The role of dyeing safflower in ensuring food security of the Volgograd region

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Abstract. The Doctrine of Food Security of the Russian Federation which was adopted on January 20th, 2020 which he obtained the level of self-sufficiency in the seeds crop of agriculture from domestic section should be at least 75%. The Volgograd region is a large agricultural region of Russia, which produces about 70% of agricultural crops from agricultural products in the region where various crops are grown, which provide most of the oilseed crops with sunflower. It was determined that its crops negatively affect the ecological situation in the region; safflower, which has up to 35% oil in oilseeds, could serve as an alternative crop. At the same time, in arid regions, forage production requires optimization, and for a variety of rations for farm animals, it is possible to use thornless safflower varieties, which are grown for green fodder and for obtaining meal, after extracting oil from safflower oilseeds. The usefulness of safflower meal for farm animals, containing up to 55 feed units, is confirmed by foreign researchers in their works. So, when feeding lambs, the color of the meat increases while the linoleic acid in it increases. The researchers state that the addition of 15% safflower seeds improves the sensory properties of lamb meat and also improves the quality of the meat. The factors of choosing a competitive focusing strategy for farms that cultivate a niche crop of safflower are considered. In 2020, 16 varieties of crops were included in the State Register of Breeding Achievements, of which 4 are breeding of the Federal Research Center of Agroecology of the Russian Academy of Sciences, 2 of them have no thorns and are suitable for obtaining green mass from safflower crops, up to two mows per season. The supply and demand in the market, market factors of their change have been studied. The economic efficiency of the cultivation of dyeing safflower for seeds and commercial purposes has been calculated.

1. Introduction
Volgograd region is a large agricultural region of Russia, which produces about 70% of agricultural products from all agricultural products in the region. The region is in 5 climatic data, therefore, in the Volgograd region there is an opportunity to grow various agricultural crops, in particular, oilseeds, the main of which is sunflower, which in 2019 occupies about 90% of the region's sown area occupied by oilseeds. Increasing to oilseeds, it is necessary to search for alternative crops that are in demand on food markets.

An alternative crop for sunflower can be dyeing safflower, which is planted on an area of about 300 thousand hectares or 37.8% [1] of the sown area of oilseeds in the region. In the world, safflower crops occupy about 1 million hectares. It is grown on the European, Asian, African, American, Australian continents. In Russia, safflower crops reach 500-600 thousand ha. Safflower oil seeds are suitable for the production of vegetable oil, are used for food and technical purposes [2]. Crops of safflower in the
Russian Federation are dominated by the arid regions of the Southern Federal District: in Rostov, Saratov, Volgograd, Astrakhan regions. Safflower shows itself as a more drought-resistant, heat-resistant, salt-tolerant crop [3, 4], the oil of which can replace sunflower oil. In the Volgograd region, a selection of dyeing safflower is underway. As a result of breeding work, varieties of dyeing safflower were obtained. The aim of the research was to determine the economic efficiency of safflower production in arid conditions for various applications. The following were investigated: the market for safflower oilseeds, the elasticity of supply and demand for safflower oilseeds, the risks of choosing a competitive strategy when growing safflower for the production of oilseeds for commercial purposes and seeds of various reproductions, calculation of the economic efficiency of their production for various purposes.

2. Materials and research methods
The work used economic-statistical, exponential, abstract-logical, graphic methods. We used analytical materials based on the results of the work of the seed service of the State Statistics Committee in the Volgograd Region, the Federal Research Center of Agroecology of the Russian Academy of Sciences.

The price elasticity of supply and demand was determined using the generally accepted method:

$$E^D_P = \frac{Q_2 / Q_1}{P_1 / P_2}$$

where $$Q_2 / Q_1$$ is the relative change in demand;

$$P_1 / P_2$$ relative price change [5].

Determination of economic efficiency was carried out according to the generally accepted method:

$$P = \frac{\Pi}{C} \times 100$$ [6],

where P – profitability level, %

$$\Pi$$ – profit, rub.;

C – commercial cost of products sold, rub. [6].

3. Results and discussions
Safflower dye has many uses. Safflower oilseeds are used to produce oil used for food and technical purposes. Safflower seed oil contains up to 25-35% [7]. Safflower attracts the attention of farmers as a fodder crop in regions with arid conditions. The culture has high nutritional properties of green mass, mowed in the "butoisation-flowering" phase of thornless varieties of culture, hay and silage, meal, cake. 100 kg of green mass of safflower with a moisture content of 76.06% contains 22.75 feed units and 2.91 kg of digestible protein. In 100 kg of silage with a moisture content of 82.78%, respectively, 15 feed units and 1.3 kg of digestible protein, and in 100 g of cake, 55 feed units [7].

According to foreign literary sources, it is known that the safflower meal remaining after the extraction of oil is used for feeding animals. In modern research, Ferreira M.S. et al. found that adding it to the lambs' feed enhances the color of the meat with a simultaneous increase in linoleic acid in it [8, 9]. Since now there is a new direction in European countries for high-quality lamb meat with a high content of polyunsaturated fatty acids, obtained by including in the diet of animals feed obtained from growing safflower.

According to experts [10, 11], the state of fodder production in the Volgograd region requires additional resources to optimize it. To ensure the efficiency of industrial production of meat and dairy products, it is necessary to observe proportionality in the development of plant growing and animal husbandry, the unifying link between them should be modern fodder production, which is a complex, well-coordinated developing system of relations. To provide agricultural livestock and poultry with green fodder, safflower can be used as a fodder crop in its pure form and in mixtures with other crops for green fodder [9]. Animals eat well the green mass of safflower without thorns (non-plucked varieties). The yield of green mass during mowing in the "butoization-maturation" phase reaches 30 t / ha, hay -10 t / ha.
In the Volgograd region, since the 90s of the last century, breeding work on safflower has been carried out, the varieties obtained as a result of the work do not have thorns: Kamyshinsky 73, Zavolzhsky 1, Alexandrite, Volgogradsky 15.

Agricultural organizations in the region are increasingly growing crops. When deciding to start growing dyeing safflower, the farm involuntarily chooses a competitive “focusing” strategy [12], which is based on narrow specialization and is defined as a choice of a limited-scale economic activity with a sharply delineated circle of consumers [13]. Acting on its principles, an agricultural organization concentrates its activities on meeting the needs of a relatively small group, producing products for a specific purpose, quality and providing specific services, while the economy risks losing a large share of profits by producing other types of agricultural crops. Specific services should be understood as trade operations for the sale of seeds of higher reproductions.

The factors for choosing a focusing strategy in the safflower industry include:

- the presence of market niches that promise an increase in demand and income in the market for oilseeds that are not employed, or the demand for the necessary oilseeds;
- lack of interest of competing oilseed producers in obtaining a niche in the market for a certain type of oilseeds as a possible successful production and uncertainty of income generation due to additional costs or possible risks associated with production and sale;
- the production resources of the agricultural enterprise do not provide an opportunity to satisfy the needs of buyers of the entire market, but allow them to effectively serve consumers of a certain type of oilseeds that make up a market niche.

Market risks possible when choosing a focusing strategy are as follows:

- the market niche, which is filled by producers engaged in the production of oilseeds, which form its basis, becomes attractive, which leads to its overflow with competitors’ products;
- the desire to make money on a highly specialized product becomes great, the supply of oilseeds is rich, the differences in prices of enterprises operating in this market are so great that buyers refuse oilseeds, which have narrow, specific properties that were previously necessary for the consumer;
- competitors, due to the existing stronger competitive advantages in the production of this type of product, can penetrate the selected target market and gain a higher level of specialization in the production of this type of oilseeds.

The calculation of the elasticity of demand for the price of safflower oilseeds, carried out on the basis of the data of the Committee of Agriculture of the Volgograd Region [9], allows us to say that the demand for them is elastic and above unity (in 2015-2016, 5.4%).

The obtained coefficient of elasticity of demand means that the volume of demand in percent changes faster than the price changes in percent, i.e. when the price changes by 1%, the amount of demand changes by more than 1%.

The price elasticity of demand for safflower oilseeds is influenced by the following factors:

- availability of substitute products on the market (many oilseeds: sunflower, rapeseed, mustard, etc.);
- safflower oil seeds are not universal, they are specific, i.e. have a market demand when required by a specific customer;
- conservatism of buyers who traditionally choose sunflower oilseeds for the production of oils.

When growing safflower, seeds of various reproductions are used. Along with this, the farm can be engaged in the production of seeds of the highest reproductions for their sale to commodity producers.
The State Register of Breeding Achievements includes [14] 16 varieties of culture, of which 4 are bred by the Federal Research Center of Agroecology of the Russian Academy of Sciences, two of them - Alexandrite and Volgogradsky 15 - do not have thorns, which will allow the use of safflower crops for green animal feed. Safflower is grown in a number of farms in the region for commercial purposes and for obtaining seeds of higher reproductions: JSC "Rassvet" of the Surovikinsky district of the Volgograd region, the yield of the Alexandrite variety is 1.2 t / ha, the Volgogradsky 15 variety is 1.0 t / ha; IE KFH Guber D.A. in the Saratov region, safflower variety Alexandrite - 1.4 t / ha; IP Kazachkov A.A. in the Rostov region, the Alexandrite variety - 1.8 t / ha, in 2020 its production of commercial oilseeds made it possible to achieve a profitability of over 60% (table 1), selling them for the production of oil and obtaining by-products of meal, which can be used to supplement the rations farm animals.

**Table 1.** Economic efficiency of production of safflower oilseeds of the Aleksan-Drit variety for various purposes, JSC "Rassvet", Surovikinsky district, Volgograd region, 2020.

| Indicators                  | Commodity oilseeds | Meal safflower | Green mass of safflower | Oilseeds Categories and superelite |
|-----------------------------|--------------------|----------------|-------------------------|-----------------------------------|
| Productivity, t / ha        | 1.20               | 0.36           | 11.3 / 22.6             | 1.4                               |
| Selling price, RUB / t.     | 12000.0            | 5000.0         | 1751.4                  | 33000.0                           |
| Sales proceeds, rubles / ha | 15600.0            | 1800.0         | 39581.64                | 46200.0                           |
| Costs, rub / ha             | 11875.0            | 4275.0         | 18200.0                 | 14250.0                           |
| Conditional clean income, rubles / ha | 3725.0 | 725 | 21381.64 | 31950.0 |
| Profitability, %            | 31.3               | 16.9           | 117.0                   | 69.2                              |

**Note:** calculated by the authors based on analytical data of the Federal Research Center of Agroecology of the Russian Academy of Sciences, 2020.

From the above calculation results, it can be concluded that the production of safflower oilseeds is economically profitable, and the manufacturer can profit from the sale of commercial oilseeds with a profitability of 31.3%, obtaining green mass for livestock feed will be cost-effective 117%, safflower meal – 16.9%, and producing oilseeds of the highest reproductions for sowing for various purposes - more than 69.2%. Agricultural organizations, using in the production of new varieties of safflower without ships, which are in demand in the food markets, will receive innovation rent for some time and remain competitive. Received income or innovation rent - additional income from the use of innovations, which can be a new technology, a new variety or hybrid of a plant, the result of an increase in production efficiency, representing the difference between average industry costs and costs in an economy that adopts technological and organizational and economic innovations ... All this time, the producer in the oilseeds market remains competitive, overcomes competitive forces, attracting a larger number of buyers. Its competitive advantage in this is ensured by unique tangible and intangible assets, they are important and relevant in the strategic future to achieve the goals of an agricultural organization. A continuous innovation process is necessary to ensure the competitiveness of an agricultural organization and its products.

**4. Conclusion**

Thus, having considered the market conditions for the cultivation of dyeing safflower, we can conclude:

- Firstly, the calculation of the elasticity of demand for the price of safflower oilseeds allows us to say that the demand for them is elastic and higher than 5.4%, i.e. the volume of demand in percentage changes faster than the price changes in percentage, i.e. when the price changes by 1%, the amount of demand changes by more than 1%.
- The main factors that increase the elasticity of demand will be the availability of substitute products (the choice and the opportunity to purchase many oilseeds of other oilseeds: sunflower,
raw materials of tropical origin for the production of vegetable oils, etc.) and the specificity of oilseeds.

- Secondly, using a competitive strategy of focusing in the production of safflower oilseeds as a unique product, the manufacturer expands the range of products for sale, producing different types of products: oilseeds of various reproductions, meal, green fodder for farm animals in summer. The manufacturer may have more profit from the sale of commercial oilseeds, the profitability will be 31.3%, and by producing oilseeds of the highest reproductions, the profitability increases to 69.2%, the receipt of meal will become profitable - 16.9%, green mass of safflower - 117%.

So, the production of safflower oilseeds in arid regions is economically profitable, and the producers engaged in the cultivation of marketable oilseeds will receive a yield of oilseeds with a profitability of more than 31.3%, and in the production of oilseeds of higher reproductions up to 69.2% profitability. For introduction into the diets of farm animals: production of meal safflower up to 16.9%, green mass with profitability – 117%.

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