quality grain. The article explores the matters of feasibility of grain farming with the organic or biological farming system. The article may be useful to agricultural entities transiting to the organic farming as well as to public authorities planning cereals farming and the measures of governmental support of the agricultural sector.*

Keywords: *biological agriculture, biological farming, organic agriculture, organic farming, no-till farming, no-till agriculture, zero tillage, state support, governmental support, agricultural efficiency, foreign experience, agriculture, farming, rural economy, agricultural sector, Belgorod Region, Belgorodskaya Oblast, Belgorod Oblast, subsidies, grants, corn farming, cereals farming, grain crop farming.*

Introduction

Over the recent years, the problem of comprehensive mechanization of agriculture caused by the lack of equipment and fuel pricing policy. The disparity of prices for machinery, fuel, chemical agents and agricultural products is the main reason of their

competitive weakness and deepening of the economic recession. This begs for a new approach to modern agricultural production based upon power- and land-saving technologies using not only some effective techniques but the achievements of the world science and best practices comprehensively at all phases of cultivation and harvesting. **Methods Used**. In this study, most influences or factors an organic or biological farming is subject to are considered. In more detail it discusses some of them under the intensive and the organic farming to include the cost of production, cost of protection, fertility, crop yield and, consequently, efficiency of production. The study uses statistical economic methods, selective detailed analysis and expert evaluation. Its findings substantiate the use of the organic system for corn farming in the Belgorod Region. **Findings**. Zero tillage and direct seeding are the variants of the minimum tillage with seeding over stubbing and sod treated usually with herbicides without any actual tilling of the soil except for making small grooves for covering of the seeds. [1,3,4] These technologies give great economies of manpower, equipment and fuel speeding up the field work under tough schedules, bettering soil conditions and decreasing aeolation and outwash. However, in Russia these technologies have been poorly studied by the agronoms and engineers alike.

Nevertheless, the direct seeding provides considerable opportunities to save time and manpower and meet optimal sowing schedules by bringing the fieldwork time down to the minimum. As the data presented by V.A. Nebavsky [4] suggest, that direct seeding costs are 5.5-13 times as small as those of the traditional cultivation and 3-4.5 times as small as minimum tillage costs. Using the resource-saving technologies in the Production and Agricultural Cooperative Caucasus Foothills allowed to: decrease diesel fuel consumption by 35-40%; bring down production costs by 25-50% (depending on crops in question) compared to the classic technology; decrease the need for farming machinery including tractors (by 40%), and hauled units (by 58%) as well as the number of servicing personnel (by 50%); increase humus content at the depth of 0-15 cm by 30-40%.

The saved money enabled to regularly pay wages even under the severe conditions and support production at a quite acceptable level. Since 1999 in the Dnepropetrovsk Region, the no-till farming has been studied under the soil and climate conditions of Ukraine. In 1996, Agro Soyuz Corporation leased 7 thousand hectares of land to use this technology and increased this area to 12 ths ha in 2006 planning to make it as large as 15 ths ha. On this ground, the following results have been achieved: production costs brought down by 5 times on average; agricultural machinery reduced by 90% (12 ha are cultivated by one tractor, one sowing machine, one spaying machine and five combine harvesters; consumption of fuel and lubricants decreased by 70% (93 l/ha to 24 l/ha); crop area cultivation time reduced by 80% (3.87 m-h/ha to 0.6 m-h/ha); consumption of fertilisers decreased by 30%; man-hours decreased (12 ths ha cultivated by 12 people); crop yield increased by 2 times (27 c/ha to 50 c/ha); grain quality increased to contain 10% more proteins; fertile ground degeneration stopped. [5,20,21,22].

Direct seeding is a completely new system of agriculture for which sufficient data have yet to be collected. That is why direct seeding is advised to be started only at a part of the cultivated lands (about 10% for large farmsteads). Before the direct seeding, one must collect all the information and knowledge relevant to the system. Smaller farms can start with one third of their cultivated areas. While in the South America direct seeding is practiced by 80% of the farmers, in the USA their share is only 10-12%. Presently, it is used over about 100 Mn ha all over the world and this figure is growing permanently. Along with environmental issues, the higher efficiency and lower labour costs are the main reasons for hundred thousand of farmers to have transited to direct seeding. [15,16,17]. The main merit of the zero tillage is the change of the agricultural paradigm

about the soil use and production environment management. It laid the foundation of the new kind of the agriculture where we no longer speak of cultivated or non-cultivated lands or unfertile plots. Presently, all soils can be sown into with zero tillage, agricultural ecosystems are invulnerable (unlike cultivation ones) and production is growing free from certain risks. The example of the South America shows a substantial rise in fertility mostly due to the better chemical and physical properties and more saving use of water. Also, the zero-tillage brought down the consumption of organic fuels.

According to the modern knowledge, zero tillage can be expected to become the best-performing alternative to reconcile the conflicting interests of boosting production with sustainable agronomic methods and efficient energy use. However, zero tillage is not enough for a sustainable agriculture which takes practical and conceptual knowledge and means including expedient rotation of crops, integrated protection from pests, diseases and weeds, returning of nutrients to the soil as fertilisers and skillful use of external materials. It is only with those knowledge and skills an effective zero tillage farming can be created and give high yields. [6,11]. The three-year long use of the no-till technology at Zaria CJSC, Kireyevsky District, Tula Region provides every evidence that it has met all the expectation. The area under crops increased considerably from 5,464 ha in 2005 to 8,712 ha in 2008. Over the last two years the company has considerably amassed its cultivated lands from 6,229 ha to 9,589 ha which the transition to direct seeding was conductive to.

The new technology showed good total grain yields as well to be 7,423 tons in 2005 and 18,909 tons as early as in 2008 with specific cereals yield having grown from 30.8 c/ha to 36 c/ha over the same time. It is worth noting, that the company became more profitable by 25% compared to the level of 2005 mostly due to the lower grain production costs. In 2005, the cost of grain production was 2.54 roubles per kilogram sold for 2.69 roubles, while in 2008 those figures were 3.76 and 5 roubles, respectively. Moreover, the company is building up its fixed assets. Over 2005-2008, their value had grown from 60,763 ths roubles to 230,835 ths roubles, i.e. by 3.8 times. [7,12,14,15]. Kamyshevatskoye LLC, Yeysk District, Krasnodar Territory directly seeded a field of autumn wheat sown after sunflower. The biological yield was 60 c/ha, but the economic aspect is even more interesting. The specific cost of crop is 14.2 ths roubles including about 200 kg of fertilisers (active ingredients), 4 or 5 treatment with protective substances, heavy amortization of machines and equipment. Nevertheless, the cost of production is competitive at 2,290 roubles/ton. Given the sale price of 4,000 roubles per hectare of the autumn wheat, the company makes net profit of 10,600 roubles or 43% in percentage terms.

What are the advantages of the new technology? Firstly, the labour efficiency increases by nearly 3 times compared to the traditional technology which enables the company to downsize and pay considerable wages to its employees. Secondly, minimization of tillage down to the direct seeding prevents dehumidification and erosion of the soil. [8,13,21]. According to experimental data obtained from the instructional farm of the Samara Agricultural Academy (situated in the southern part of the trans-Volga steppe zone), the average yield of the autumn wheat cultivated traditionally over 131 hectares was 21.6 c/ha, while direct seeding yielded 26.7 c/ha (the difference of 5,1 c/ha is substantial givenLSD_{05}= 1.4 c/ha). Thus, the direct seeding increased the yield of autumn wheat by 23.6% compared to the traditional cultivation after a non-fallow fore crop. It gave 1 ths roubles per hectare in excess giving 1 Mn roubles more from 1,000 ha. The calculations show that traditional tillage farming of 2,000 ha requires 19 kinds of agricultual machines worth 15.6 Mn roubles meaning the annual amortization of 927 roubles/ha with 52% falling at tractors and combine harvesters. The resource-saving

technology of direct seeding requires only 11 kinds of machines worth 14.8 Mn roubles with the annual specific amortization 8% lower (857 roubles). 35% of this amount falls at energy and fuel with the rest falling at agricultural machines. Therefore, direct seeding and the relevant agronomic techniques means, first, a lower metal intensity of crop farming. In other words, the weight of steel dragged over the fields during the technological processes is 70% less. Accordingly, the direct seeding considerably saves motor fuel which as not renewable. [9,15,19]

The cost of production and yield are analyzed first as the most essential drivers of economic efficiency. The cost of machinery is temporarily ignored because it is costly and depreciates for a long time. A comparison of the cost of traditional and no-till production is in favor of the latter. The costs are lower due to the number of operations, greater productivity, less fuel and lubricants. Under different conditions and with various breeds, the economy is 25% to 50%. The no-till technology shows greater yields compared to the moldboard plowing. A study in Missouri, USA revealed the increase of the cereals yield with no-till farming by 10% over 14 years. In Kansas, the increase in the yield of corn, grain sorgo and sunflower seed was 26%, 11% and 17% in 7 years. Over 14 years, the no-till yields of wheat and sorgo were 60% and 63% higher than with tradition tillage. In Paraguay, the no-till technology raised the yield of soy by 44.2% to reach 56.0% over 7 years and 55% over 10 years. In Brazil (Parana), the no-till sowing gave an increase by 5-20% (depending on the crop) in 10 years and by 66% for corn and 56% for soy – over 17 years. In Samara Region, Russia since 1998, the average no-till yield has been increasing permanently. In the resent years, it is 30-34% over the Region's average. [15].

The no-till technology reduces manpower costs by up to 30%, capital expenditure – by up to 47%, need for tractors' capacity – by up to 44%. It also increases yields under stress conditions. Summarizing the findings of many foreign studies and production indicators from many countries, the advantages of this technology may be grouped in three clusters: A) Agricultural – higher fertility, better soil structure, protection from aeolation and outwash, higher soil humidity and resistance to drought, restoration of soil biota, higher biological activity, less machine treatment; B) Economic – lower costs and labour intensity, higher competitiveness, higher agricultural profits, smaller fuel consumption; C) Social – restoration of ground water, more abundant and less silted rivers and lakes with smaller erosion (by down to 70-90%), lower water-purification costs, less land and water reservoirs pollution problems, smaller consumption of pesticides, smaller greenhouse gas emissions and their impact on the global warming, CO2 sequestration, preserving biological variety and landscapes. [5].

In the Belgorod Region, the organic farming has been fully implemented at Meat Farms Iskra LLC (Iskra) of Korochansky District. The rest of the companies in the Region use it only partially or do not use at all which makes a deeper and more impartial analysis impossible. That is why, in this article that company is compared with the Agricultural Cooperative Niva (Niva) and Agro Belogorye LLC (Belogorye). Niva deals in beef and grain. Belogory specializes in pork and grain. As a holding, Belogorye includes the grain-growing subsidiaries Borissov Grain Company, Prokhorovka Grain Company and Krasnogvardeyskoye Grain Company all of them dealing in grain. Besides that, the mentioned companies have their cultivated areas in one and the same climate zone. Table 1 shows the cost of production of grain by Iskra to be much less than that of the other two companies with the considerably greater efficiency. Thus in 20015, Iskra's cost of production was 422.17 roubles per center whereas Niva and Belogorye showed 564.7 RUR/c and 583.10 RUR/c respectively. The same is true of previous years save for 2013 which we mean to be an exception. Analyzing the cost of production, we will see the cost

of fuel per 1 hectare smaller for Niva and Belovodye due to the organic farming. At the same time, since Iskra does not till, it must spend more on fighting weeds. According to the international practice, such costs are typical for the implementation phase of organic farming. [3] Iskra fertilize a little less because the mulch partially rots through bringing the need for fertilisers down compared to the intensive farming. Since organic farming uses less operations, the servicing of fixed assets is cheaper. All the facts described above reveal the efficiency of the organic farming compared to the intensive one which is confirmed by the steadily high grain production payback of 31% to nearly 81%. It is worth noting, that in 2015, the profitability of the analyzed companies was by more than 2 times higher with organic farming although the yield was the same with both methods (40-42 c/ha).

Table1 – Organic and Intensive Farming Efficiency in the Belgorod Region

No.	Indicators	Years		
		2013	2014	2015
Meat Farms Iskra LLC (organic farming)				
1	Prime cost for 1cof cereals, roubles	486.26	314.89	422.17
2	Expenses for petrochemicals at 1 ha	686.45	1,432.71	1,294.81
3	Expenses for protective solutions for plants at 1 ha, roubles	1,822.41	2,326.38	3,286.89
4	Expenses for fertilisers at 1 ha, roubles	3,962.65	2,874.68	4,644.32
5	Maintenance expenses of the main solutions, at 1 ha, roubles	73.00	90.34	641.29
6	Labor expenses for 1 c of the products, man-hours	No data	No data	No data
7	Yieldc/ha	36.6	58.3	42.3
8	Cereals production profitability, %	31.4	70.6	80.9
Agricultural Cooperative Niva (intensive farming)				
1	Prime cost for 1cof cereals, roubles	372.71	412.03	564.70
2	Expenses for petrochemical sat 1 ha	1,447.62	3,186.59	2,619.47
3	Expenses for protective solutions for plants at 1 ha, roubles	1,945.66	2,736.87	3,331.05
4	Expenses for fertilisers at 1 ha, roubles	1,606.72	1,316.20	1,303.16
5	Maintenance expenses of the main solutions, at 1 ha, roubles	2,727.73	5,011.17	2,467.89
6	Labor expenses for 1 c of the products, man-hours	No data	No data	No data
7	Yieldc/ha	40.4	52.9	40.8
8	Cereals production profitability, %	60.8	34.5	36.0
Agro Belogorye LLC (intensive farming)				
1	Prime cost for 1cof cereals, roubles	552.14	487.61	583.18
2	Expenses for petrochemicals at 1 ha	1,719.58	1,909.30	2,436.48
3	Expenses for protective solutions for plants at 1 ha, roubles	1,472.33	1,766.78	2,283.42
4	Expenses for fertilisers at 1 ha, roubles	4,090.93	4,422.43	4,977.40
5	Maintenance expenses of the main solutions, at 1 ha, roubles	3,708.32	3,182.34	2,502.79
6	Labor expenses for 1 c of the products, man-hours	0.291	0.227	0.266
7	Yieldc/ha	37.1	46.9	42.4
8	Cereals production profitability, %	16.3	12.0	35.4

Conclusion

The study reveals the need to implement the new agricultural system because of its high economic efficiency not to mention its ability to restore organic substances in natural ways. Thus, the study indicates that organic grain growing is efficient in the Belgorod Region since the yield of cereals at the companies using it is high. It can also solve some developmental problems of the regional grain farming.

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