Russia: on the way to “Agriculture 4.0”

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In 2005-2017 years agriculture has become one of the most dynamic sectors of the Russian economy with average annual growth (3,6%), which outstrips mid-global tempo

That *was based on the model "Agriculture 2.0" focused on maximizing production by massive mechanization and chemicalization. It brought significant results particularly in 2011-2017 due to realization of the Russian Federation Food Security Doctrine (2010)*.

Dynamics of crops yield* and productivity of livestock in Russia, 2016-17 to 2011-15, average per year:**

- **cereals – 125,3% up to 2,8 t**
- **sugar beet – 116,3% up to 45,6 t**
- **sunflower seeds – 110,4% up to 1,5 t**
- **vegetables- 107,8% up to 23,2 t**
- **milk yield per cow – 121,9% up to 5,7 t**
- **hogs and pigs output per head – 107,4% up to 0,2 t**

* per hectare ; ** in agricultural organizations, per one head

Dynamics of agricultural production in Russia, 2016 -17 to 2011-15, average per year:

- **cereals – 135,5% up to 127,4 mln. t**
- **sugar beet – 127,3% up to 49,8 mln. t**
- **sunflower seeds– 120,4% up to 10,3 mln. t**
- **fruits – 121,8 % up to 3,9 mln.t**
- **vegetables – 113,2% up to 16,3 mln. t**
- **cattle and poultry for slaughter- 118, 8% up to 10,4 mln. t**
- **milk – 94,3% up to 30,4 mln.t**

Russia's population increased only by 2,1% up to 146,8 mln. pers.

The share of domestic production in the resources of the Russian internal market in 2017, %*

- **grain - 99,7 (95)**
- **vegetable oil- 88,4 (80)**
- **sugar (from sugar beet) – 94,6 (80)**
- **potatoes – 97,0 (95)**
- **milk and milk products- 82,4 (90)**
- **meat and meat products -90,4 (85)**

* in brackets-threshold indicators of the Russian Federation Food Security Doctrine

Position of Russia in Global Food Security Index in 2017 (113 countries, maximum score-100)

	Category rank	Category Score
1.Total	41	66,2
2.Affordability	36	70,7
3.Availability	52	58,7
4.Quality and Safety	26	75,7

1.better than in BRICS (except Brazil), CIS and EAEU and worse than in the USA and the EU (except Bulgaria)

2.better than in BRICS, CIS and EAEU and worse than in the USA and the EU (except Bulgaria, Romania)

3.better than in CIS and EAEU (except Belarus) and worse than in the USA and the EU (except Bulgaria)

4.better than in BRICS, CIS and EAEU and worse than in the USA and the EU (except Bulgaria, Czechia, Hungary, Poland, Romania, Slovakia)

Source: https://foodsecurityindex.eiu.com/Country

Application of the model "Agriculture 2.0" in Russia was based on the traditional industrial technologies largely imported*:*

- 90% of sugar beet, 80% of corn and 40% of sunflower are sown with seeds of foreign selection
- 80% of the initial lines in poultry are imported
- imported machinery accounted for 22-69% of the tractor and combine fleet

By 2020 their innovation and productive potential would be exhausted. In addition, these technologies do not reduce losses of up to 40% across the agri-food chain.

By 2025 the growth model would change to “Agriculture 3.0” based on “precision agriculture", applying IT technology

It integrates sensor technologies with mapping of natural - microclimate, soil and other heterogeneities, allowing to optimize carrying out of the main agricultural works in accordance to specific sites of fields and individual features of animals and significantly increase economic and ecological efficiency.

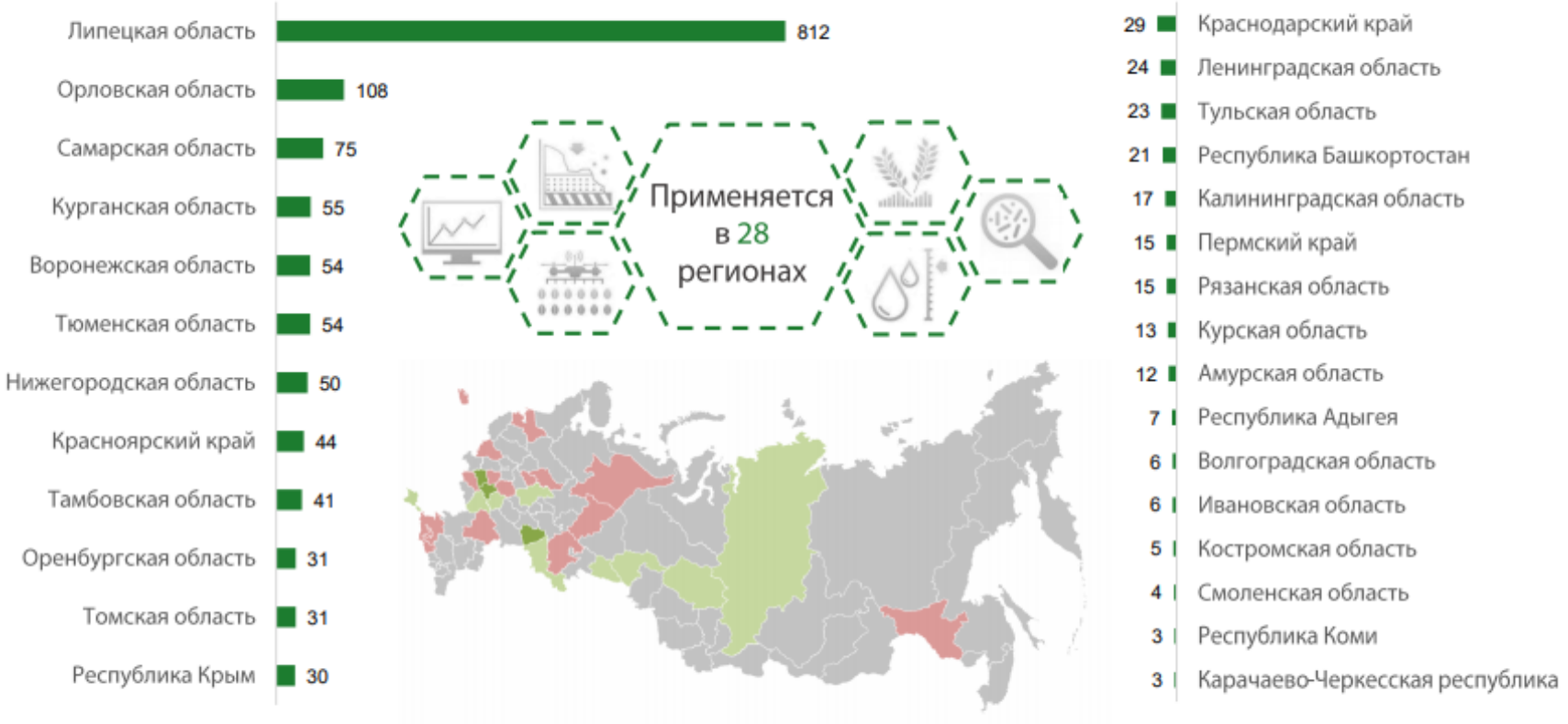
This transformation requires the advanced development of the national scientific and technological base, as import opportunities are limited and expensive.

So far, Russia has not made enough progress in this area :

- elements of precision agriculture are used only by 1600 farms in 33 % of the subjects of the Russian Federation and cover 10 % of the arable land
- elements of dairy farms robotization are used by about 150 enterprises in 39 % of subjects of the Russian Federation
- investments in IT technology account for only 0.5% of investments in fixed capital of agriculture and the share of IT professionals in agriculture is about 2.5%

Precision agriculture. Who has already started to use new technologies in Russia?

РЕЙТИНГ РЕГИОНОВ, ИСПОЛЬЗУЮЩИЕ ЭЛЕМЕНТЫ ТОЧНОГО ЗЕМЛЕДЕЛИЯ (ПО КОЛИЧЕСТВУ ХОЗЯЙСТВ)



Данные Центра прогнозирования и мониторинга научно-технического развития АПК в области точного сельского хозяйства, автоматизации и роботизации

By 2025, precision agriculture should spread to 60% of arable land.

Federal scientific and technical program for the development of agriculture of the RF for 2017-2025 is designed to provide scientific and technological support for the development of agriculture and reducing risks in the food sector:

- funding for the Program is about $ 900 mln.
- main goals - to remove technological dependence and dependence in crop production, animal husbandry, veterinary medicine, forage production, storage and processing of agricultural products; to ensure the availability of high-quality and competitive agricultural products of domestic production in the Russian market; to make the agricultural education system a driver of development of the agri-food complex.
- the realisation of the Program is planned through the implementation of complex scientific and technical projects, which initially have their customer and necessarily include the following stages:" Creation of scientific and (or) scientific and technical results and products "("creation of knowledge");" Transfer of scientific and (or) scientific and technical and products "("transfer of technologies");" Commercialization of scientific and (or) scientific and technical and products "("commercialization of knowledge").

By 2035 ”Agriculture 3.0” should be partly transformed into“ Agriculture 4.0”- as a base of the new national agri-food system

- It should solve the problems of food production and consumption in complex, saving resources and pressure on the environment and diminishing ‘input’ into global climate change. *Its key element – digitalization that ensures the integrated internal and external networking of farming operations.* The Russian market of IT technologies in agriculture is already estimated at $ 6 bln, and by 2026 can increase at least 5 times.
- According to estimates, the comprehensive digitalization of the agri-food complex of Russia will potentially increase labor productivity in agriculture 3-5 times, reduce fuel consumption by 30-40% and significantly-agrochemicals, increase gross profit of "digitalized" farms by 25-50%, without compromising the quality of the products in 2-3 times to reduce the trade margin on food products in wholesale and retail trade, a 3-fold increase in the consumption of food products in Russia in physical terms with the current incomes of households.

In 2018 it is planned to adopt the updated the Russian Food Security Doctrine

It foresees transformation of “precision” to “smart” agriculture with full-scale use of digitalization, robotization, IoT, genomics, alternative energy sources, organic farming and modern financing systems. When specifying the measures for updating the Doctrine, the "Road map" of food market development (FoodNet), produced in 2017 by the Agency for strategic initiatives - an Autonomous non-profit organization created by the Russian Government, will probably be used. According to this map by 2035:

- Russian companies should take more than 5% of the world market in 5 priority segments: "smart" agriculture (used in the production of automation, artificial intelligence, big data), accelerated selection, available organic matter, as well as "new sources of raw materials" (processing, for example, biomass of algae and insects, the introduction of pseudo cereal crops, etc.) and personalized nutrition. The total world market for these segments could exceed $ 2 trln by 2035
- Implementing these plans Russia by 2035 would be able to optimize domestic food consumption and increase country share in the global agricultural exports up to 5-10%.
- At the first stage of the FoodNet projects, the Federal budget will be assisted through grants and return financing forms. However, it is assumed that projects should be developed mainly through private investment.

Thank you for your attention!