Development of crop production in the Kemerovo region

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Abstract. A conceptual approach to improving the efficiency of crop production is presented. The factors of increase are: the volume of production; legislation; innovation; investment; human resources; sales markets and pricing policy. The influence of these factors on the development of crop production in the Kemerovo region is considered. The efficiency of this method is proved.

1. Introduction

Over the years, state agricultural research and development works in the state sector, the non-profit sector and the higher education sector have been a key component in addressing many agricultural challenges and transforming of global agriculture into a dynamic and productive sector [1].

Scientists considered a conceptual approach to the development of agriculture, which was based on one factor. An example may be papers by the following authors: I. G. Kuznetsova, S.A. Shelkovnikov, E. V. Sharavina “Development of conceptual approach of human capital formation in agriculture of Novosibirsk region”, O. I. Panteleeva, A. V. Khuldiakov “Conceptual approaches to the state support of development of rural territories in the world”, O. V. Eremenko, D. V. Rudenko, “Conceptual approaches to forecasting the development of agriculture in the region”, and other authors.

Currently, the domestic practice is dominated the sectoral approach, which is implemented, in particular, in the Concept of sustainable development of rural areas of the Russian Federation for the period up to 2020, where sustainable development of rural areas is understood as its stable socio-economic development, increasing agricultural production, improving the efficiency of agriculture, achieving full employment of the rural population and improving its living standards, as well as rational use of land [2].

The method proposed below will allow a systematic approach to the problem of agricultural producers.

2. Methods

Agriculture is one of the industries included in the country’s agribusiness. The food security of the country depends on how effective the industry will be, so the goal facing the agricultural producer is to increase production efficiency. But just to produce more products, better quality in these conditions is not enough. It is impossible to increase the efficiency of agricultural products, setting only narrow goals. For example, increasing the yield of a product or increasing investment.

In this case, we will talk about economic efficiency, about how profitable the industry is. In modern conditions, a marketing-oriented approach to forecasting the development of agriculture in the region is required [3].
A conceptual approach to improve production efficiency due to factors that affect the efficiency of agricultural production is proposed. These include:
- production volume;
- legislation;
- innovations;
- investment;
- human resources;
- sales markets and pricing policy.

3. Results
Let’s consider the influence of these factors on the example of one of the branches of agriculture – crop production. Taking as a basis one of the districts of the Siberian Federal District. Agricultural and industrial complex of the Kemerovo region is an important component of the region’s economy. Working in agriculture -3.3% of the employed in the economy. In agricultural turnover is 28% of the land resources of Kuzbass. In comparison with other regions of Siberia, agricultural production of the region is characterized by high intensification of production. Per one worker in agriculture in the Kuzbass accounts for 67 people, in Russia – 23. The main products of crop production-grain, potatoes, vegetables. Income from the production of the industry is 44.4% of the total income of agricultural products.

More than a million hectares of acreage in the Kemerovo region are occupied by crop production. Kemerovo region is trying to provide the population with its own crop production, namely grain, potatoes, vegetables [4].

Let us consider how the volume of production changed during the analyzed period. We present the acreage and the volume of production in table 1.

Table 1. Acreage and the volume of production [5].

| Indicator                  | 2013     | 2014     | 2015     | 2016     | 2017     | Deviation, % | Growth rate, % |
|----------------------------|----------|----------|----------|----------|----------|--------------|----------------|
| Acreage, thousand ha       | 1012.1   | 959      | 971.7    | 961.2    | 954.7    | -57.4        | 94.3           |
| Crop production, million   | 21914.9  | 24132.7  | 21849    | 22238    | 21758    | -156.9       | 99.3           |
    rubles                   |          |          |          |          |          |              |                |

The 5.7% decrease in the area during the analyzed period led to decrease in the volume of output at 0.7% in actual prices.

The gross yield of the main groups of crop production is presented in figure 1.
During the analyzed period, the gross volume of vegetables decreased by 7 thousand tons or 3.1%, the grain harvest increased by 176.1 thousand tons or 19.2%, and the gross yield of potatoes increased by 45 thousand tons or 6.9%.

Let us trace how the legislation has changed during the analyzed period. Federal law No. 264 “On the development of agriculture” was adopted on 29.12.2006. The changes concern article 7 part 1 of federal law (FL) from 23.07.2013 № 236-FL, “support of agricultural producers engaged in agricultural production are unfavourable for the production areas”. Changes were also made in accordance with the Federal law No. 467-FL from 29.12.2014. article 5 part 1 about the accessibility and targeted support by extending the circle of addressees. Changes made by the Federal law from 12.02.2015 № 10-FL article 15 part 1 touched on agricultural machinery. Changes made by Federal law from 01.07.2017 No. 144-FL, article 14, part 2, touched on the state purchasing interventions.

In order to ensure the competitiveness of agriculture in the globalized markets, a management model of “overtaking type” is needed. The success of which will be determined by the intensity of innovation processes that can provide a significant effect and return on investment in innovation in a relatively short period of time [6]. If we talk about innovation, it is necessary to take into account that should be carried out in three directions: raw materials (seeds), technology and storage.

For production is used zoned seed fund in Kemerovo region. Twenty-five varieties of different crops produced by Kemerovo scientists are included in the State register of breeding achievements. Zoned varieties increase crop yields by 20-25%, as adaptation to certain soils and weather conditions increases seed germination and ensures sustainable crop growth.

The number of researchers involved in innovation in agriculture is shown in figure 2.
Figure 2. The number of scientists involved in research in agriculture of the Kemerovo region, people.

The 20% decrease in the number of researchers involved in innovations during the analyzed period is due to the lack of a systematic approach to agriculture in general and crop production in particular. There is no holistic view of the interdependence of research and product yields. Since it is believed that the yield is affected only by the seed fund and is not taken into account that the seed fund requires constant updating. In addition, not the entire seed fund is updated, but only 30-40%.

Renewal of equipment in 2017 amounted to 4.5%. The provision of agricultural organizations with tractors and combines is presented in figure 3.

Figure 3. The provision of the agricultural organizations with tractors and harvesters, tractors per 100 hectares of arable land, and harvesters per 1000 hectares of sowings of appropriate crop, pieces.

The provision of agricultural organizations with tractors and combines in the region is reduced, as the upgrade of equipment is slow [7]. There are also problems with the storage of vegetables. Lack of storage space negatively affects the quality of products, which leads to lower prices and allows producers from other regions to increase their own niche in the local market.

Support infrastructure in the Kemerovo region includes:
– Department for business development and consumer market of Kemerovo region;
– municipal centers and business support funds;
– State fund for business support of the Kemerovo region;
– business incubators;
– Kuzbass Technopark;
– center of cluster development LLC Innovative Research and Production Center “Innotech”;
– the regional center of engineering LLC Innovative Research and Production Center “Innotech”;
– Agency of investment promotion and protection;
– Kuzbass chamber of commerce and industry;
– regional representation of the innovation promotion fund.

Functions of the coordinator of creation and development of infrastructure of support of business are carried out by: Department for development of business and the consumer market of the Kemerovo region.

Let us consider the structure of investments in crop production by financing sources in Kemerovo region in table 2.

### Table 2. Investments in crop production by financing sources in Kemerovo region of financing, million rubles

| Indicator                  | Year     | Deviation, ± | Growth rate, % |
|----------------------------|----------|--------------|----------------|
|                            | 2013     | 2014         | 2015           | 2016           | 2017           |                |
| State support              | 300.1    | 7660         | 8309           | 11395          | 3612           | 3311.9         | In 12 times    |
| Region subsidies           | 181.7    | 271          | 132            | 60             | 29             | -152.7         | 84             |
| Other investments          | -        | 404          | 402            | 325            | 202            | 202            |                |
| Total                      | 481.7    | 8335         | 8843           | 11780          | 3843           | 3361.3         | In 7 times     |

Despite the obvious growth of investments in agriculture of the region, the process is complex and ambiguous. Regional investments fall. State support is growing steadily until 2016, but in 2017 its amounted 31.7% from 2016. Other investments are also declining. Consider in table 3 investments by type of activity.

### Table 3. Investments in crop production by types of activity in Kemerovo region, million rubles

| Indicator                  | Year     | Deviation, ± | Growth rate, % |
|----------------------------|----------|--------------|----------------|
|                            | 2013     | 2014         | 2015           | 2016           | 2017           |                |
| Elite seeds                | 100      | 110          | 136            | 136            | 125            | 25             | 125            |
| Modernization              | -        | -            | 150            | 2960           | 405            | 405            | -              |
| Soil fertility, incl.      | -        | 8            | 10.6           | -              | -              | -              |                |
| - liming of acidic soils;  |          |              |                |                |                |                |                |
| - introduction of peat;    |          |              |                |                |                |                |                |
| - application of mineral   |          |              |                |                |                |                |                |
| fertilizers,               |          |              |                |                |                |                |                |
| Other activity             | 381.7    | 8217         | 8546.4         | 8684           | 3313           | 2931.3         | In 7 times     |
| Total                      | 481.7    | 8335         | 8843           | 11780          | 3843           | 3361.3         | In 7 times     |

Analysis of the table showed that there is no clear plan of the investment process in the Kemerovo region. State support and regional subsidies go to grants (including novice farmers), purchase of agricultural machinery, servicing loans for the purchase of fuel, reimbursement of direct costs for the creation and modernization of vegetable stores, reimbursement of direct costs for the modernization of greenhouse complexes, monitoring the fertility of agricultural land, melioration, etc.

Kemerovo region does not have a “personnel shortage” in the field of agricultural activity. Because there is Kemerovo state agricultural Institute on its territory, which provides human resources for the village. On the basis of the University you can get additional education or pass the course of
professional development. There are secondary professional institutions in the region that also train personnel for agriculture. Table 4 shows the name of the specialty (profession) and types of educational institutions.

Table 4. Education institutions and specialties.

| Name of specialty (profession)                      | Kemerovo state agricultural institute middle professional education/high education | Kemerovo agrarian technical school named after G.P. Levin | Prokop’evskiy agrarian college | Yashinsky technical school of technology and mechanization | Mariinsky agrarian technical school |
|-----------------------------------------------------|----------------------------------------------------------------------------------|----------------------------------------------------------|-------------------------------|----------------------------------------------------------|------------------------------------|
| Economics and accounting (by industry)              | +                                                                                | +                                                        | +                            |                                                          |                                    |
| Operation and repair of agricultural machinery and equipment | +                                                                                |                                                          |                              |                                                          |                                    |
| Veterinary                                           | +                                                                                |                                                          | +                            |                                                          |                                    |
| Master of maintenance and repair of machinery and tractor fleet | +                                                                                |                                                          |                              |                                                          |                                    |
| Agricultural mechanization                          | +/+                                                                              |                                                          |                              |                                                          |                                    |
| Tractor-driver of agricultural production           |                                                                                  |                                                          |                              |                                                          |                                    |
| Agronomy                                             | +/+                                                                              |                                                          |                              |                                                          |                                    |
| Zootechnology                                       | +/+                                                                              |                                                          |                              |                                                          |                                    |
| Technology of production and processing of agricultural products | +/-                                                                              |                                                          |                              |                                                          |                                    |
| Agro engineering                                    | +/-                                                                              |                                                          |                              |                                                          |                                    |

If we talk about additional professional education, the Kemerovo state agricultural institute offers the following programs of professional development: veterinary and sanitary examination, soil fertility monitoring and sampling methods, organization of the veterinary service, sampling of food products of animal and plant origin. The Institute also offers a program of professional retraining in technical operation and maintenance of vehicles.

Wages in crop production for the analyzed period did not exceed 15.5 thousand rubles.

The demand for crop production in the region is high, so the problem of markets for crop production does not exist. In addition, there is an agricultural and industrial cluster in the region, created on the basis of the Kemerovo state agriculture institute, the members of the cluster are trying to settle in the markets of China and South Korea.

After analyzing the state of crop production in the Kemerovo region for the period from 2013 to 2017, we can say that the acreage for products decreased by 5.7%, the volume of production in monetary terms in natural prices decreased by 0.7% excluding inflation. Gross harvest of vegetables
decreased, despite the growth of potatoes in 2016 in 2017 resulted in a decrease in production volume. During the analyzed period, grain harvest increased. The number of scientists involved in crop production is reduced from 29 people in 2013 to 23 people in 2017. Harvesting equipment is updated quite slowly while reducing its number. Investments in agriculture of the region are not stable, targeted, but there is no clear plan of investment in the areas. Despite the fact that the region has its own agricultural University, there are no strong links in personnel and research between the University and farmers (not counting cluster members). Kemerovo state agriculture institute preparing for crop production agronomists only, no breeders and no specialists with a narrow specialty. All this is bad for the efficiency of the industry.

The legislative framework should be aimed not only at supporting the agricultural producer, but also take into account the needs of the consumer of these products. Currently (federal law No. 144 dated 01.07.2017 article 14, part 2) the law protects the manufacturers. Grain interventions have been conducted in Russia since 2001 to stabilize domestic grain prices. It is necessary to take into account the needs of the region in vegetables, its produced about 80 kg per year per resident, but the need for vegetables is much higher from 100 to 140 kg (not counting potatoes).

In order not to reduce potato prices and not lose market because of lower quality during storage, with the necessary assistance of the local authorities in developing cooperative vegetable storage (as over 40% of potatoes are produced by personal subsidiary plot and the quality of storage is not up to par).

The innovation process should be constant and relate to the main areas: sales market (proper logistics), product quality, proper storage, excellent seed fund, quality land fund for crop production, provision of agricultural organizations with equipment. Equipment and technologies should be modern and highly effective. Investments are needed to support the proposed activities. Investments need to be planned, and for this it is necessary to assess their liquidity. This will help in choosing the right strategy for the organization.

The advanced development of science and technology requires from modern workers constant readiness and opportunity for constant training and retraining, as well as readiness for non-standard thinking in making important professional decisions [8]. “Personnel shortage” does not threaten enterprises, because in the Kemerovo region there is a specialized University, which provides not only training, but also professional development, as well as retraining of personnel. It is necessary to cooperate the organizations with University on the adjustment of training programs.

4. Conclusion
The proposed conceptual approach makes it possible to see not only the problem, but also the wider possibilities of its solution. Because no matter how good the seeds and good weather are, but if there are no good specialists, modern technology, conditions for storage and sales of products, there can be no question of any efficiency.

The purpose of any entrepreneur (including farmers) is profit, and the purpose of the employee – a decent wage. Increasing production efficiency will help achieve these goals. Small farmer alone will not be able to overcome this barrier, but he has a choice to join the agricultural and industrial cluster or cooperate with their own kind. It is possible to go by the other way: to get support from the state as an investment, but it is necessary to make an application correctly (so that the money came to you), and for this you need to know well not only the weaknesses but also the strengths of your economy, and a conceptual approach will help to understand this. Properly set goals, the vision of the impact of certain factors on the achievement of goals will make it possible to get the planned profit.

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