Cluster approach for the development of the agro-industrial complex in the region

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Abstract. In the current economic conditions the regional development strategies are based on the achievements of science and innovation technologies. In this case the cluster approach is seen as an innovative technology of the regional economy management. The cluster is often used in modern economic systems as a term of the complex of industrial organizations, equipment suppliers, components and production services, scientific and educational organizations of territorial proximity and cooperation relations in goods or services production. The development of clusters in a market economy is needed to new production systems as the context of globalization and regionalization of economic activity. Using the Smolensk region as an example of great opportunities, we are considering the clustering generally, influence on the development of traditional industries in the region. The Smolensk region has a strategy of the flax cluster for 2018-2020. The positive dynamics of the flax development as cultivated areas can increase gross collection of the flax fibre in farms of all categories during the implementation of this strategy. It should be noted the region has problems in the flax industry; that why solving these issues it is possible to achieve sustainable competitive advantages applying measures for the flax cluster development of the Smolensk region.

1. Introduction

The Smolensk region showed the best result in the National rating of the investment climate as constituent entity of the Russian Federation in 2017 and moved from the third group of regions to the second group in 2018; included in TOP-20 of the National rating of the investment climate in 2019 [1, 2]. The Centre of clusters development of the Smolensk region was created in 2016 due to the state support of small and medium-sized businesses; flax clusters work for the regional economy sectors as: IT technologies, flax growing, domestic and inbound tourism, composite materials and plastic. The Smolensk region has four clusters as IT, composite, flax, tourism. The flax cluster of the Smolensk region is the most favourable for a successful development in flax fibre industry to cultivation next future; as known historically the socio-economic situation of the region was depended on this sphere.

2. Research results

Smolensk oblast was one of the first region of the Russian Federation started restoring the flax industry. In the region are provided funding by regional budgets and private investment with using strategies and number of targeted programmes: the Federal target program of the flax complex development in Russia for 1996-2000 years, the Regional target program FLAX for 2001-2002 and 2003-2010 years, the Long-term regional target program of the flax complex development in Smolensk oblast for 2012-2014 years, the Departmental regional target program of the flax complex development in Smolensk oblast for 2014-2017 years [3].

The flax cluster development strategy of Smolensk oblast for 2018-2020 years was one of the latest to implement in this region. The purpose of the creation and development of the flax cluster was needs to form the closed flax cycle manufacturing with a release of finished products according to principle "from farms to customers"; the overall target to establish interaction between participants of cluster such as authorities, scientific and educational organizations of the Smolensk region [4].

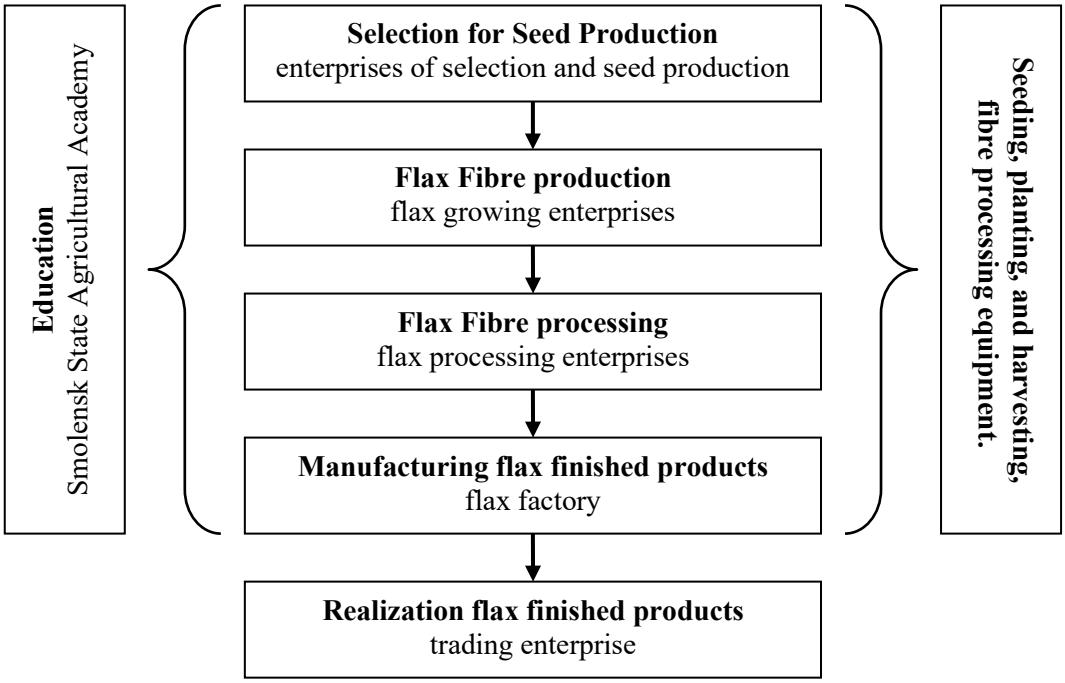

Figure 1. The composition of the Smolensk region flax cluster.

The selection for the Smolensk flax seed production is successful implemented. The varieties and compositions of flax seeds were improved due to the annual allocation of subsidies for the reproduction of original and elite seeds; 5-7 varieties of flax seeds were sown out in 2006, more than 10 varieties of domestic and foreign selection is sown out in 2020. The significant proportion (36%) is a domestic flax seeds selection, 28% -Dutch "Agatha", 24% - Belorussian, 12% - the Tver region flax seeds selection. Currently JSC Yartsevsky Linozavod and Izvekovo Ltd produce annually more than 100 tons of elite flax seeds in the Smolensk region. The flax seeds yield is 4-5 centners per 1 hectare [3].

Flax sowing and processing enterprises are main participants the Smolensk region flax cluster. The region flax industry is represented by sixteen flax sowing enterprises; three flax-sowing enterprises with activities in the seed selection; six flax-growing enterprises with activities in the commercial production. The flax processing complex is represented by three flax factories with primary processing; four flax factories CHARLE with the same type fiber production and one flaxmill producing monofilament. The important constituent element of the flax cluster is an infrastructure which includes educational, research

organizations and financial institutions. The Smolensk State Agricultural Academy provides professional education, training and retraining as a leading organisation in this sphere.

The Smolensk region widely used flax modern innovations and technologies to cultivation of Federal Scientific Center of Bast Cultures located in the Tver region. The process for improving flax seeds harvesting technologies and commercial purposes will be continuing in the Smolensk region [5]. As result the wastage of flax seeds decreased due to improving technologies and increased the flax seeds quality. The flax seeds yield was 7 centners per 1 hectare and more in this region. The Smolensk flax sowing enterprises were collected 700 tons of flax seeds in 2018-2019 by each; it's 2-3 times more than volumes in 2010-2011 years. Enterprises are reimbursed 25% direct costs during the construction industry of flax processing factories from 2018 till now, also soft loan was provided as support based on 10 000 roubles each hectare of flax cultivated areas; due to financial support as subsidies to the elite seed production from 2017; financial subsidies for agricultural machineries and equipment from 2019 [6].

Some investment projects of flax growing are being implemented in the region: the first modern flax processing complex – Agricultural holding PROMAGRO (Russian linen) is the under-construction project and an unique production complex of flax harvesting equipment Dehondt Technologies Developpement (France) based on one of Smolensk manufactures, also the development of a flax cultivation with a primary processing such as LLC Partnership Linnaya Manufaktura.

Russian linen is a large-scale investment project aimed at reviving the Russian flax industry, within the framework of which the first new flax mill in Russia in the last 30 years will be launched in the Safonovo Industrial Park in the Smolensk region in 2020. As a result social impact: creation 225 new jobs. The new manufacture will be focused on very high-quality competitive domestic products with the export in future. Long flax fiber is produced using the turbine scutchers which clean flax straws from the hards.

Long flax fiber is the most valuable product of primary processing of flax straws, this type of fiber is used for a wet method of spinning; as a result the pure flax or flax-type yarn of the finest quality. Linen fabrics for household and suits can be produced from this type of primary products (yarn), long flax fiber is a high-demand market product. The current positive dynamics of the flax complex region development is an active Administration work with investors. Flax producers of the Smolensk region were successful to end the recession and stabilize the restoration of sown areas. The main indicators of flax industry table 1 [7, 8].

Table 1. The main indicators of flax industry.

	2005	2010	2011	2013	2015	2016	2017	2018
Sowing areas of flax-fiber, thou. hectares								
Russian Federation	95.7	51.2	55.5	55.2	52.6	48.5	47.5	44.8
Central Federal District	43.3	14.4	17.5	17.7	16.9	16.9	14.2	14.9
Smolensk Region	9.7	1.6	2.0	4.0	3.9	5.0	5.1	4.1
Gross harvest of flax-fiber, thou. tonnes								
Russian Federation	55.9	35.2	43.4	39.0	45.2	41.2	38.8	36.7
Central Federal District	23.0	9.2	12.8	12.1	14.8	14.4	12.6	13.2
Smolensk Region	4.6	0.8	1.1	2.7	3.8	5.1	4.5	3.3
Yield of flax-fiber (fiber), centners per one hectare harvested								
Russian Federation	6.3	8.2	9.0	8.5	9.1	9.4	9.2	8.7
Central Federal District	5.6	7.5	7.7	7.6	8.9	8.8	9.3	9.7
Smolensk Region	5.2	6.1	6.6	7.0	9.7	10.3	8.9	10.2

The industry transferred to an industrial basis without improving mechanized flax harvesting led technology which decreased the flax fiber quality and common yields by almost half; 70-80% flax fiber had the position number 10 during 2012-2014 years; it's quite difficult with these indicators to go on competing in the global marketplace. The decline reasons of flax products quality were outdated flax

harvesting machines that lead to lengthening time frames [9]. The technological modernization of the flax industry is already showed positive results; if the flax fiber average yield was 6.1 centners per hectare, flaxseeds - 1.5 centners per hectare in 2010, now it reached to 9.2 and 2.6 centners per hectare due to the introduction of narrow range specializations in the flax industry.

The Smolensk region has increased crop areas by 3 times to 4.8 thousand hectares last decade (compared 2019 to 2010) concerning to all-Russian flax fiber sowing areas by 4.5 times to 3 6 thousand tons, flax fiber yield - 1.5 times to 9.2 centners per hectare. Also it is necessary to pay attention to one of the most important fact the Smolensk Region was the third place among the regions of the Central Federal Districts such as the Bryansk and Tver regions in 2019, the sixth place among regions with flax fiber growing [8]. The comparison chart of the Smolensk region figure 2.

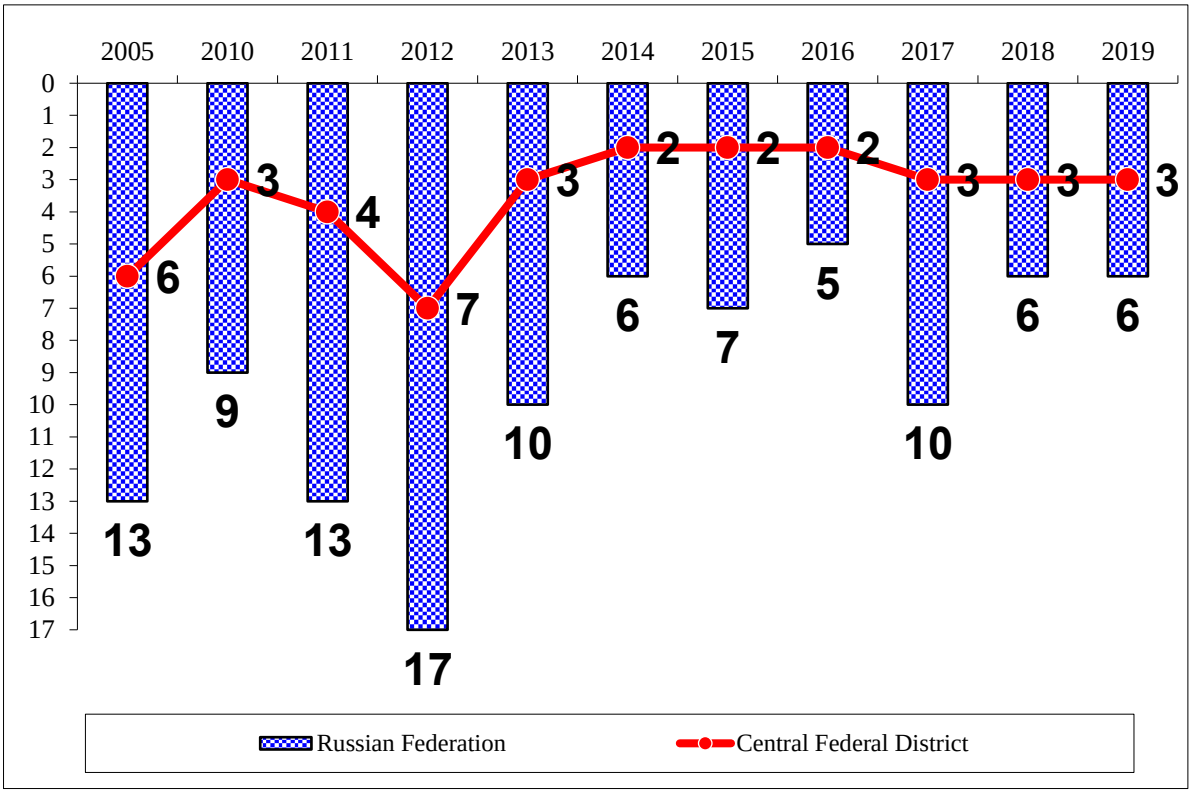

Figure 2. The comparison chart of the Smolensk Region among the Central Federal Districts.

The Analysis of flax industry in the Smolensk region has a positive trend, but the region has some problems to improve:

- the decrease of crop quality and quantity due to an insufficient number of flax-sowing specialized equipment;
- the shortage of skilled labour for the development of this industry;
- the insufficient of financial resources, the lack of a large-scale development and targeted federal flax growing supports.

Obviously the Smolensk region has a real significant potential for the flax industry development thru identified problems; this region needs a comprehensive support by clustering [10]. The implementation process of the flax growing cluster development will lead to socio-economic effects: an expansion of flax fiber acreages; a production increase of yield and a number of work places; gross profit in the flax industry of the Smolensk region due to a new investment climate in this region.

3. Conclusion

One of the priority directions of the agro-industrial complex development in the Smolensk region is the flax cultivation and processing; considering the region has favorable climatic conditions and the flax cluster project. In practice the further flax-growing development is possible due to the cooperation of flax-growing farms, flax processing enterprises, scientific and educational organisations and finished product trades. The cluster flax development will increase flax fiber sown areas and yield; also the flax quality as a result an increase of production due to competitiveness of flax fabrics and yarns, nonwovens and various composite materials. The cluster implementation will contribute to the economy development of the Smolensk region such a strategic direction as the flax cultivation and processing; and improve competitiveness in the flax industry of the Smolensk region.

References

[1] Chulkova G V, Semchenkova S V and Zarankina O M 2019 Agricultural investment opportunities within the region: risks and development strategies *International Agricultural Journal* **1(62)** 6
[2] Uskov A A *et al.* 2020 *Territory Development : Past, Present, Future* (Yelm) p 268
[3] Prudnikov A D *et al.* 2018 *Potential of the Flax Field* (Moscow: Scientific consultant) p 120
[4] Flax Cluster of the Smolensk Region https://ckr67.ru/klastery/lnyanoj-klaster/
[5] Kuchumov A V, Terentyev S E, Nikiforov A G, Skobeev I N, Rostovtsev R A, Romanov V A and Novikov E V 2019 *Linen Trust Drying Machine* Utility model patent RU No 2019109791 appl. 02.04.2019, publ. 11.11.2019
[6] Department of Agriculture and Food Supply of the Smolensk Region https://selhoz.admin-smolensk.ru
[7] Semchenkova S V, Romanova I N and Rybchenko T I 2016 Key issues and trends in development of the flax subcomplex in the Smolensk region *Fundamental research* **12-3** 698-703
[8] Rosstat Federal State Statistics Service https://rosstat.gov.ru
[9] Terentyev S E, Gnezdova J V and Semchenkova S V 2020 Features of machine-technological stations organization in the system of agro-industrial production *IOP Conf. Ser.: Earth and Environmental Science* **459** 062060
[10] Romanova Ju A *et al*. 2020 Formation of a digital agricultural development system *IOP Conf. Ser.: Earth Environ. Sci.* **548** 032014