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# RUSSIA: POLICIES FOR AGRI-FOOD SECTOR COMPETITIVENESS AND INVESTMENT



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# Russia:

## Policies for Agri-Food Sector Competitiveness and Investment

Despite advances in agricultural production, TFP, and trade balances, Russia continues to lag behind many comparator countries in measures of crop and livestock productivity. This report aims to provide a vehicle for dialogue with government on agrifood sector collaboration to address this situation. It identifies policy recommendations to address selected challenges and to support the government's aim of attracting investments in the agri-food sector, approached from the point of view that increased productivity will improve the competitiveness of agri-food value chains, result in higher profitability, and encourage more investment, including FDI, in Russian agriculture. In practical terms, this report identifies three areas in which the public sector may be able to use policy and programmatic interventions to spur productivity, competitiveness, investment, and exports: investing in broadening productivity gains in priority sectors, strengthening value chains and value-addition in the food industry, and promoting human capital in rural areas through capacity building in agricultural sciences and farm management to improve labor productivity. Some progress has been made, but more is needed.

# Russia: Policies for Agri-Food Sector Competitiveness and Investment

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base Analyses; and Appendix 3: Benchmarking Production Systems and Costs for Pork, Dairy and Crop Production in Russia.

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## Introduction and Summary

Recent studies indicate that total factor productivity (TFP) in Russian agriculture has risen considerably since the early 1990s. In fact, agricultural TFP rose rapidly from a very low base during the 1990s and 2000s (roughly 5 percent per year during that period) and has continued to rise, albeit at a slower pace (under 2 percent per year), since (Rada, Liefert, and Liefert 2017). The steep decrease in TFP growth rates in agriculture is consistent with the situation in the overall economy and poses challenges for long-term growth (World Bank 2017b). However, productivity increases helped rebound agricultural production, which in recent years has reached and even surpassed pre-transition levels. At the same time, Russia shifted from being dependent on imports for key commodities to being an important agricultural exporter. As Rada, Liefert, and Liefert demonstrate, the recovery in production levels (and the recent turnaround in agricultural trade) was accomplished with significantly lower levels of input use in Russian agriculture than had been employed before the transition (including, significantly, reduced acreage of land in production). In fact, in the aggregate, input use initially fell even more steeply than production. Since the initial decline in the early 1990s, input use has leveled off and in some areas begun to climb slowly.

Despite advances in agricultural production, TFP, and trade balances, many crop and livestock productivity measures in Russia continue to lag behind those recorded in comparator countries. Crop yields remain below those found in Europe and North America. The same holds true for productivity in livestock enterprises, though with substantial variation between farm types. Additionally, the downstream agribusiness sector remains substantially underde-

veloped relative to the agribusiness industries found in countries at comparable levels of development. Agriculture's share of Russia's overall gross domestic product (GDP) falls between 4 and 5 percent—comparable to the shares found in most Organisation for Economic Co-operation and Development (OECD) countries. However, Russia's downstream agribusiness sector accounts for only 2 to 3 percent of GDP—potentially well below the comparable percent share that would be found in other OECD nations.

In light of the situation described above, this report examines selected issues and challenges for agri-food sector competitiveness and foreign direct investment (FDI) in Russian agriculture. Its purpose is to serve as a vehicle for dialogue with government on agri-food sector collaboration. To this end, the report identifies policy recommendations to address selected challenges in the competitiveness of agri-food value chains and to support the government's aim of attracting investments in the agri-food sector. The analyses and background studies that underpin the recommendations are approached from the point of view that increased productivity will improve the competitiveness of agri-food value chains, result in higher profitability, and encourage more investment, including FDI, in Russian agriculture.

The analyses utilize two methods to identify policy issues relevant for competitiveness and investment in Russian agriculture. The first method addresses the extent to which farms in Russia could reach competitiveness—defined by attaining high productivity and profitability levels, comparable with similar farms abroad. This is approached through careful comparative analysis (benchmarking) of typical and successful large modern farming operations in pork production, milk production, and corn/soybean en-

terprises. The second method examines the productivity and scope for expanding post-farm food processing and manufacturing. This is approached by analyzing food manufacturing industry data and estimating factors influencing TFP at the sectoral level.

The focus on untangling factors that affect the productivity and profitability of agriculture and food sectors is especially relevant in view of the World Bank's recently published Systematic Country Diagnostic (SCD), which pays special attention to the issue of productivity in the Russian economy (World Bank 2016). The SCD concludes that declining productivity growth due to structural constraints is one of the major impediments to the development of the Russian economy. This report intends to add to the knowledge of factors that affect productivity in the agri-food sector of Russia.

In agreement with the Ministry of Agriculture, the report is focused on identifying areas in which policy actions might lead to sustainable investments—especially FDI in the agricultural and food manufacturing sectors—and catalyze growth in competitiveness and exports. Therefore the report does not cover all of the many aspects of agriculture and food sector development in Russia. More background details on the sector are widely available in the current literature, which includes the analyses of regulatory frameworks that are part of the World Bank's Enabling the Business of Agriculture (EBA) series. See Box 1 for a summary of Russia's comparative performance in the EBA assessment.

The report identifies three areas in which the public sector may be able to use policy and programmatic interventions to spur productivity, competitiveness, investment, and exports. These areas are the following:

- ✓ **Investing in broadening productivity gains in priority sectors.** A number of agricultural sub-sectors are catching up with international competitors in terms of productivity and are close to achieving competitiveness. The evidence from this report shows that this is certainly the case for large agribusiness in the pork and dairy sectors. These sectors have acquired new modern technologies, replacing old and obsolete technologies as more financial resources became available both from public and private investments. The pork sector overall has strongly benefited from investments and technology modernization. The dairy sector is trailing because large agribusiness is unable to expand its level of production to fulfil domestic demand, is highly price-dependent for profits, and the small and medium dairy sector has not benefited much from investments or technology modernization opportunities. Going forward, more broad-based productivity gains would be achieved and growth would be maintained by introducing policies that support the spread of innovation and technology throughout the entire agriculture sector.
- ✓ **Strengthening value chains and value-addition in the food industry.** For an economy as advanced as the Russian economy, the food manufacturing industry is unusually small compared to the agriculture sector and to the rest of the economy. But it is productive. Productivity growth in food manufacturing has slowed, but is still higher than productivity in total manufacturing, thereby showing prospects for sector expansion. However, it is unclear why the sector is not expanding, and more importantly why it is not supporting growth in the agriculture sector to a greater extent. To help understand

### Box 1. Enabling the Business of Agriculture: Russia's Comparative Performance

Russia is included among the 62 countries in the Enabling the World Bank's Business of Agriculture data collection. When compared with the average of these countries, Russia scores higher in all indicators except for transport. However, perhaps of greater relevance, Russia can be compared with other countries in its region or its income level. Across the full range of topics, Russia scores higher than other countries in Europe Central Asia region. When compared with other high-income countries, it scores well below their average. Such comparisons highlight areas places where its regulatory framework can be streamlined to achieve better policy outcomes, including for productivity and profitability.

Tables B.1 and B.2 summarize Russia's performance within each of these groupings.

**Table B1. Russia Compared with Europe and Central Asia**

Topic	Seed	Fertilizer	Machinery	Transport	Markets
Operations	Above average	Above average	Above average	Below average	Above average
Quality control	Below average	Above average	Above average	—	Below average
Trade	—	Below average	Below average	Below average	—

**Table B2. Russia Compared with High-Income Countries**

Topic	Seed	Fertilizer	Machinery	Transport	Markets
Operations	Below average	Above average	Below average	Below average	Below average
Quality control	Below average	Below average	Above average	—	Below average
Trade	—	Below average	Below average	Below average	—

Source: World Bank 2017a.

Note: — = not available.

this, the analyses in this report show that the backward linkages of food manufacturing to the agriculture sector are not strong. Adequate infrastructure and effective modern public policies that support food manufacturing–agriculture linkages and stronger value chains would strengthen the performance of agriculture and the rural economy in general.

- ✓ **Promoting human capital in rural areas through capacity building in agricultural sciences and farm management to improve labor productivity.** An important constraint for

long-term productivity gains in the agri-food sector is the availability of skilled labor. The labor market does not seem to be able to respond to the potentially high demand for highly skilled farm labor. Low wages indicate that there might be deficiencies in the labor market, because labor demand for skilled workers is filled by unskilled workers, including foreign migrants. Generating rural employment and filling the supply gap for skilled workers in the agriculture and food manufacturing industry would require direct and indirect employment generation, particularly at the regional level,

with improved access to and improved quality of education and other services.

The next section considers the challenges of new growth in the agriculture and food sector. This is followed by a look at whether the new type of producer can be a successful engine of growth. The

next section presents issues of productivity and competitiveness at the farm level, investigating in greater detail farms that produce dairy, pork, corn, and soybeans. The next section looks at food processing as a potential driver of agricultural growth. The report concludes with a consideration of the role and potential of policy.

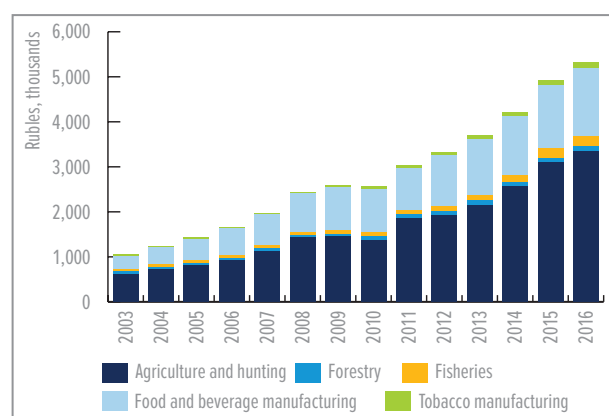
## Agriculture and Food: Challenges of the New Growth Sector

Russia is a major producer of agricultural commodities and plays an important role in global food markets.<sup>1</sup> It has the largest expanse of agricultural land in the world. Russia is ranked fifth in the world by agriculture value added and seventh by total foreign direct investment (FDI) inflows in the agriculture sector. The country is the world's largest producer of barley; the fourth largest producer of wheat, and most recently its largest exporter; the second largest producer of sunflower seeds; the third largest producer of potatoes; the third largest producer of milk; and the fifth largest producer of eggs and chicken meat. Domestically, the share of the agriculture value added is 4.3 percent of GDP. Agriculture and food manufacturing value added together comprise 6.3 percent of GDP. The agri-food processing sector contributes 13.5 percent of the value-added of

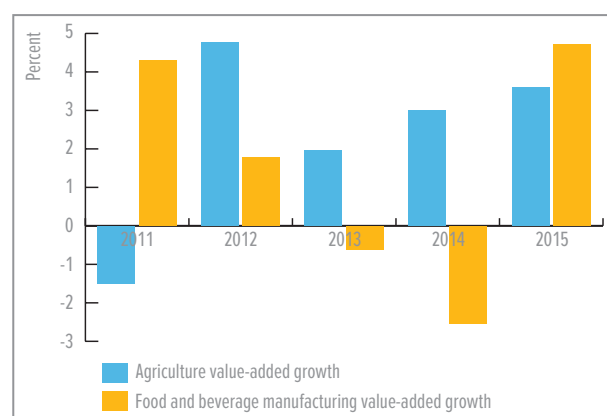
the country's total manufacturing, and less than 2.0 percent of its GDP.<sup>2</sup>

The agriculture sector has shown resilience to the recent economic crisis with a gross value-added (GVA) growth rate of 3 percent in 2015 and 3.6 percent in 2016 against the general decline of the economy of 2.8 percent and 0.2 percent, respectively (Figure 1). The food and beverage manufacturing sector recorded an impressive 4.7 percent growth, albeit after consecutive two years of decline (Figure 2). The overall food sector's growth was the result of its quick transformation, which took advantage of groundwork set forth by the government support programs and policies of recent years. These policies have boosted the production of important commodities—namely grains, poultry, and pork—and ensured that domestic producers and food manufacturers are protected from outside competition. In addition to government support policies, the cheap ruble and favorable weather have helped to trans-

**Figure 1. Growth in Food and Agriculture Sector Value-Added, 2003–16**



**Figure 2. Mixed Growth Rate in Value-Added, 2012–16**



Source: ROSSTAT database.

<sup>1</sup> The data presented are from the FAOSTAT database.

<sup>2</sup> ROSSTAT database.

form the agri-food sector into one of the major priority sectors in the country.

In 2015 and 2016 Russia produced a record harvest of grains, especially wheat, and became the largest exporter of wheat in the world. The response to the Western sanctions—so-called countersanctions, devaluation of the ruble, and restrictive trade mea-

sures—through sanitary and phytosanitary border controls helped the sector boost production and domestic market access (Box 2). Nevertheless, policy makers are struggling to identify improvements to public policies that would continue boosting sector performance. The key policy challenges faced by the Ministry of Agriculture are how to boost export performance and how to ensure that industry is com-

### **Box 2. How the Russian Agri-Food Sector Responded to Recent Economic Shocks**

A recent combination of economic shocks resulted in a deterioration of terms of trade for the Russian agri-food sector over the course of the past three years. The first shock was the depreciation of the ruble exchange rate, resulting from the drop in global oil prices. The Russian ruble lost 46 percent of its value between July and December 2014. The decline boosted the price competitiveness of commodity exports (Shagaida and Uzun 2016), which registered a record volume in the 2015–16 export seasons, pushing Russia to the top place in grain exports. At the same time, major agri-food producers and exporters complained that their costs of production suffered because their inputs and technology investments became more expensive. According to the Bank of Russia's survey in May 2016, more than 80 percent of agri-food producers interviewed would have preferred a stronger ruble in order to reduce the costs of imported technology and other inputs for their production (Bank of Russia 2016).

The second shock was the decline in consumer incomes, which led to reduced consumption. Food purchases constitute significant share of average household expenditures, and the average share of food expenditures in total expenditures rose to 38 percent for the whole population in 2014. Consumers switched to less expensive food products. The net effect from consumption decline has been difficult to measure, but recent research suggests that food retail trade declined considerably.<sup>a</sup>

The third shock was the decision by the government to embargo imports from those countries that imposed sanctions against Russia as a result of the political crisis around Ukraine. According to some experts, the effects of these measures were significant in that they reduced the availability of certain food items (fresh fruits and vegetables, cheeses and other dairy products, and so on). Russian suppliers shifted to alternative markets in the search for substitute channels for food products. The domestic sector response has been relatively quick, expanding production, but with a time lag required to substitute domestic supply in absence of investment growth (World Bank 2017b). This is probably the biggest shock, which created market imbalances and significantly reduced the availability of key food products. Domestic prices responded. As a result, food prices increased; they are still above international levels for several key food products. Such imbalance created a favorable environment for key domestic subsectors (dairy, pork and poultry, beef), which in turn benefited from more directed government support programs.

*Note:*

<sup>a</sup> Based on the data from the Analytical Center for the Government of Russian Federation. 2015 "Results of Food Embargo".

World Bank Group. 2017b. Russia Economic Report, No. 37, May 2017: From Recession to Recovery. World Bank, Washington, DC

petitive. These require more investment, specifically FDI that could bring the benefit of new technologies and market access (see Box 3).

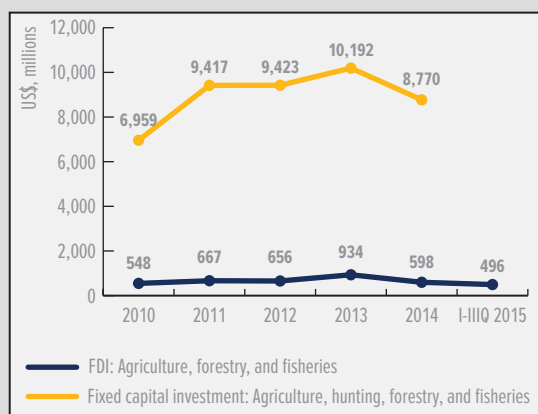
What leads policy makers to confront these important challenges? Although export trends have been positive recently, they have remained mainly concentrated in the grain sector. Exports of poultry meat products and some processed food products (mainly confectionary and condiments) are relatively limited. The remainder of the sector is mostly domestic. It is important to highlight the fact that net agri-food trade flows have always been negative. The trade patterns depicted from 1998 to 2015 in Figure 3 show trade

balance to have narrowed in 2014 and 2015. Exports have picked up overall since 2007. The annual rate of growth in agri-food exports is impressive, at 7.66 percent, compared to agri-food imports at 0.16 percent during these years. However the average share of agri-food exports in total exports has remained at 1.96 percent in 2007–15, whereas agri-food imports continue to hold a sizeable share in total imports (averaged 16.33 percent in the same period), indicating the country's high level of demand for food imports (Figure 4). This demand remains high even though there has been a consistent decline in the share of agri-food imports in total imports—from as high as 24 percent to almost 14 percent during this period.

### Box 3. Foreign Direct Investment in the Agri-Food Sector

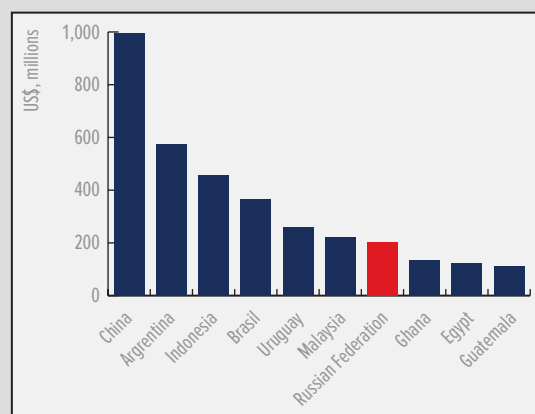
The Russian agri-food sector has attracted considerable investment in the recent decade (Figure B3.1). The food manufacturing sector, including beverages and tobacco, received around 4.0 percent of all FDI, and the agriculture sector received around 0.4 percent of FDI. Such FDI performance compared positively with other countries, and Russia has been consistently in the top 10 countries with the most FDI in its agriculture sector (Figure B3.2). However, experts suggest that a considerable part of agri-food sector FDI was due to round-tripping—that is, Russian investments undertaken by Russian investors from foreign jurisdictions. Given the large market size, the majority of FDI in the food manufacturing sector has been market-seeking, therefore limiting potentially larger scale trickle-down effects for technology transfer and productivity gains (Kuznetsov 2012).

**Figure B3.1 FDI and Fixed Capital Investment**



Source: Bank of Russia and ROSSTAT database.

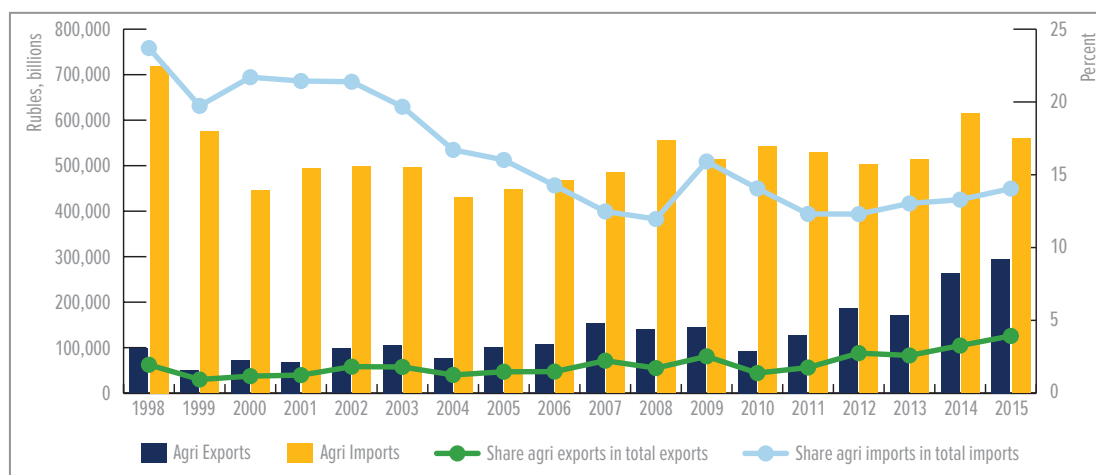
**Figure B3.2 Top 10 Countries with FDI Inflows in Agriculture, 2000–13**



Source: FAOSTAT database.



**Figure 3. Agri-Food Trade Balance Average, 1998–2015**  
*Percent share in total value of agriculture exports*



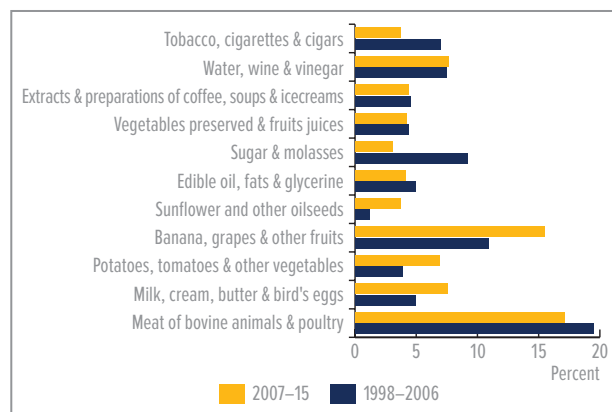
Source: Authors' estimates, based on COMTRADE data

The composition of agri-food trade has not shown any significant change over time. A bifurcation of the value of exports and imports before and after 2007 shows that the commodities having a relatively higher share in total agri-food exports include cereals (43 percent) and edible oils (12 percent) (Figure 5). The share of some of these commodities in total agri-food exports is found to have dropped slightly during 2007–15. The agri-food import basket consti-

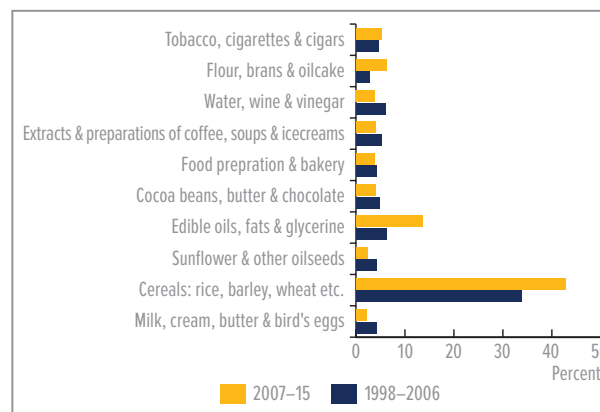
tutes beef, fruits, and vegetables, whose combined share in total agri-food imports has varied from 5 to 20 percent. Strong government support of the pork and poultry sector since the early 2000s has helped nearly eliminate their imports.

The domestic consumer demand for cereals may not have strong prospects for growth, although there is still untapped potential for feed grains. With

**Figure 4. Agri-Food Imports: High-Value Food Products**



**Figure 5. Agri-Food Exports: Commodities**



increasing per capita incomes, consumer demand is likely to shift to high-value produce such as fruits and vegetables, dairy, beef, and processed food, for which the country is highly dependent on imports. Consumer demand is high in fruits and vegetables, but Russia's fruit and vegetable production, though picking up, is far from becoming a competitive sector. On the other hand, poultry and pork production have achieved self-sufficiency levels, but are yet to demonstrate competitiveness internationally be-

cause quality and animal health issues pose major challenges.

To boost export performance, and to ensure that the industry is competitive both domestically and internationally, the Russian agri-food sector must continue to improve productivity; expand food processing and manufacturing with much stronger linkages to agricultural production; and substantially increase value addition in agricultural production.

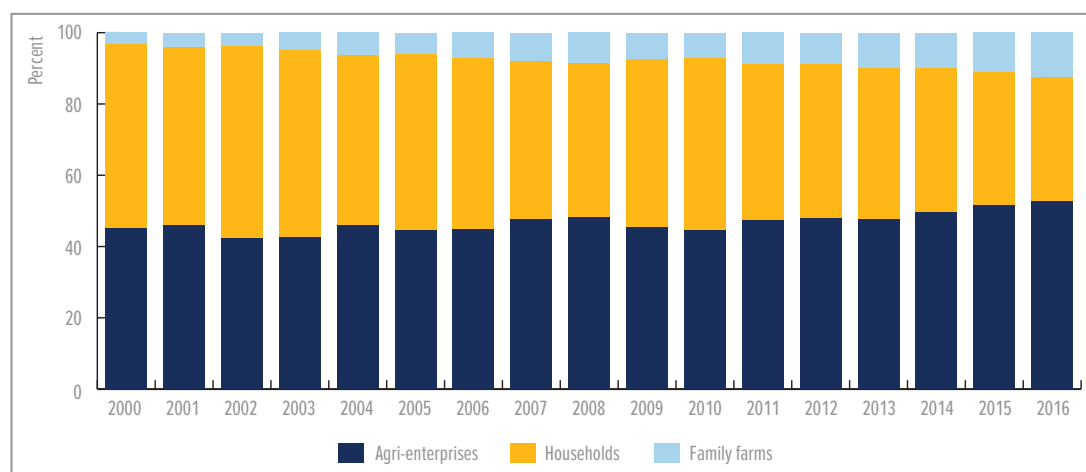
## Can the New Producer Type Be the Growth Engine?

Russia's agrarian structure may help explain some of the successes of recent agricultural sector performance and the challenges it faces. The agrarian structure in Russia is based on three types of farms: (1) agri-enterprises—large industrial farms with large land and livestock holdings; (2) emerging family farms—individual farms operated by family farmers and limited hired labor; and (3) household plots—small land plots adjacent to rural homes. Around half of agricultural output is produced by agri-enterprises (Figure 6). Although many agri-enterprises are nearly the same in terms of the area farmed and in management and technology used as the collective farms of Soviet times, since 2000 more-advanced agri-enterprises have emerged. These enterprises can mobilize investments, utilize advanced technology, and import better management practices in the

agriculture sector. They are sometimes called agro-holdings and are perceived to be the driving force behind productivity (Davydova and Franks 2015) and production growth. They also dominate the export of commodities. In many respects, these large agro-holdings are extremely concentrated vertical businesses that own the most-advanced technology. The value chains are limited to each individual agri-holding, and spillovers of technology beyond the borders of the holding are rare.

Agri-enterprises and family farms tend to specialize in the production of grain, oilseeds, and other industrial crops that require high levels of mechanization, while household plots generally produce potatoes, vegetables, fruit, and milk for self-consumption and sale in local markets (Figure 7).<sup>3</sup> The largest share of household plots (78 percent) specializes in the production of potatoes, but these farms sell only 17 percent of their production. The share of house-

**Figure 6. Agri-Enterprises: Share of Agricultural Output by Type, 2000–16**  
Percent shares of total value of agricultural production



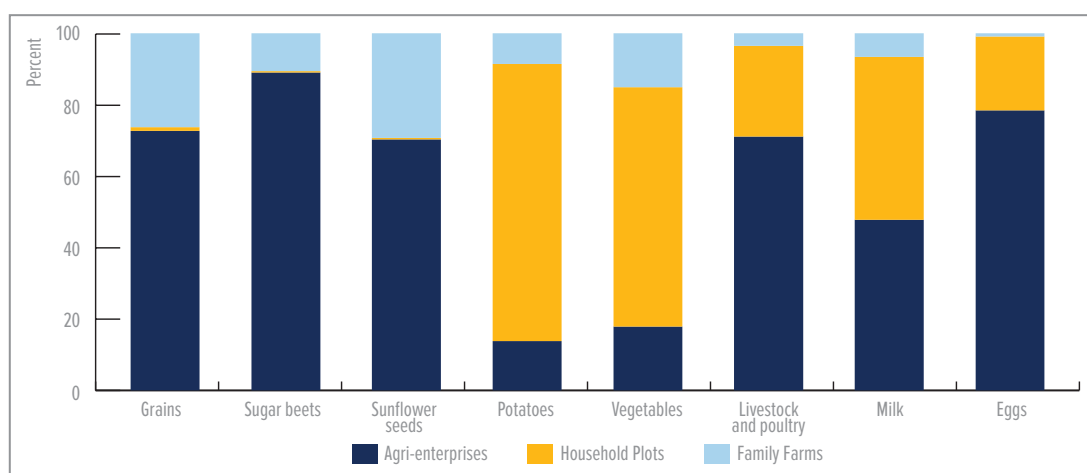
Source: ROSSTAT database.

<sup>3</sup> This discussion is based on Grosclaude 2016.

hold plots in vegetable production was 68 percent in 2015, of which 16 percent was sold. By contrast, agri-enterprises sold 83 percent of their production and family farms 77 percent.<sup>4</sup> In livestock, specialization has also emerged. Poultry is produced mainly by agricultural enterprises. Pork production is gradually specializing in agri-enterprises by pushing household pig farming out of business as a result of animal health and bio-safety concerns. Nevertheless, households were responsible for 39 percent of all livestock production, of which 46 percent was commercialized. They were also responsible for 46 percent of total milk production, of which 31 percent was commercialized. In general, the share of output of agri-enterprises has increased in total production. For example, in 2013 agri-enterprises contributed 47.6 percent of gross agricultural output. Their contribution increased to more than 52 percent in 2016 (Figure 6).

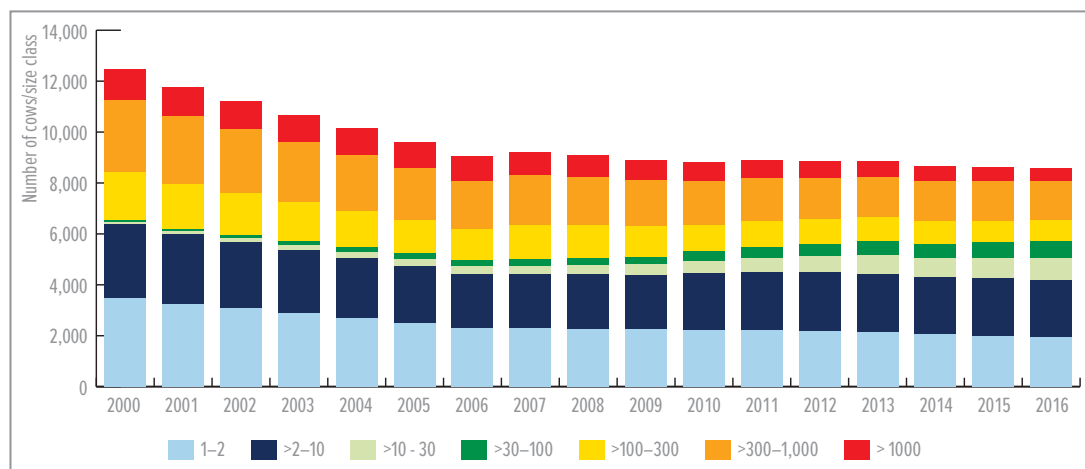
The trend of increasing the share of agricultural output, especially grains and meat, by agri-enterprises is expected to continue because agri-enterprises are likely to continue to achieve further productivity gains as a result of policies and support programs that give them better access to technology and capital. However, emerging family farms and the small to medium farm sector present the opportunity to fill the production gap in subsectors where agri-enterprises have a weaker competitive advantage, and which are higher-value subsectors—namely fruit and vegetable production, and even small-scale milk production. For example, in the milk sector, policy-driven farm structure consolidation is seeing an increase in farms with 10–100 cows (Figure 8). Few of these farms register as agri-enterprises—the majority are registered as family farms. The bigger commercial dairy farms have seen marginally declining trends. Since 2007, family farms with a herd size of 10–100

**Figure 7. Agri-Enterprises and Family Farms: Specializations, 2015**  
*Percent share of total output by farm type*



Source: ROSSTAT database.

<sup>4</sup> Agri-enterprises and family farms are fully commercial. The statistics show only the share of primary production sold. If the primary production is processed on farm, it is not reflected in the statistics. Most agri-enterprises are integrating up in the value chain and are acquiring processing facilities, which allows them to process their own production.

**Figure 8. Share of Milk Production: Farms of 10 to 100 cows of IFCN Standard Classes**

Source: IFCN International Farm Result Database 2016 Comparison Network (IFCN), <http://ifcndairy.org/>

cows are replacing household farms with fewer than 10 cows. In the sectors where small and medium farms have a comparative advantage for increasing production and productivity, large agri-enterprises can build linkages with such farms by transferring technology, creating out-grower schemes and promoting cooperation (see Box 5).

On the other hand, in the pork production sector, where large commercial farms have benefited from investment support and higher prices, farm consolidation is taking place and the sector is being dominated by large mega-farms. The 10 largest companies now control around half of the pork production the country.

The RUSLANA database provides a basis from which to assess the performance of farms in two priority livestock sectors: pork production and dairy farming. These sectors are considered priority for agricultural development, and they have been the focus of federal agricultural policy attention since the 2000s. The data sample employed for the purpose of the

present analyses included 3,340 dairy farms and 506 pig farms—each of these farms was recorded in the RUSLANA database and reported these two sectors as their area of primary economic activity, respectively. This sample contains only registered agricultural enterprises, including almost all agro-holdings. It is not a comprehensive sample that represents all agricultural producers in Russia because it leaves out household plots and, most importantly, it also leaves out commercial family farms. It likewise leaves out other agri-enterprises that have mixed production systems and do not report either pork or dairy as their main economic activity. However, this sample provides a snapshot of the operations and performance of the most commercially oriented but also technologically diverse agricultural producers.

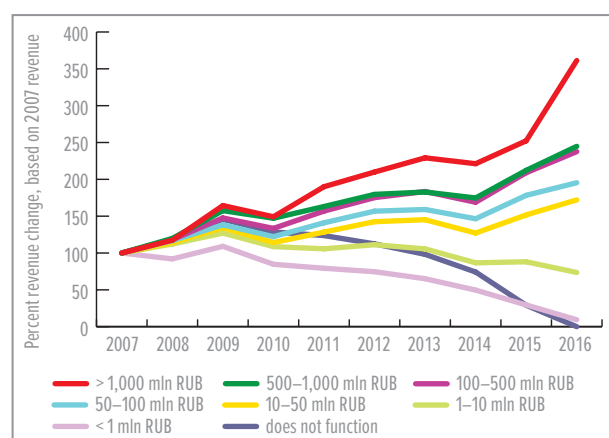
For the pork production sector, the sample represents almost 70 percent of national pork production. For the dairy production sector, it represents more than 50 percent of national production. As such, the sample provides a characteristic picture of the performance of small, medium, and large agri-en-

terprises. The RUSLANA database reports financial performance in the form of the balance sheets of the agri-enterprises. Thus physical production indicators cannot be analyzed with this database. The financial results give a picture of revenue growth, investment performance, and labor productivity. They also help enhance an understanding of where the weaknesses are and where public policy attention would be necessary to support the sectors' growth.

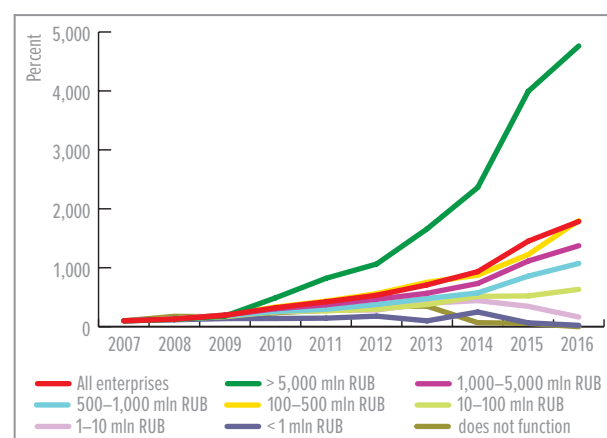
Both dairy and pork agri-enterprises have demonstrated significant growth since 2007 (Figures 9 and 10). Total revenue growth between 2007 and 2016 was more than 200 percent for the dairy and more than 1,000 percent for the pig agri-enterprises, respectively. The largest share of revenue growth reported large agri-enterprises with averages of 40 percent per annum in the dairy sector and 150–200 percent per annum in the pig sector. The sample distinguishes the size of agri-enterprises based on their annual revenues as reported in the RUSLANA database.

These revenue growth rates are partly driven by growth in domestic prices in Russia, but also partly by technology utilization. The impact of domestic prices on revenue growth has been particularly strong since the imposition of food import restrictions in 2014. High revenue growth is leading to a transformation of the pig industry, which is now dominated by medium- to large-scale enterprises. The largest 10 pork producers represented 46 percent of total slaughter in 2015. Although the Russian pork production sector is still less concentrated than it is in several comparator countries, it is certainly trending in this direction. On the other hand, despite the strong revenue performance of large dairy companies, such transformation does not (and will most likely not) take place in the dairy sector because that sector is more capital intensive and, usually, better financial and production performance can be achieved in small- to medium-sized dairy enterprises. Figure 12 shows the dairy sector growth rate, which is much lower than that in the

**Figure 9. Growth of Dairy Enterprise Revenue since 2007**



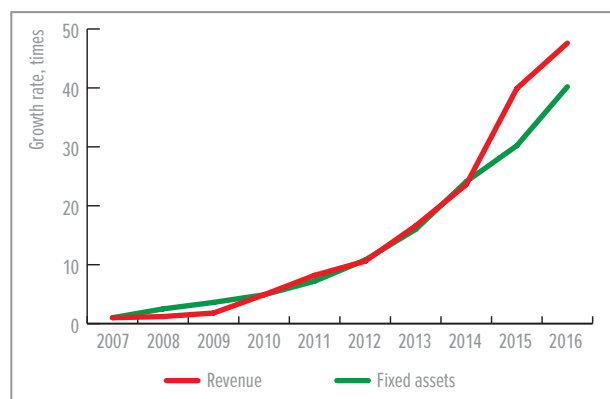
**Figure 10. Growth of Pork Enterprise Revenue since 2007**



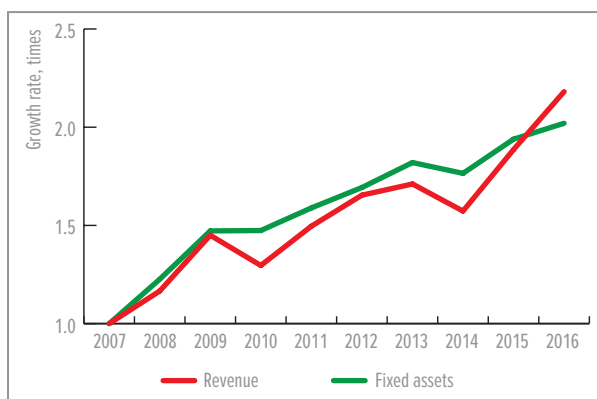
Source: RUSLANA database (courtesy of the Infrastructure Economics Centre, IEC\_rus).

Note: The RUSLANA database reports only cattle breeding enterprises since there is no separate reporting of milk/dairy enterprises. It is assumed that the majority of these enterprises are engaged in milk production.

**Figure 11. Pork Sector: Investment Growth as Fixed Asset and Revenue Growth, 2007–16 (2007 = 100)**



**Figure 12. Dairy Sector: Investment Growth as Fixed Asset and Revenue Growth, 2007–16 (2007 = 100)**



Note: Revenue performance improved with the price hike of 2014–15.

Source: RUSLANA database (courtesy of the Infrastructure Economics Centre, IEC\_rus).

pork industry (Figure 11). Both in terms of investments and in terms of revenue performance the milk industry is different from the pork industry.

Profitability in both the dairy and pork sectors has been growing, though in both sectors its growth rate has been declining since 2007. The main drivers for profitability in these two sectors are the relatively high domestic prices for both pork and milk and relatively low domestic prices for feed, which comprises up to 60 percent of production costs. Russian farm enterprises enjoy favorable internal market conditions characterized by protection from import competition and resulting higher prices. Productivity increases are fueled by major technological advances that certain (mostly large) enterprises in the agri-food sector have undergone in the last decade. The sector adopted new technologies, improved genetics, and better animal health conditions, and improved management.

However, at the level of the farm enterprise, the analyses show mixed results for productivity. For

the pork production sector, in the past 10 years labor productivity has grown by more than four times. This reflects technological advances of the sector, which has invested considerably in new production technologies. However, part of the growth in revenue per employee—an indicator used to measure labor productivity in Tables 1 and 2—could be the revenue growth from increased prices. Furthermore, part of the increase in labor productivity may be attributed to shedding excess farm labor (inherited from the Soviet era) as the agricultural enterprises underwent technological modernization (Uzun and Lerman 2017).

Small enterprises are gradually exiting the pork sector, a trend that will continue. Labor productivity growth in the dairy sector has shown varied results. Medium and large dairy farms reported an average labor productivity growth of 3.3–3.6 times over the past 10 years, with the large companies reporting labor productivity growth on the order of 10 times during this period (Tables 1 and 2). Small enterprises

reported a productivity decline, and considering the sizeable contribution of small and medium enterprises in the dairy production, their results reflected on the overall sector productivity. These findings from the RUSLANA database are consistent with analyses of other authors (Uzun and Lerman 2017), who mostly attribute improvements in labor productivity to the shedding of excess labor and to an increased

efficiency of input use through the adoption of new technologies.

However, smaller dairy companies, which may eventually emerge as the key drivers of dairy production, demonstrate a fall in productivity and technical efficiency—indicating their lack of access to new technologies, challenges of management, and issues

**Table 1. Labor Productivity of Enterprises that Stated Dairy/Cattle Breeding as their Core Business**  
(Thousand rubles of revenue/employee)

Groups of enterprises by revenue	Labor productivity, thousand rubles/employee		
	2008–10	2011–13	2014–16
ALL ENTERPRISES	822	796	791
> 1 billion rubles	2,340	2,872	3,255
500–1,000 million rubles	1,039	1,211	1,366
100–500 million rubles	881	955	993
50–100 million rubles	633	626	604
10–50 million rubles	701	543	477
1–10 million rubles	468	274	181
< 1 million rubles	419	199	67
Out of business	656	337	89

Source: RUSLANA database (courtesy of the Infrastructure Economics Centre, IEC\_rus).

**Table 2. Labor Productivity of Enterprises that Stated Pig Farming as their Core Business**  
(Thousand rubles of revenue/employee)

Groups of enterprises by revenue	Labor productivity, revenue/number of employee, thousand rubles per employee		
	2008–10	2011–13	2014–16
ALL ENTERPRISES	1,078	2,196	4,462
> 5 billion rubles	2,366	8,465	23,005
1– 5 billion rubles	1,360	2,505	4,667
500 – 1,000 million rubles	757	1,418	2,768
100– 500 million rubles	497	922	1660
10–100 million rubles	496	572	705
1– 10 million rubles	600	509	338
< 1 million rubles	293	163	92
Out of business	582	482	57

Source: RUSLANA database (courtesy of the Infrastructure Economics Centre, IEC\_rus).

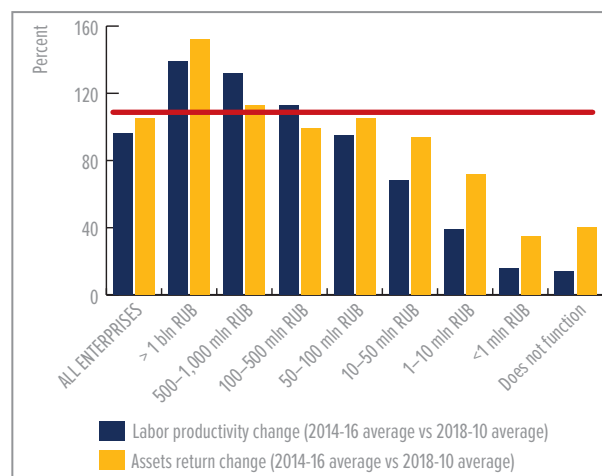


with animal health, as well as potential difficulties obtaining access to higher performing genetic material. Their asset turnover—a financial ratio representing the efficiency of the use of a firm’s assets—declines over time, though the decline is slower than that of labor productivity.<sup>5</sup> Since there is a shortage of milk in the country, even the most inefficient agri-enterprises running on obsolete technologies can still sell their product at relatively high prices and enjoy temporary revenue growth.

As these analyses show, potentially “efficient” production capacity probably lies within those enterprises with revenues of more than 100 million rubles (Figure 13). This revenue threshold allows investments in state-of-the-art technologies for the development of production facilities (standardized livestock breeding complexes, milk storage, transportation and processing facilities, and so on). Those companies with a smaller turnover have been unable to efficiently utilize relevant production capacities. Larger companies also have better access to credit and government subsidies, and therefore benefit from cheaper capital that they can use to modernize their technology.

However, large dairy sector enterprises are capital intensive and the prospects of repeating the success of pork industry are limited. Although several mega-size dairy farms do exist, their share in milk production is not increasing and will likely drop in

**Figure 13. Assets Turnover for Enterprises that Stated Dairy/Cattle Breeding as their Core Business, by Enterprise Size, 2008–16 Average**



Source: RUSLANA database (courtesy of the Infrastructure Economics Centre, IEC\_rus).

the future. Because most gains in milk production will come from companies with less revenue and fewer cows, government policies should focus on supporting the small and medium enterprises in the dairy sector to improve their performance vis-à-vis productivity and profitability. If the government objective is to increase domestic milk production, it should direct a substantial part of its focus on designing policies that help smaller, perhaps small and medium, dairy enterprises and individual farms improve their productivity through access to new markets, better technologies, animal genetics, and support for animal health.

<sup>5</sup> This observation about asset turnover is based on average financial results of 2007–16.

## Productivity and Competitiveness at the Farm Level: Catching Up in Key Sectors

Total factor productivity (TFP) in Russian agriculture has risen significantly since the early 1990s. Agricultural TFP rose during the 1990s (roughly with an average growth rate of 2 percent) and has continued to grow, but at a declining pace in the 2000s (Figure 14) (Rada, Liefert, and Liefert 2017).<sup>6</sup> Despite the advances made in agricultural production and trade balances described above, many partial agricultural productivity measures in Russia continue to lag behind those recorded in comparator countries. Crop yields remain below those found in Europe and North America; the same holds true for measures of productivity in livestock enterprises.

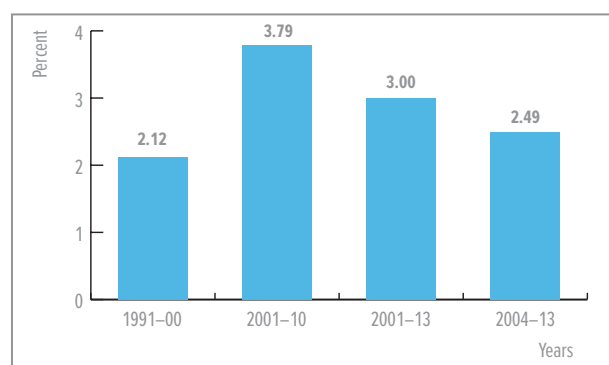
Furthermore, the off-farm agribusiness sector remains substantially underdeveloped relative to the agribusi-

ness industries found in other countries at comparable levels of development. Agriculture's share of Russia's overall GDP falls between 4 and 5 percent—comparable to the shares found in most Organisation for Economic Co-operation and Development (OECD) countries. However, Russia's food manufacturing sector is relatively small compared with those of OECD comparators, as it accounts for only 2 to 3 percent of GDP—well below the 10 to 20 percent share that would be found in other OECD countries. This dichotomy points to the need to upgrade agricultural and food industry development policies in order to fully utilize existing potential. Understanding constraints faced by the sector may help the government and policy makers address the policy challenges.

This section examines several successful large agricultural enterprises in each of four priority agricultural sectors (dairy, pork, and corn and soybean grain crops). For these selected enterprises, farm records were analyzed to determine the level of competitiveness that has been achieved relative to relevant international comparators. Although only a small number of farms were studied, they were chosen to be representative of the experience of these important segments of Russian commercial agriculture. For the selected farms, productivity growth has been impressive since the 2000s, albeit from a relatively low base. Although this growth has slowed in the most recent years, these farms are approaching (and may soon achieve) true competitiveness with comparator farms in Europe and beyond. The detailed findings are summarized below.

Agricultural enterprises (especially those in the livestock sector) are profitable in the short term mostly

**Figure 14. Russia's Agriculture TFP Growth Rate, 1991–2013**



Source: USDA Agricultural total factor productivity growth indices for individual countries, 1961–2013, dataset updated October 7, 2016. <https://www.ers.usda.gov/data-products/international-agricultural-productivity/>

<sup>6</sup> TFP is a measure of the effectiveness of the usage of inputs (such as labor and capital). The higher the TFP, the more output is produced from the same amount of inputs. If the number of workers and the size of the capital is the same, but the output increases, this change is interpreted as an increase of the TFP.

because of two factors: low-cost feed production and high domestic prices for meat and milk. A closer look at the cost structure of meat and milk production suggests that around 50 to 60 percent of costs comprise feed costs, where Russia has comparative advantage; these costs reduce overall costs compared with benchmarked farms in North America and Europe. Farms also benefit from market conditions that are favorable: market prices for most agricultural products are high in Russia as a result of border protection measures. On the other hand, physical labor productivity in the sector appears to be rather low and the cost of infrastructure is high in terms of its proportion of total costs. These factors pose medium- to long-term risks. Feed costs are highly weather dependent and wages can be expected to rise with economic development, resulting in the need for increases in physical productivity. Market protection measures are not beneficial to the economy overall and may not last for very long. Thus policies should help farmers to stay profitable by introducing risk management options and support programs.

To explain the above findings, we employ benchmarking methodology, identifying and comparing typical production systems and farms in Russia with their comparators in North and South America, Europe, and Asia. By using benchmarking methodology, typical production systems and farms representing the highest market share of milk, pork, and crop production are identified in selected major production regions of each country used in the benchmarking exercise. A “typical farm” is a farm that has characteristics that are common to farms of the selected major production region of the country. Such

a farm is not representative of all farms, but gives a fair picture of farm performance based on a single case study. The study employed focus group and individual interview techniques and farm data analysis to derive farm performance information. This methodology is developed by the IFCN Dairy Research Centre and the agri benchmark network.<sup>7,8</sup>

The following sections present and discuss findings for four priority sectors: dairy, pork, and the grain crops – corn and soybeans.

## The Performance of Dairy Farms

The dairy sector in Russia has yet to demonstrate sustainable trends in milk production and market development despite consistent domestic demand. Although public policies and support are targeting capital-intensive modernized dairy units, productivity remains below the level of competitors, but it is catching up and—with supportive public policies—could soon be competitive. However, a closer look at the economic indicators at the farm and sectoral level point to several challenges—some linked to public policies and infrastructure, others to farm management. From the public policy perspective, the following issues are important. Russian dairy production has not tapped into global dairy markets yet, as demonstrated by the lack of domestic and international competition that could have resulted in more investment in the sector. Subsidized policy support strategies seem to be forcing dairy farms and enterprises to be dependent on support for profitability and for growth, perhaps even for survival (this may be the case especially for smaller enter-

<sup>7</sup> Information about the IFCN Dairy Research Centre can be found at [www.ifcndairy.org](http://www.ifcndairy.org).

<sup>8</sup> Information about the agri benchmark network is available at [www.agribenchmark.org](http://www.agribenchmark.org).

prises). Although the maximum proportion of subsidies is going toward capital investment, significant changes in terms of increased production—as is the case in the pork industry—are not visible.

The case study on a typical modern farm in the St. Petersburg region shows that—despite subsidy levels that are two to three times higher than comparable farms in Europe—labor, land, and capital productivity levels are quite low. Our analysis included two 850-cow typical modern corporate dairy farms with high milk yield levels per animal, which are comparable to the milk yields in farms in East Germany but lower than those in the United States and much higher than those grassland grazing farms in Ireland or New Zealand. The typical Russian farms in the Northwest region have free stall barns, as in other larger modern farm types. Such modern farms are not representative of all dairy farms in Russia: significant numbers of farms are still small and traditional, and, as was noted earlier, such small farms produce the largest share of milk. In terms of market organization, cooperatives are not common in Russia, and small and medium farms do not have the benefit of typical market linkages and organization the way their comparators in the United States, Europe, and New Zealand have. The seemingly high revenue and profit levels should be treated with some caution, because they are converted to U.S. dollar average for the year 2015 when the Russian currency devaluated by 59 percent over the previous year against the U.S. dollar. Since most farm costs and revenues are in rubles, this does not distort the profitability picture, but may point to an artificially high level of farm revenue.

Our analyses of farm records indicate that Russian farms receive comparable revenues from sales of milk and meat, but they also benefit from subsidy levels two to three times higher than several Euro-

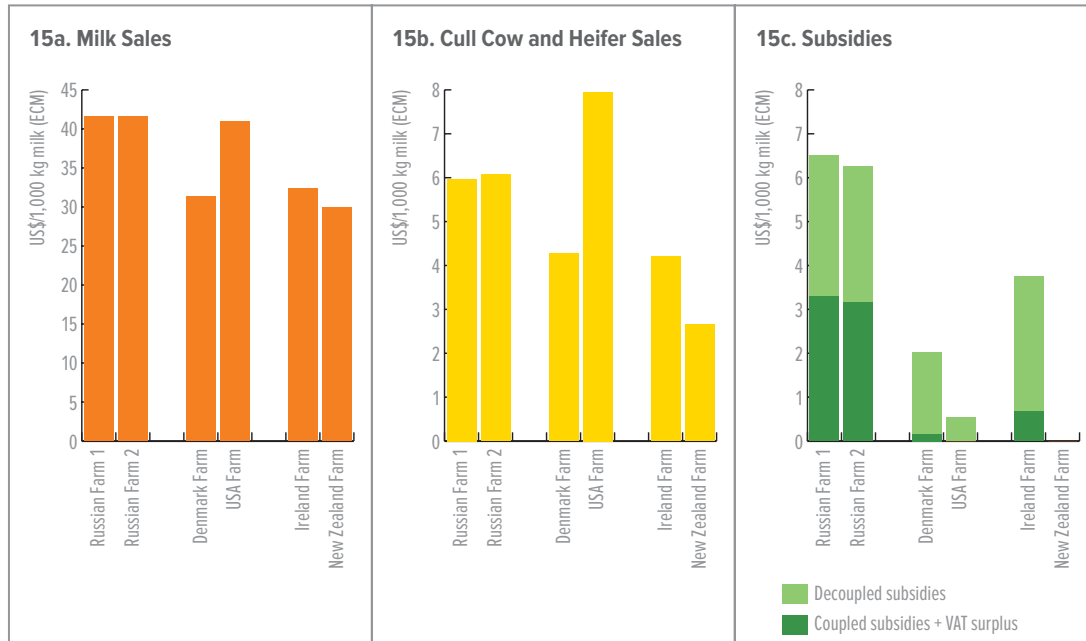
pean and U.S. farms. Both coupled and decoupled subsidies comprise the revenues from milk sales. The volume of milk produced makes the returns from subsidies quite significant as a proportion of total farm income (Figures 15a, 15b, 15c).

The impact of subsidy removal on farm profitability was analyzed separately. The analyses show that subsidies are very important to ensuring milk production; in the long run, however, the subsidies could be removed in a phased manner, provided the farms could improve their management and productivity for sustained production.

A typical advantage of Russian farms is their very low land costs, but feed and labor costs are still high, and so reducing these costs would provide an opportunity to make the farms competitive globally (Figure 16). Typical Russian farms have quite high labor costs, even though farm wages are much lower than wages in other comparator countries. There is potentially scope to improve labor productivity by a factor of three to five through improved management and improved mechanization. Wages for farm labor are much lower at US\$3 per hour compared to US\$12–18 in the other countries

We did not analyze the reasons for low wages, but based on the interviews with farm operators, we identified several possibilities: (1) there are fewer employment opportunities in rural regions; (2) there is a lack of skilled workers who would require higher wages, and therefore a reliance on a large number of unskilled workers; (3) there is a reliance on unskilled low-wage migrant workers. More analysis is needed to understand levels of mechanization and technology substitution that could replace lower wage levels. The capital input of Russian dairy farms is almost twice as high as it is in comparable farms

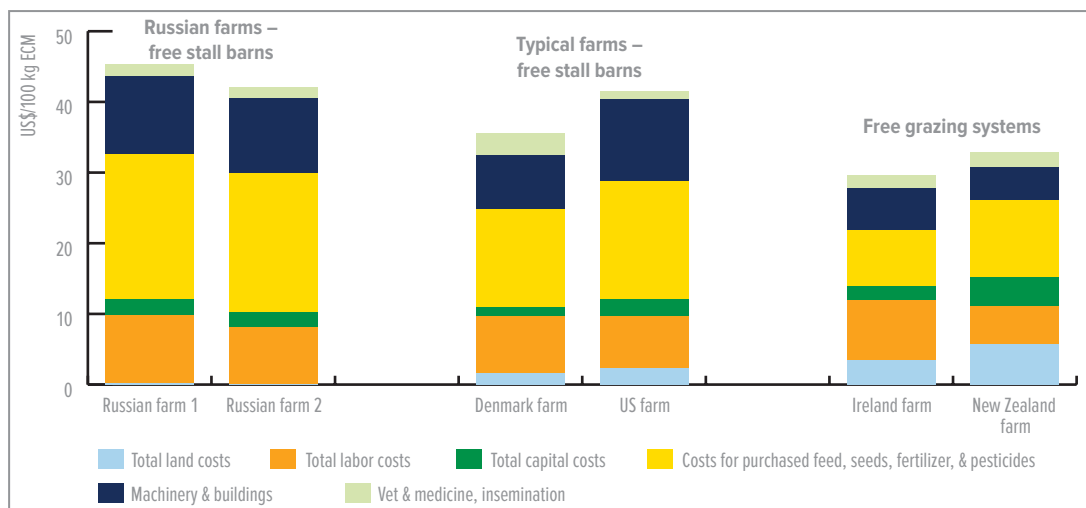
Figure 15. Dairy Farm Revenue: Russian Farms and Comparator Farms



Source: IFCN International Farm Result Database 2016 Comparison Network (IFCN), <http://ifcndairy.org/>

Note: ECM = Energy-corrected milk.

Figure 16. Cost Comparison of Typical Dairy Farms



Source: IFCN International Farm Result Database 2016 Comparison Network (IFCN), <http://ifcndairy.org/>

Note: ECM = Energy-corrected milk.

in Europe and the United States; clearly unnecessarily high capital investments are not needed for the optimal combination of labor intensity and capital intensity. Capital input (excluding land) in the modern Russian farm is high relative to the level of its intensification and resource use. Ideal levels of capital input are in the range of US\$1,800 to US\$2,500 per cow to make returns from dairy enterprises profitable at global levels.

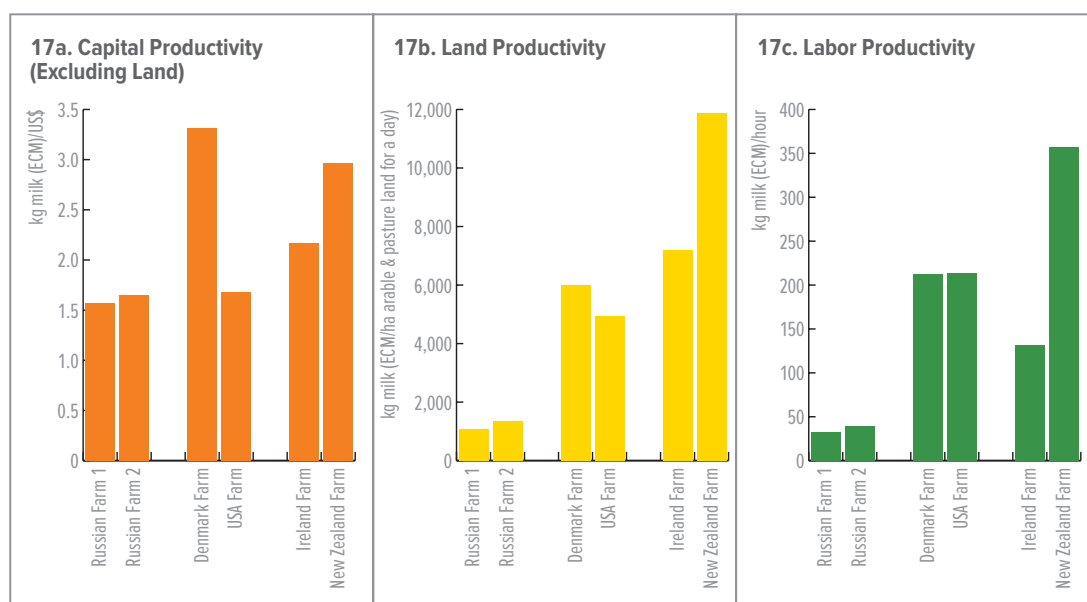
There is also an opportunity to improve labor productivity at lower wages in the short and medium term by improving farm management. Long-term gains in labor productivity would be achieved by promoting farmer training and education programs and improving the skills of rural workers.

Typical Russian farms lag behind their comparators on land, labor, and capital productivity indicators (Fig-

ures 17a, b, and c). Labor productivity levels in Russia are about 30–40 kilograms of energy-corrected milk (ECM) per hour. The labor productivity levels in Germany are 210 kilograms of ECM per hour; in New Zealand it is 355 kilograms of ECM per hour. The high levels of labor productivity in Germany and New Zealand are explained by good management and the efficient use of mechanization by highly skilled farm labor. But even at such high levels of labor productivity in Germany, the analyzed German farm is unable to make returns to labor on par with the regional wage level—an important benchmark for labor productivity—pointing to the continuous need for improvements in farm management and technology if milk prices are low.

Land costs in Russia are the lowest among the countries compared, as a consequence of very low land rents. Most Russian agricultural land is owned and

**Figure 17. Dairy Farm Productivity**



Source: IFCN International Farm Result Database 2016 Comparison Network (IFCN), <http://ifcndairy.org/>

Note: ECM = Energy-corrected milk; ha = hectare.

not much land is rented out. Russia has very extensive land use practices reflected in a very low stocking rate. This makes milk productivity per unit of land use very low, at around 1,000 kilograms of milk per hectare (Figure 20). Land productivity levels in other countries are 5 to 12 times higher. There is great scope to improve land use for dairy development, but because land is not yet a constraining factor, such potential may not be fully realized. In the long term, there is an opportunity to improve the level of grain yields and pasture quality to make milk production more competitive.

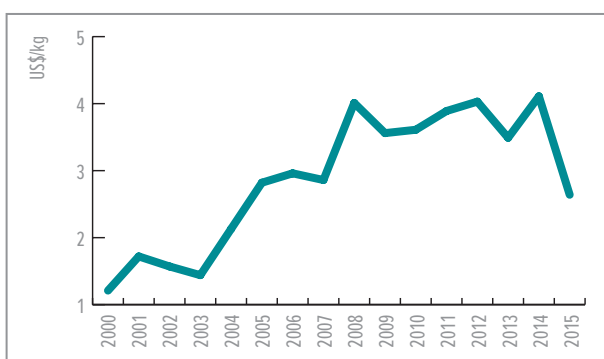
Thus, in the short to medium term, capital seems to be the main constraining factor for productivity growth in Russian dairy enterprises. As these analyses show, capital investments in Russian dairy enterprises are almost twice as high as they are in comparators. For this reason, the greatest scope for improvement is in achieving capital efficiency.

### *Main Factors Affecting Profitability*

- ✓ **Feed efficiency:** Typical Russian 850-cow dairy farms have similar feed conversion efficiency. However, the quality of feed is much lower than in it is in farms in New Zealand and Ireland, especially in terms of energy and protein content. Although Russian farms are not grassland-based dairy systems, it is still believed that the quality of feed can be improved by managing pasture better.
- ✓ **Feed ration:** Russian farms have a ration with 50 percent concentrates that are mostly purchased, and with significant grass and grass silage. Although the current low feed prices in Russia are making Russian dairy production
- more competitive, there is a good scope to reduce feed costs by boosting the yield of fodder production and improving the feed management.
- ✓ **Feed cost proportions:** Purchased feed (concentrate and roughage) has the highest share of feed costs in Russia; the home-grown feed proportion is comparatively rather minor.
- ✓ **Feed costs:** The typical Russian farm bears a significant cost for feed, paying 60 percent of its total costs for feed, of which about 40 percent is purchased feed.
- ✓ **Replacement rates:** The replacement rates of lactating cows are much higher in Russian farm types, signifying higher replacement costs and lower lifetime production. With replacement rates as high as 35 to 47 percent per year, herd management through proper nutrition, breeding, and veterinary and health care needs to be developed to make the farms competitive with other main dairy regions in world.
- ✓ **Veterinary and health costs:** Both these costs are quite low in Russia. This is reflected in relatively higher levels of somatic cell count levels at 0.28 million cells per milliliter of milk in comparison to 0.08 million in Ireland or 0.175 million cells per milliliter milk in New Zealand.
- ✓ **Culling rate:** The culling rates of lactating cows are much higher in Russian farms than in comparator countries. The animals tend to reach lower milk yield levels in their 3rd to 4th lactation, making it economically not sustainable to keep them for milk production. On the other

hand, higher beef prices make it feasible to cull cows for beef. However, the main reason for high rates of culling are the consequences of high herd concentrations on typical Russian

**Figure 18. Pork Prices, 2000–15**

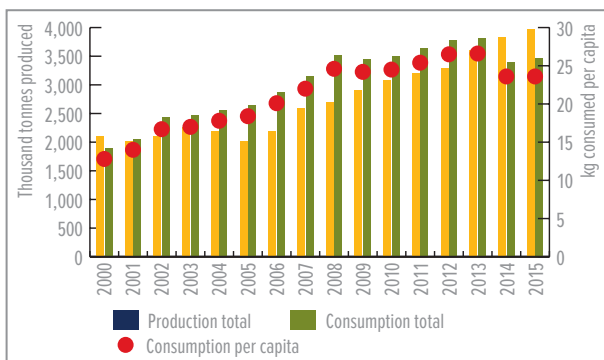


farms, which switch from extensive to intensive milking technologies while the feed production remains extensive. The quality of Russian grass feed is low. Subsequently the share of concentrates in cow's feed ration is too high. These all lead to diseases and to a reduction of the productive period of cows, resulting in their culling. The situation is typical not only for farms in the Leningrad region, where the farms were analyzed, but also in farms in other parts of Russia.

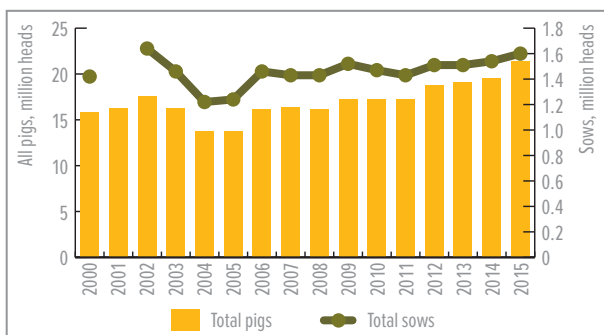
## The Performance of Pig Farms

Despite the decline of pork prices in dollar terms since 2014 and the slight fall in consumption, Russian pork producers benefit considerably from market protection and high market prices in ruble terms (Figures 18, 19, and 20). Favorable market prices and stable demand have provided profit increases for pork producers because output prices and corresponding revenues enter very significantly into the profit equation. In contrast, individual cost components enter into the equation through their proportional contribution to total costs. For example, an increase in pork prices of 10 percent increases the revenues by 10 percent; but an increase of feed prices by 10 percent increases total costs by only 5 percent if feed costs have a proportion of 50 percent in total costs.

**Figure 19. Production and Consumption, 2000–15**



**Figure 20. Animal Inventories, 2000–15**



Source: agri benchmark Pig Network, <http://www.agribenchmark.org/pig.html>

Apart from prices and subsidies, returns are also determined by overall production volumes as well as by outputs per animal. The latter is where animal performance characteristics and farm management factors contribute to the profitability. We analyzed a typical mega-farm enterprise in the Krasnodar region of Russia, comparing it with comparators in



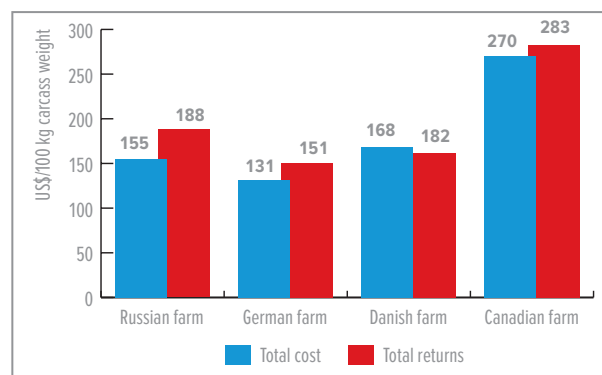
Denmark, Germany, Canada, China, and Vietnam—all typical farm enterprises for their specific geographic regions selected for this analysis. For the farms analyzed, animal performance in the Russian sow enterprise is similar to performance in Western competitors in terms of piglet weights, but lower in terms of number of piglets raised. This can be an indication of a lower health status and/or inferior management. In contrast, animal performance in the finishing farm enterprise—where piglets are fed and raised to market weights—appears to be lower than in the Western competitor farms, as the Russian farm demonstrates worse performance of feed conversion (at least partially), daily weight gain, carcass yields, and carcass weights. There seems to be room for improvement in all these productivity indicators.

When it comes to costs, the main factor appears to be the advantage in feed prices for Russian farms. According to the data available, it seems that Russian farms have a price advantage in feed rations that is between 30 and 45 percent less than it is for the Western competitors; this advantage is even greater when compared to the Asian farms analyzed. As a consequence, the Russian farm seems to have a feed cost advantage over its competitors, especially in sow enterprises.

For these reasons, overall the Russian farm demonstrates positive profits because the market prices are favorable (Figures 18 and 21).

Production costs of Russian farms are comparable with those of Western farms. Asian farms normally demonstrate higher costs. Cost components such as maintenance, depreciation, labor, veterinary and medicine are rather high for the Russian farm. Animal purchases enter the cost equation as opportu-

**Figure 21. Russian Pig Farms with Favorable Market Prices Exhibit Overall Positive Profits**



Source: agri benchmark Pig Network, <http://www.agribenchmark.org/pig.html>

nity costs, as we calculate the closed-cycle pig production (Figures 22 and 23).

When looking at the long-term profitability of the entire system from piglet to finished pig, the Russian farm breaks even whereas all other farms in the comparison make a loss (Figure 24). The main reasons for such a positive performance are that the analyzed Russian farm has relatively high performance, low feed costs, and high prices for piglets.

However, as in the case of the dairy industry, physical labor productivity in Russian farm enterprises is very low (Figure 25a). This is not an issue as long as wages are relatively low (Figure 25b). With improving economic development and corresponding increases of salaries, improvements in physical labor productivity are necessary if the farming sector wants to compete with other sectors.

In addition to the need to improve labor productivity, there is a need to improve capital productivity because capital remains the main limiting factor (Figures 25c and 26). Given that, in the short and me-

Figure 22. Total Costs of the Pig Enterprise (Factor and Nonfactor Costs)

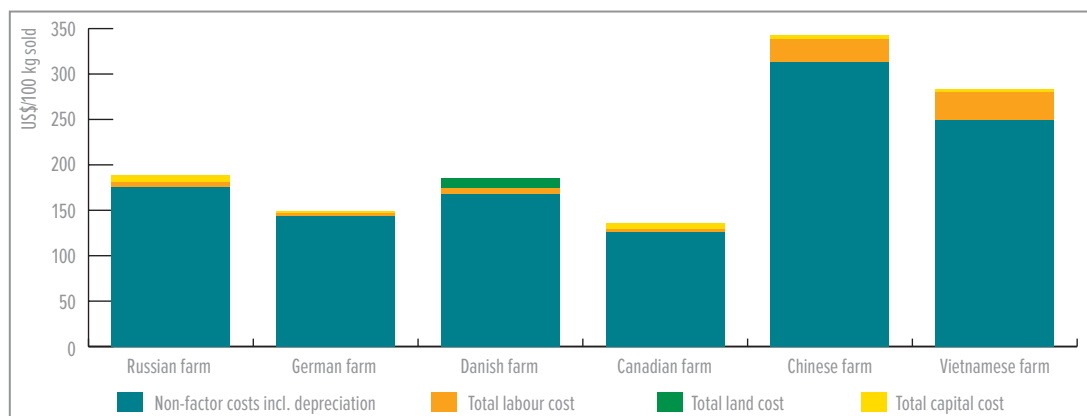


Figure 23. Breakdown of Nonfactor Cost Components of the Pig Enterprise

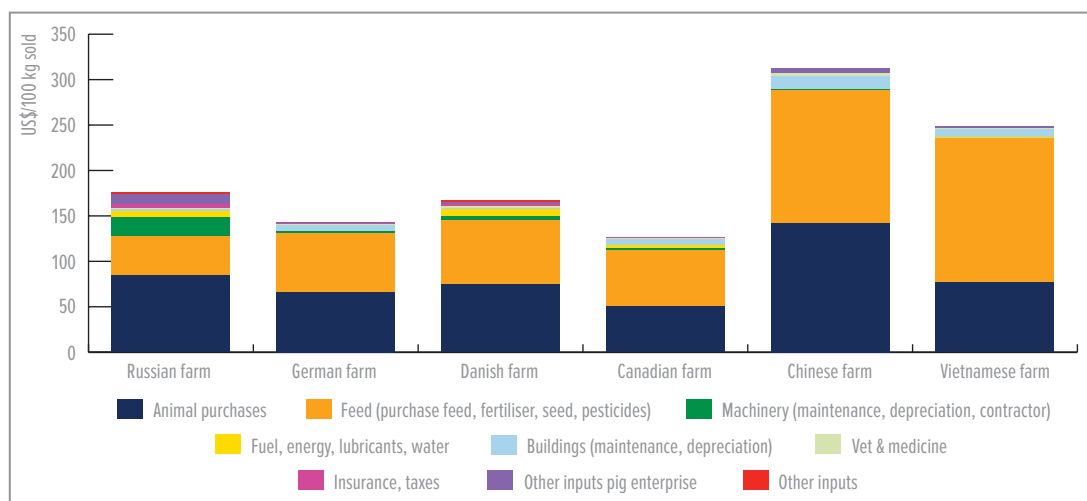
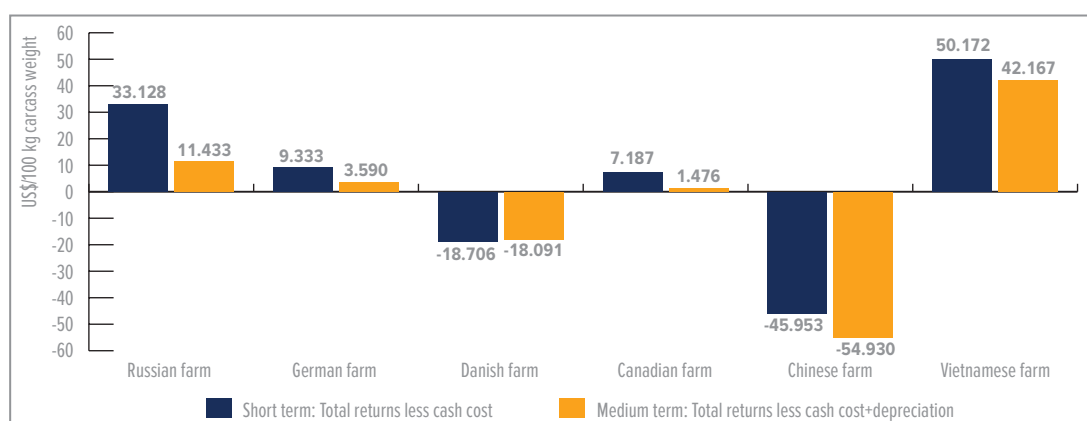
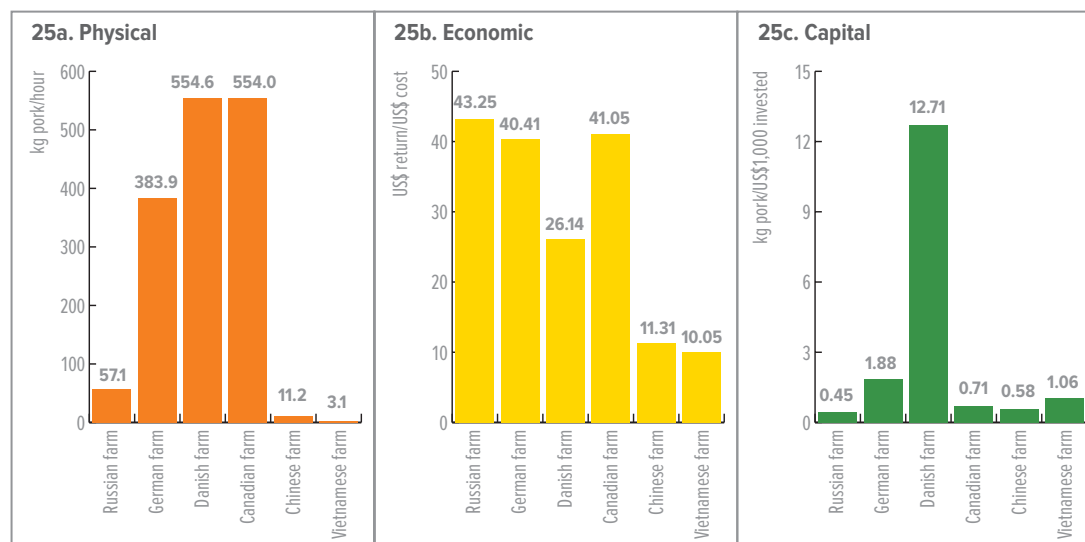


Figure 24. Short- and Medium-Term Profits of Finishing Enterprises



Source: agri benchmark Pig Network, <http://www.agribenchmark.org/pig.html>

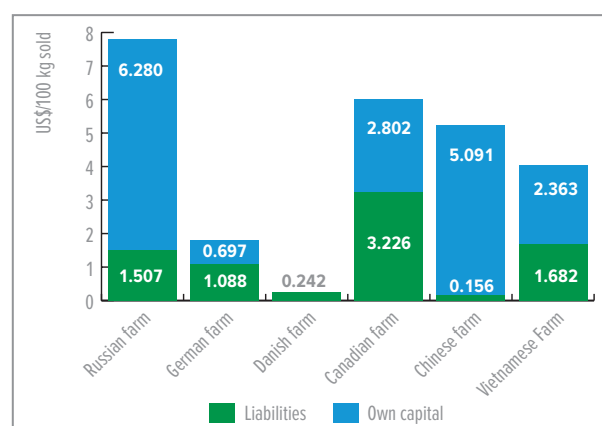
**Figure 25. Labor Productivity**

Source: agri benchmark Pig Network, <http://www.agribenchmark.org/pig.html>

dium term, profitability is guaranteed through high market prices and relatively low production costs, improving capital productivity may not be urgent. However, in the long term and with export orientation on the horizon, the industry and government policy may consider improving resource allocation, with a specific focus on limited resources such as capital and labor (which will become limited in the long term).

## The Performance of Corn-Producing Farms

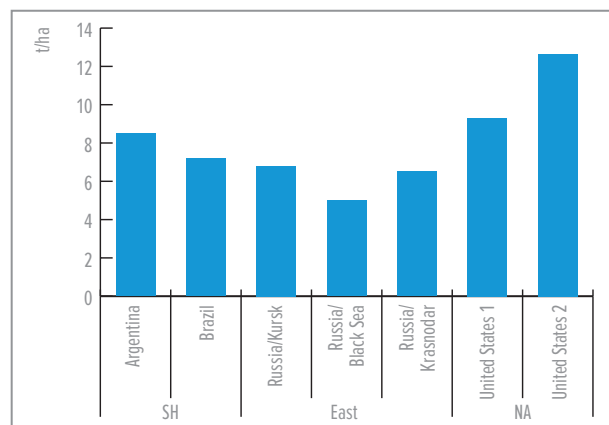
Russian corn producers underperform their comparators in North and South America, but yields are improving at an average annual rate of 6 percent. Russia follows the strategy of producing non-genetically modified (GM) crops, and therefore may not achieve the overall high yields seen in countries such as the United States, Argentina, or Brazil (Figure 27). However, this strategy may position Russia

**Figure 26. Capital Costs**

Source: agri benchmark Pig Network, <http://www.agribenchmark.org/pig.html>

to become a major supplier of corn both domestically and internationally, because an aversion to GM crops is growing in Europe and Asia. Therefore, in the long term corn may become a major crop if the domestic downstream sectors are ready to absorb the capacity and if the logistics infrastructure permits its export expansion. Despite restraint from

**Figure 27. Corn Yield across Farms in Comparator Countries, 2015**



Source: agri benchmark Pig Network, <http://www.agribenchmark.org/pig.html>

Note: East = Eastern Hemisphere; NA = North America; SH = southern hemisphere.

the use of GM seeds, the yield differential in Russia is still below its potential: similar climatic and soil conditions in other similar regions produce better yields.

With an average annual increase of 10.2 percent between 2000 and 2013, corn is tending to replace low-margin crops when this is agronomically possible with regard to rotation. On the other hand, the expansion of corn acreage is tempered by higher risks associated with corn production than for traditional crops such as wheat as a result higher upfront cash and liquidity requirements as well as limited know-how.

Compared with U.S. farms, Russian farms are rather competitive in direct costs (Figure 28). However, when compared with their peers in Latin America, they are at the same level. One of the advantages of corn production in Russia is the low cost of nitrogen. In 2015, the average price of 1 kilogram of nitrogen was US\$0.54 for Russian farms versus an average

US\$1.05 outside of Russia. This might be because of low domestic energy prices in Russia and the fact that there is no need to import nitrogen (contrary to the United States at least). The costs of seeds and plant protection chemicals are approximately the same for Russian, Brazilian, and Argentinian farms on both a per-hectare and per-tonne basis, and they are significantly higher for U.S. farms—especially on a per-hectare basis.

However, Russian farms lag their comparators in operating costs (Figures 28b, c), which puts significant cost pressure on farms. The per unit of management cost is high in Russia, primarily because of low yields; on a per-hectare basis, however, machinery costs are comparable with those in the United States. Compared with an Iowa farm, they are even lower (average Russian farm machinery costs are US\$200 per hectare versus Iowa farm machinery costs, which are US\$300 per hectare).

A considerable risk factor is wages, which are seemingly low now but pose a significant risk of complacency. Russian farms can hire labor at much lower wages than major competitors such as the United States. For instance, the average wage on Russian farms in 2015 was around US\$2.90 per hour versus US\$24.90 per hour in the United States. Despite this fact, labor cost per unit is at a similar level or even higher in Russia than in the United States. This is an indication of very low physical labor productivity. Contrary to the situation in the United States and Brazil, Russian farms do not have access to family labor, which causes only an opportunity cost and thereby acts as a buffer when economic margins become tighter. When comparing costs on a per tonne basis, the low corn yields of Russian farms negate their advantage of lower per-hectare costs.

Figure 28. Corn Production Costs, 2015

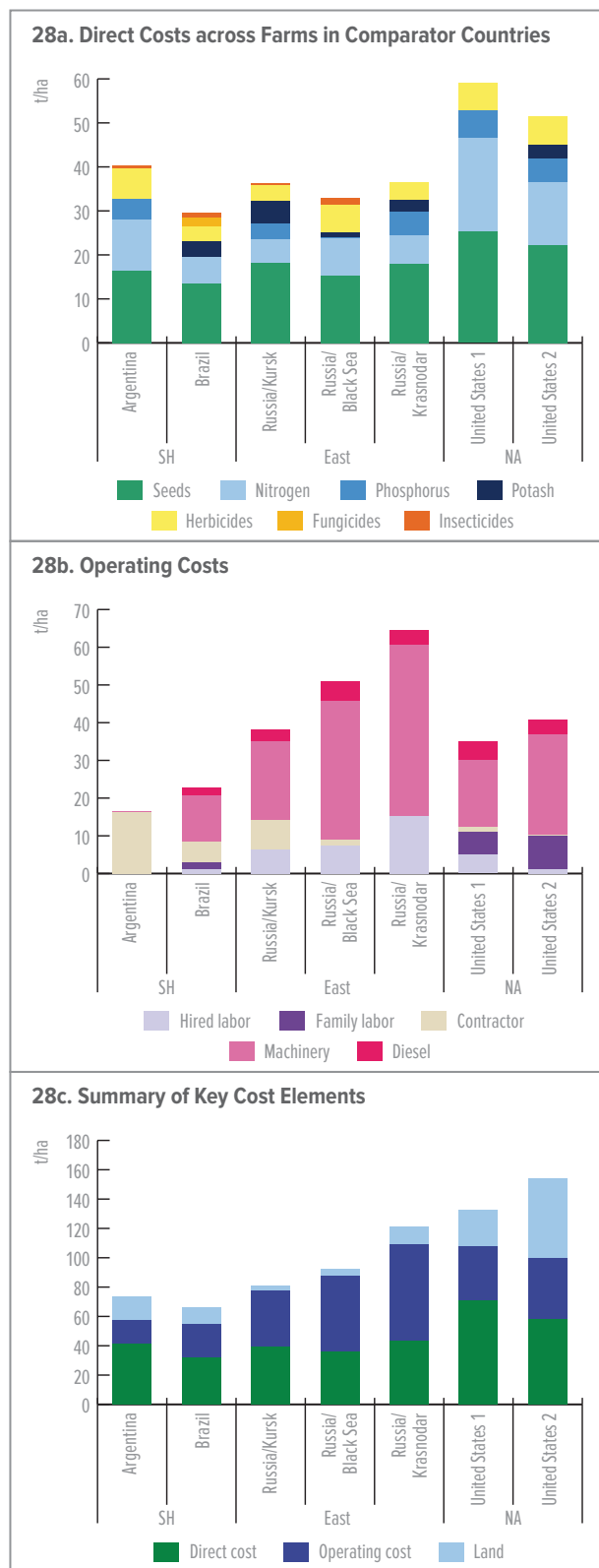
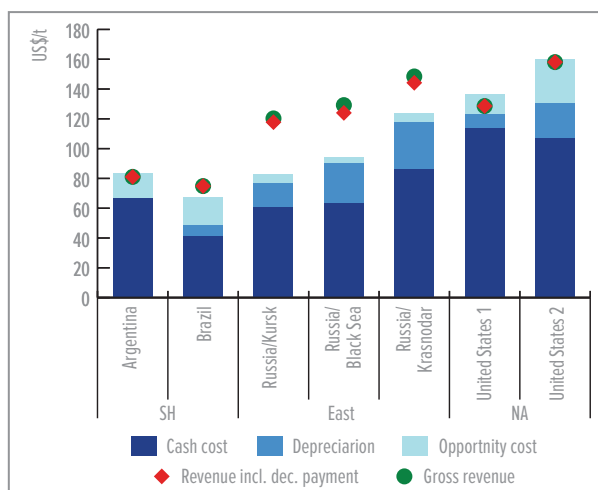


Figure 29. Corn Production: Total Costs and Gross Revenue, Including Decoupled Payments, 2015



Source: agri benchmark Cash Crop Network, <http://www.agribenchmark.org/cash-crop.html>

When it comes to profitability, Russian farms saw a better financial result than their peers (Figure 29) because of the following reasons. Land values in Russia are among the lowest of the selected corn producers. The cash costs of growing corn—comprising all actual cash expenses of a farmer during crop production (direct costs, labor, contractor, land rent, and so on)—is 41 percent lower in Russia than in the United States, and 28 percent higher than it is for Latin American producers. Opportunity costs (including own land, family labor, and own capital) take the bigger share in the United States and Latin American countries. Opportunity costs of Russian farms include land and equity and are lower than the opportunity costs of their international peers. In return, this implies that Russian farms are very cash driven and thereby rather sensitive to changes in cash flow.

Russian farms receive farm-gate prices comparable to U.S. cash prices for corn, unlike Brazilian and Argentinian producers, whose sales prices were, on

average, US\$57 per tonne lower. These lower sales prices reflect the transportation costs from locations remote from the harbors—in the case of some Brazilian farms, more than 2,000 kilometers—and, in Argentina, export taxes. In addition, Russian producers received decoupled payments from the government—on average, an extra US\$4.2 per tonne of corn, which obviously in corn is not of any significance.

## The Performance of Soybean-Producing Farms

Soybeans are a relatively new crop for Russian producers in the European part of the country,<sup>9</sup> and acreage for this crop is growing at about the same pace as it is for corn: Between 2000 and 2013 the acreage of soybeans in the Russian Federation increased an average of 10.2 percent yearly. During the same period, the average increase in yields was 3.4 percent annually. Lack of locally developed varieties, adopted inoculants, and inadequate know-how are the main constraints for higher yields and thereby for a faster expansion of soybeans in Russia.

Compared with their international peers, Russian farms achieve significantly lower yields (Figure 30a). In 2015, drought reduced the average yield of Russian farms to 1.3 tonnes per hectare, while the normal yield for the same producers would be 2.0 tonnes per hectare or slightly more. Like corn, GM soybeans are banned in Russia—but, contrary to corn, this political situation is assumed to have no major impact on costs because in the United States, GM soybeans are primarily Roundup Ready. Recent analysis (Hakim 2016) indicated that savings in her-

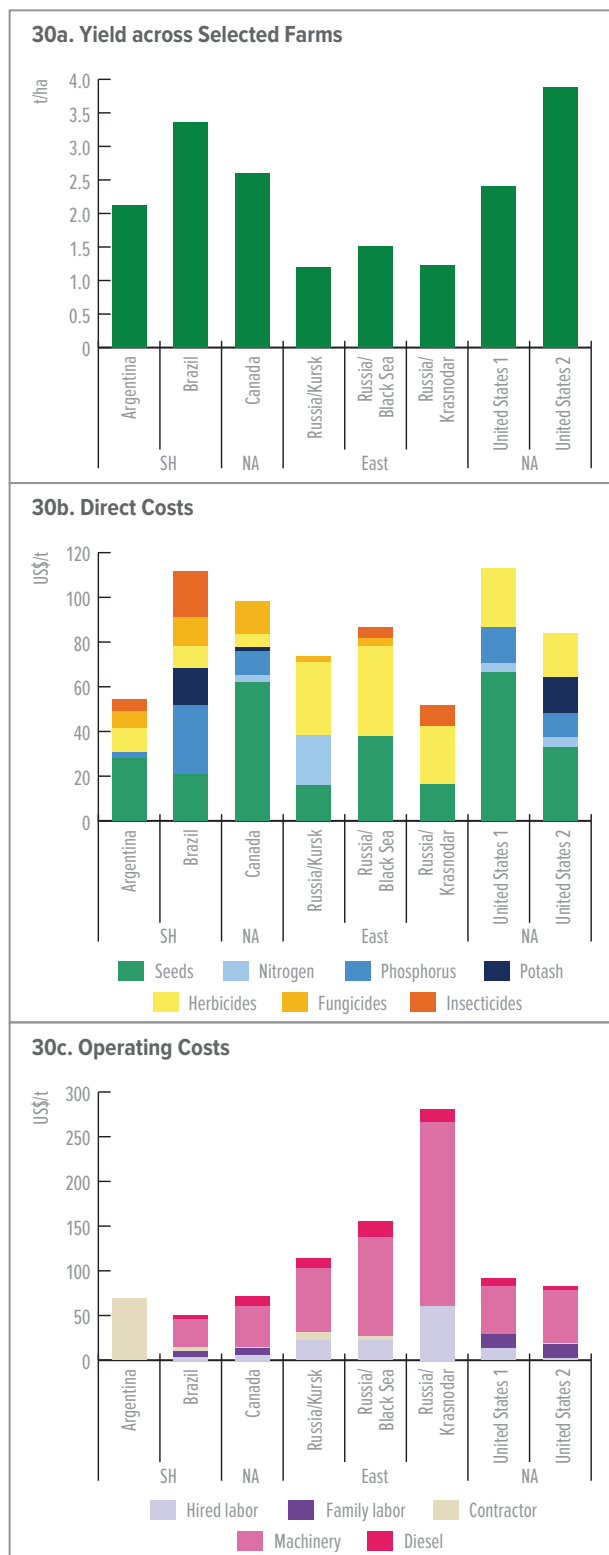
bicide cost for GM seeds are more or less compensated by higher seed cost (Figure 30b). Only if insect control becomes a major issue in Russia will the lack of access to this technology come at a price in terms of competitiveness.

Direct production costs for soybeans are relatively low on a per-hectare basis, but, given low yields, Russian producers tend to be close to the rest of world on a per-tonne basis. Some Russian producers use nitrogen in soybean fields, per the old-time production system, but this practice is gradually being replaced by no or very low nitrogen input, as is seen in the other countries. The Russian soybean seed market lacks varieties that have been developed specifically for its domestic climatic and agronomic conditions. The relative position of Russian producers as far as machinery and labor costs are concerned is the same as in corn (Figure 30c). Russian producers receive the highest market price for soybeans in the given sample because Russia is a net importer, hence local prices are partly driven by imports (Figure 31). In addition, the domestic market is artificially supported by the ban of imports of GM soymeal. Should Russia eventually become a net exporter of soy, the economics of the crop will change significantly. In addition to the high domestic prices, Russian farms benefit from government payments—they receive an average of US\$19.4 per tonne.

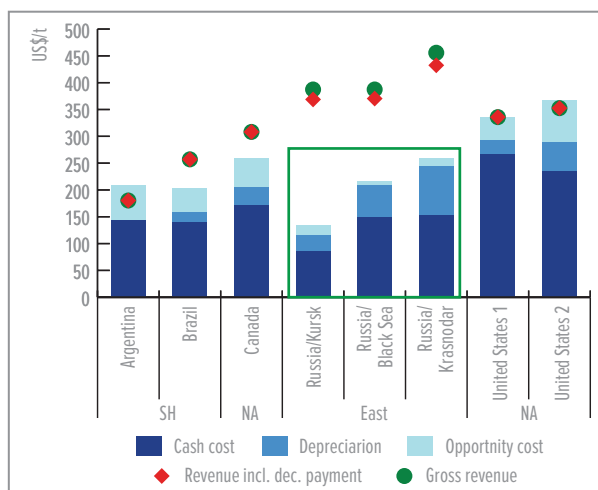
In Figure 31, the scenario of higher yields for Russian farms is considered. Assuming that there were no changes for the other international peers (no changes in yields, costs of production, or the selling prices of beans), we adjusted yields of the Russian farms to their “normal” level under a normal

<sup>9</sup> Soybean production has been more common in the Far East regions of Russia.

**Figure 30. Soybean Production, 2015**



**Figure 31. Soybean Production: Total Cost and Gross Revenue, Including Decoupled Payments, 2015**



Source: agri benchmark Cash Crop Network, <http://www.agribenchmark.org/cash-crop.html>

weather scenario—that is, 2.0 tonnes per hectare instead of the drought-reduced 1.3 tonnes per hectare. Preserving the total cost of production per hectare at the same level (as in Figure 31) and assuming that the prices were unchanged, the economics of soybean production for Russian farms improves significantly.

The overall production cost of Russian soybeans would compete with that of Latin American farmers and would have a stronger competitive position than North American producers. The per tonne cost of production drops below US\$260 for the first analyzed farm with the scenario yield, versus US\$423 with the previous level. The second analyzed farm potentially displays a remarkable US\$133 per tonne total cost—40 percent less than during the dry 2015 year. The average farmer's profit would go up from US\$103 to US\$210 per tonne under the better-weather scenario.

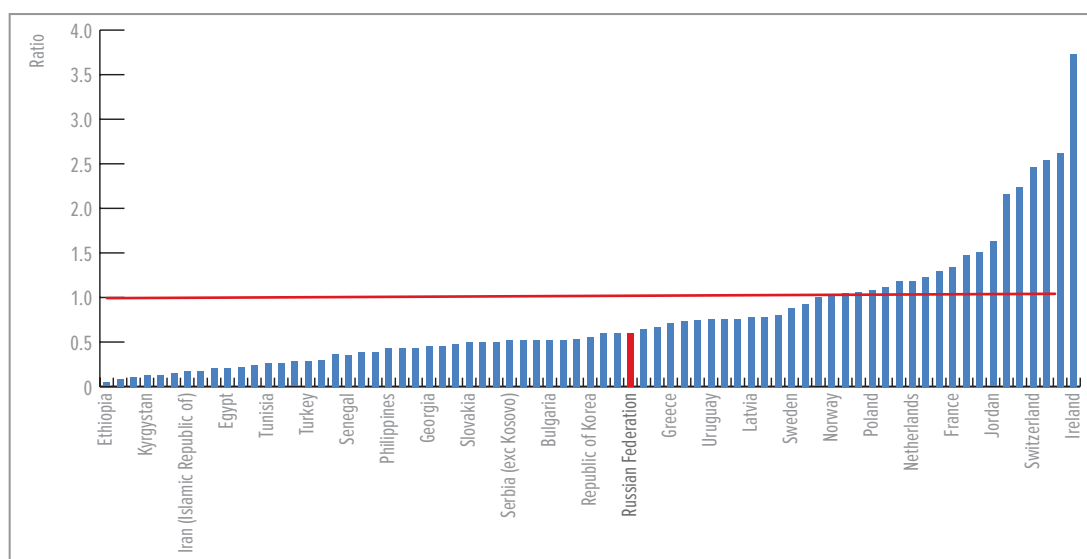
## Food Processing: A Potential New Driver of Agriculture Growth

Russia's food manufacturing industry has grown steadily over the past decade at a higher rate than primary agricultural production. However, the share of food manufacturing in the economy is still far below the share in countries at similar income levels, indicating that there are still opportunities for developing value-addition in the agri-food sector. Furthermore, the so-called depth of the food manufacturing sector—an indicator that measures the extent to which agri-food processing is developed in a country compared to primary agriculture—is also quite low in Russia (Figure 32). Relative to comparators, Russia's indicator is closer to that of commodity producer and exporter countries rather than to technologically

advanced food manufacturers. Russia's food, beverage, and tobacco industry (farming and agribusiness taken together) constitutes a smaller share of the economy than in other OECD countries. In 2015, a total 51,387 enterprises generated a contribution of 5,383,265 million rubles (approximately 2 trillion in 2005 rubles) to the economy, which represents 6.7 percent of GDP; food processing and agribusiness (not including farming) represent 16.2 percent of Russia's economy-wide manufacturing output.

Table 3 provides key industry indicators from 1998 through 2015 together and divided into two time periods, namely 1998–2006 and 2007–15, with the aim of gauging changes over a longer period. The industry shows a high rate of growth in the number of enterprises, at 4.77 percent during 1998 to 2006 followed by a decline at 2.05 percent.<sup>10</sup> On average,

**Figure 32. Depth of Food Manufacturing Sector: Food Manufacturing Value-Added/Agriculture Value-Added, 2005–14 Average**



Sources: FAOSTAT data and authors' calculations.

<sup>10</sup> Bootstrapped standard errors are obtained using 5,000 replications. This method is employed since it gives better estimates when the size of the sample is small. The idea of the method is to use the empirical distribution of the data for making conclusions about the significance of the estimates.



the number of enterprises decreased from 57,869 to 53,164. Food enterprises provided employment to 1.346 million workers during 1998–2006, which gradually reduced to 830,000. Employment in this sector fell at an annual rate of 2.24 percent, slightly higher than the annual rate of decrease in the number of enterprises. A consistent decline in the number of workers per enterprise, from 24 to 16, reflects declining labor intensity in the industry.<sup>11</sup> Fewer workers per enterprise also indicates that Russia's food industry is relatively small in size.

In general, Russia's food sector employment (employment generated by the agriculture, food manufacturing, and food service sectors) is skewed toward agriculture (Figure 33). A more desirable structure in the food sector employment would be less dominated by agriculture and include more employment from value-added sectors, namely food processing and food services. In high-income countries, within the food system, agriculture accounts for a smaller share of jobs while food services accounts for most jobs. For example, in the United States, agriculture

**Table 3. Spatial Trends, Size, and Growth in Food Processing and Total Manufacturing in the Russian Federation, 2005 Prices**

Indicator	Average performance			Annual rate of growth		
	1998–2006	2007–15	1998–2015	1998–2006	2007–15	1998–2015
<b>Food Manufacturing</b>						
Enterprises (no.)	57,869	53,164	55,517	4.77***	–2.05***	–0.33
Workers (thousands)	1,346	839	1,093	–4.76*	–2.24***	–4.71***
Workers per enterprise	24	16	20	–9.43***	–0.19	–4.38***
Wage rate (rubles)	5,765	10,747	8,256	9.84***	2.36**	6.96
Output per enterprise (million rubles)	22.32	29.90	26.11	–1.43*	3.28***	2.65***
Gross value-added per enterprise (million rubles)	8.69	11.80	10.24	–3.31*	4.64***	2.73***
Fixed investment per enterprise (million rubles)	1.69	1.98	1.83	–0.42	–2.41	0.99
Labor intensity	14.40	8.08	11.24	–8.62	2.25	–5.23
<b>Aggregate Manufacturing</b>						
Enterprises (no.)	414,651	408,231	411,441	3.11***	–0.29	0.26
Workers (thousands)	11,506	7,968	9,737	–4.45***	–3.12***	–3.98***
Workers per enterprise	28	20	24	–7.56***	–2.83***	–4.24***
Wage rate (rubles)	6,267	12,312	9,289	11.7***	3.01***	7.82***
Output per enterprise (million rubles)	25.62	25.70	25.66	–1.91	1.04	–0.04
Gross Value Added per enterprise (million rubles)	6.82	9.36	8.09	3.60***	1.81	3.34***
Fixed investment per enterprise (million rubles)	1.04	1.91	1.48	7.43***	0.27	6.16***

Source: Authors' calculations based on the ROSSTAT database.

Note: Based on least squares growth rate with bootstrapped standard errors (5,000 replications):  $\text{Log } Y = a + b (\text{time}) + e$ .

Significance level: \* = 10 percent, \*\* = 5 percent; \*\*\* = 1 percent.

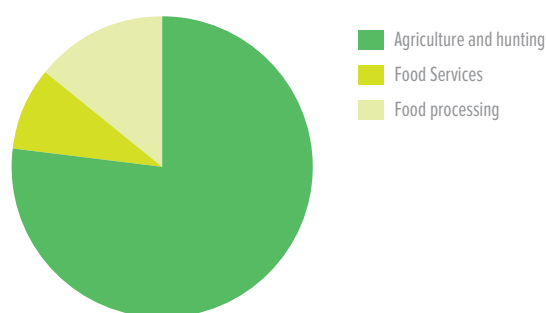
<sup>11</sup> Labor intensity is the relative proportion of labor (compared to capital) used in a process. Its inverse is capital intensity.

accounts for about 20 percent of overall food system jobs and food manufacturing accounts for 14 percent of jobs, while food services accounts for about two-thirds of the jobs in the food system. Such transformation is achieved by upgrading the skill-sets of rural labor both in primary agriculture and in other food sectors. Modern agricultural production demands highly skilled labor, with workers who have knowledge of modern practices and tools, such as information and communication technologies. In addition, skills beyond agricultural production—including in food storage, grading, processing, and alternative energy—also need to be developed to facili-

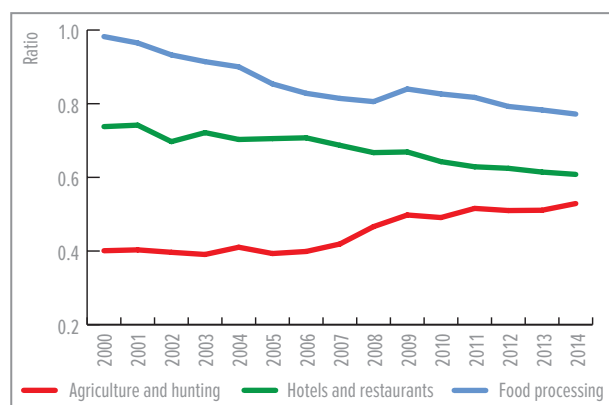
tate food systems transformations and investments, including FDI, in response to changing consumer demand (Townsend et al. 2017).

The earlier sections of this report observed that low-skilled and low-paid labor is not yet a constraint to primary agriculture performance because they do not yet impact profitability. However, in the long term this may be a constraint. Furthermore, salaries in the food manufacturing sector (as well as in other food sectors) have been declining in the last 15 years compared with average salaries in the economy (Figure 34). This indicates that the food manufacturing industry may be losing its appeal. It also indicates that, as the industry is becoming more technologically advanced, it is failing to attract higher skilled (and therefore higher paid) workers.

**Figure 33. Composition of Food Sector Employment, 2010–15 Average**



**Figure 34. The Ratio of the Average Wage in the Industry to the Country's Average Wage, 2000–15**



Source: ROSSTAT database.

The average scale of operations in food manufacturing sector is also small, with an average of 1.83 million rubles in real fixed assets per enterprise. The investment per enterprise has hardly grown during the selected period except in 2007 and 2008, when it reached a peak of 23 million rubles at 2005 prices. On an average, each enterprise produced 26 million rubles of output, with an annual growth rate of 2.65 percent during 1998–2015. The growth in the size of the industry (measured in output per enterprise) was negative during 1998–2006, but subsequently turned positive and grew at 3.28 percent annually. Compared to output per enterprise, the rate of growth in gross value-added (output minus input) per enterprise is much higher, at 4.64 percent. This may be attributable to an improvement in labor productivity and capital intensity.

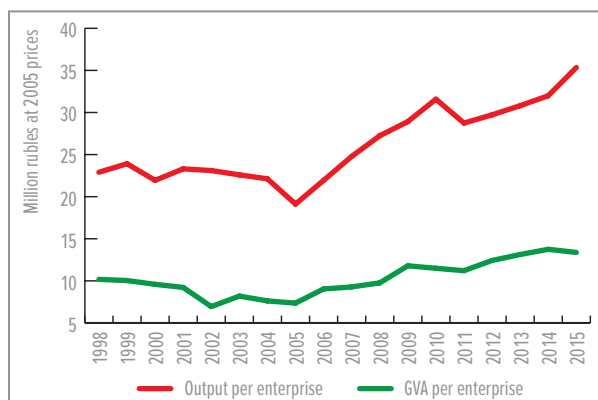
Production and output per factory in the food processing sector have grown quite rapidly in recent years, primarily because of an increase in the scale

of operations (output per factory) (Figure 35). However, the number of enterprises grew at a much slower pace and employment per factory has barely increased. The sector has not demonstrated notable employment generation, despite the relatively low exit rate of enterprises in recent years. Although the average number of workers is much higher in food processing than in beverage and tobacco, labor productivity per employee is significantly lower in food processing, at 1,475,000 rubles compared to 1,946,000 and 7,875,000 rubles in beverage and tobacco respectively. This shows that the food processing sector has a diverse technological base: there are some very advanced manufacturing enterprises with new technologies and some old, Soviet-era legacy enterprises. Contrary to this, the beverage and tobacco subsectors enjoy higher-level technological advancement because FDI in these sectors has been rapid and comprehensive—the beverage and tobacco segments have aimed to quickly establish themselves in the domestic market.

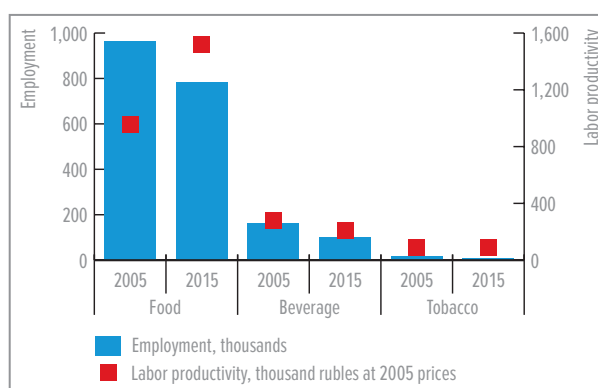
From 2005 through 2015, employment in each of these three subsectors fell at an annual rate of 2.27, 5.25, and 6.15 percent respectively (Figure 36). However, labor productivity grew positively at 3.67 percent per annum only in the food sector, which has been able to upgrade technology. Labor productivity increased more rapidly in food only after 2012. The key subsectors within food include meat and dairy processing, bakery, fish preserving, and the vegetable oil industry. Both beverage and tobacco segments have shown negative rates of growth, at 4.36 and 0.59 percent respectively. Figure 36 depicts changes in employment and labor productivity in each sector at two points in time: 2005 and 2015.

As shown in Figure 37, the fall in labor intensity in food enterprises was less steep than that in to-

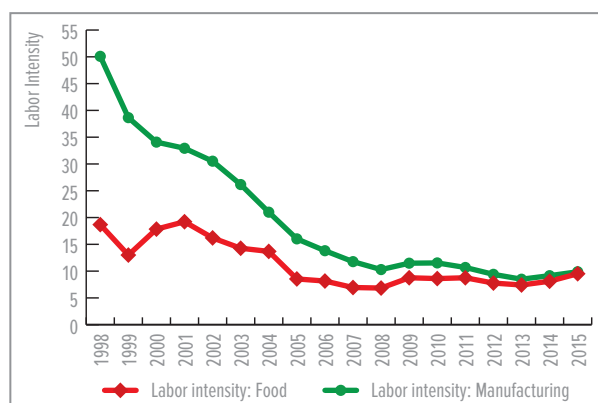
**Figure 35. Output and Gross Value-Added per Enterprise in Food Enterprises**



**Figure 36. Changes in Employment and Labor Productivity in Food Enterprises, 2005 and 2015**



**Figure 37. Trends in Labor Intensity in Total Manufacturing and Food Enterprises, 2005 Prices**



Source: Authors' calculations based on ROSSTAT database.

Note: GVA = gross value-added.

tal manufacturing until 2007, after which the two moved at the same rate. Such fall in labor intensity is consistent with the investments made in technology; after 2013, some signs of improvement are visible in both.

Consistent with this trend, labor productivity has risen, as have levels of wages—albeit at a declining rate compared with the rest of the economy—while capital intensity has declined and capital productivity increased. Table 4 shows the estimates of these three partial productivity measures along with a total factor productivity (TFP) index for food enterprises and aggregate manufacturing. It also provides estimates on the annual rate of growth in each of these productivity measures for overall period and for two

time periods. It is important to mention that labor productivity has risen faster in the food processing, but wages have increased more rapidly in the overall manufacturing sector. Like labor productivity, capital intensity<sup>12</sup> is much higher in food—1.5 to 2 times more than in total manufacturing. Capital productivity and the wage rate have almost converged, but significant gaps remain in labor productivity and capital intensity in favor of food enterprises, thereby suggesting its high growth potential in the country. In terms of growth, the annual rate of growth in labor productivity was high at 6.12 percent during 1998 to 2006 and fell slightly to 4.82 percent in the subsequent period. Significant growth is visible in capital productivity, at 7.05 percent between 2007 and 2015.

**Table 4. Partial Productivity and TFP in Food and Aggregate Manufacturing in the Russian Federation, 2005 Prices**

Indicator	Average performance			Annual rate of growth		
	1998–2006	2007–15	1998–2015	1998–2006	2007–15	1998–2015
Food manufacturing						
Labor productivity (rubles) (GVA/worker)	382,996	748,548	565,772	6.12**	4.82***	7.11***
Capital intensity (rubles) (investment/worker)	75,922	125,185	100,553	9.01**	-2.22	5.37***
Capital productivity (GVA/investment)	5.20	6.10	5.65	2.89*	7.05***	1.74*
TFP index	97.98	112.60	105.29	0.29	2.62***	1.51***
Aggregate manufacturing						
Labor productivity (rubles) (GVA/worker)	255,318	483,503	369,411	11.2***	4.63***	7.58***
Capital intensity (rubles) (investment/worker)	39,889	98,246	69,068	15.0***	3.10***	10.4***
Capital productivity (GVA/investment)	6.69	4.92	5.81	3.83*	1.54*	2.82***
TFP index	93.34	103.13	98.23	2.43***	1.08***	1.28***

Source: Authors' calculations based on ROSSTAT database.

Note: Based on least squares growth rate with bootstrapped standard errors (5,000 replications):  $\text{Log } Y = a + b(\text{time}) + e$ . GVA = gross value-added; TFP = total factor productivity.

Significance level: \* = 10 percent, \*\* = 5 percent; \*\*\* = 1 percent

<sup>12</sup> Capital intensity is the amount of fixed or real capital present in relation to other factors of production, especially labor. At the level of a production process or the aggregate economy, it may be estimated by the capital to labor ratio.

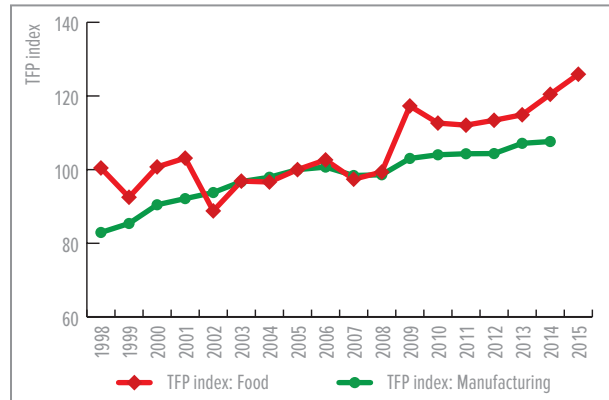
Labor intensity is the relative proportion of labor (compared to capital) used in a process. Its inverse is capital intensity.

Like partial productivity measures, TFP tends to be much higher in food than in total manufacturing. The TFP index in the food sector was 97.98 during 1998–2006; this jumped to 112.6 during 2007–15, growing significantly at an average rate of 1.51 percent per annum. A higher rate of growth in TFP is identified only in the second period. This contrasts with total manufacturing, which witnessed a higher rate of growth in the first period at 2.43 percent and a decline at 1.08 in the period that follows (Figure 38).

### Factors Determining Employment, Estimation of Technical Progress, and Returns to Scale

A statistical analysis was undertaken to estimate the factors that determine employment (labor demand), output, and TFP in food enterprises. Details and methodology of the analyses and a detailed description of the model are available in a separate technical paper<sup>13</sup>. The analysis confirms that food manufacturing is an attractive sector of the economy. Increasing the scale of operation and capital intensity as discussed above are associated with positive but low growth in employment. The elasticity of employment per factory with respect to scale (output per factory) is estimated to be 0.59, indicating that employment grows almost half as quickly as output per enterprise. As expected, the wage rate has a strong negative impact on labor demand (−0.65). An increasing wage rate induces the substitution of capital for labor, as confirmed by a measurement of capital intensity, which shows a negative and significant impact on employment. The impact of trade (exports/imports), captured through the trade openness index or trade

**Figure 38. TFP Index in Food Enterprises and Total Manufacturing, 1998–2015, 2005 Prices**



Source: Authors' calculations based on ROSSTAT database.

freedom index, has the expected negative sign but is found to be statistically insignificant.

These results show that the food processing sector is undergoing technological modernization and improving labor productivity. However, lower wages and stagnation in the movement of workers from once sector to another may indicate that labor is not moving from agriculture or other lower productivity sectors to food manufacturing. There could be constraints to the movement of labor as a result of infrastructure and geography or major skill gaps, which are important factors. The lack of skilled labor could be one of the main impediments to further labor productivity growth in food manufacturing. As firms improve their technologies they will drive out unskilled labor and demand a more-skilled labor force. Training and re-training would be costly for these firms, putting pressure on their profitability and therefore their competitiveness. Government policies should focus on promoting vocational education and worker training and retraining, and on improving the

<sup>13</sup> Appendix 1: Policies for Accelerating Productivity Growth in Food Processing Enterprises in the Russian Federation (by Seema Bathla and Alina Pugacheva)

availability of a skilled labor force in the food processing industry.

For estimating technical progress and returns to scale, two important factors responsible for consolidation and scaling up are considered—namely labor and capital (fixed investment). The analyses, outlined in detail in the separate technical Appendix 1, show that TFP is responsible for only 30 percent of food manufacturing growth because the industry has already been utilizing the available technology. Provided that the market demand for processed food products increases, there is still potential for growth in the food manufacturing sector through the expansion of production facilities. In terms of the contribution of labor and capital to TFP growth, labor contribution is more statistically significant, indicating that the industry still has the potential to absorb labor. These results should be considered with the caveat that there are federal level indicators and a regional decomposition of TFP may yield different results for different regions.

## Factors Explaining Productivity Growth in Food Enterprises

Trends in partial factor productivities estimated from 1998 through 2015 show that although labor productivity and capital intensity have grown consistently, capital productivity has increased much faster (Table 5). Despite these trends, labor productivity and capital intensity have slowed from the very high rates of growth experienced during 1998–2006. Capital productivity has increased with a significant growth that began in 2009. In view of these divergent trends,

we have examined the performance of the food enterprises using TFP. There has been a significant improvement in TFP—from 0.29 to 2.62 percent—although the growth performance of aggregate manufacturing is much lower than that of food and declined from 2.43 percent during 1998–2006 to 1.08 percent during 2007–15. An improvement in TFP growth in food enterprises may be attributed to the acquisition of better technology, driven by the growing demand for processed food, better capacity utilization, and a policy change in its favor. A high correlation between TFP and gross value-added (GVA) at 0.88 is again indicative of a growing efficiency in the use of inputs.

What explains changes in productivity growth in Russia's food enterprises? To explain this we looked at the key factors specific to the industry as well as some external to the industry. The industry-specific factors are size and capacity utilization; the external factors include public policy, represented by the size of public spending and support services to agriculture; and infrastructural development, of which two particularly important public investments are roads (represented by road density) and power (measured as electricity consumption per capita). Other public policy variables taken to capture the business environment and investment climate are FDI, the agriculture trade openness index, and per capita income. These macro variables are replaced by select indexes, such as the economic freedom index and the economic globalization index.<sup>14</sup> Agricultural linkage, which is captured by land productivity and the size of agriculture in the economy, is considered to capture the role of backward linkages in influencing the productivity growth of food industry. Evidence

<sup>14</sup> Information about the Index of Economic Freedom is available at <http://www.heritage.org/index/>; information about the KOF Globalization Index is available at <http://globalization.kof.ethz.ch/>.

**Table 5. Partial Productivity and TFP in Food Manufacturing in the Russian Federation, 2005 Prices**

Partial productivity Indicators	Average performance			Annual rate of growth		
	1998–2006	2007–15	1998–2015	1998–2006	2007–15	1998–2015
Labor productivity (rubles) (GVA/worker)	382,996	748,548	565,772	6.31**	4.94*	7.37*
Capital intensity (rubles) (investment/worker)	75,922	125,185	100,553	9.43*	–2.19	5.52*
Capital productivity (rubles) (GVA/investment)	5.20	6.10	5.65	–2.85**	7.29*	1.76**
TFP index	97.98	112.60	105.29	0.29	2.65*	1.52*

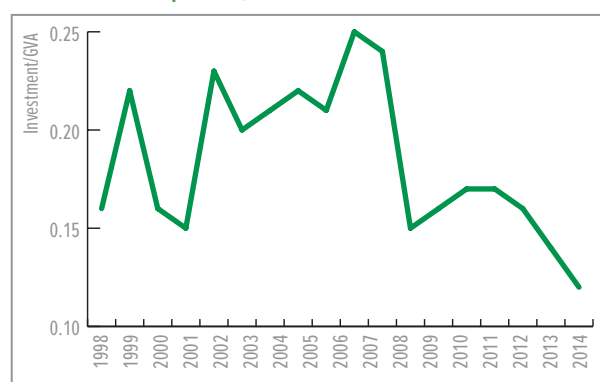
Note: Based on least squares growth rate:  $\log Y = a + b(\text{time})$ . GVA = gross value-added; TFP = total factor productivity.

Significance level: \* = 10 percent, \*\* = 5 percent; \*\*\* = 1 percent

shows that many food manufacturing enterprises largely rely on imported raw materials (as high as 70 percent is imported), thus these enterprises have weak domestic linkages with agricultural producers (USDA Foreign Agricultural Service 2016).

The size of industry and the capacity utilization (investment/GVA), both internal factors, tend to explain statistically significant variations in TFP although the elasticity is higher for the latter at 0.36. A negative coefficient of capacity utilization may indicate underutilization of capacity, which would have a negative impact on productivity growth. As estimated by our model (Figure 39), the level of capacity utilization (represented by capital output ratio) was high in the industry and started dropping only in 2009, suggesting better capacity utilization has been evident only in recent years, perhaps as a result of an increase in demand following import bans.

Among the public policy variables assumed to influence TFP, it is apparent that policy and institutional environment matter considerably. As expected, trade openness and FDI are important, with agriculture linkages having an insignificant impact on productivity. These variables, when replaced by select indexes (trade freedom, economic freedom, and economic globalization) turn out to be posi-

**Figure 39. Capacity Utilization (Investment/GVA) in Food Enterprises, 1998–2015**

Source: Authors' calculations based on ROSSTAT database.

Note: GVA = gross value-added.

itive and significant in inflecting TFP. The amount of public spending and expenditure that goes toward agriculture support services, although positive, has not impacted productivity significantly. Per capita income, which captures the impact of growth and consumer demand, is found to be positive. This variable is dropped in the analysis, however, because of its high correlation with other variables.

Improvement in infrastructure over time does have a positive impact on TFP. A 10 percent increase in spending on infrastructure is associated with an increase in the productivity of the food processing sector of only 6.5 percent. These findings substan-

tiate the literature available for several countries in Central and Eastern Europe on the key importance of physical and human capital, international trade, infrastructure, and more investments in research and development in the factors that influence TFP growth in the food industry (Alston, Babcock, and Pardey 2010).

One of the key findings of the above exercise is that the agricultural linkage does not bear a high and significant impact on productivity in Russia's food enterprise, implying that the relatively small size of the country's agricultural economy may not be helping much in its growth. This has implications for improving land productivity so that the industry can take

advantage of growing agricultural sector for raw material instead of depending on imports. However, this finding should be interpreted with a caveat. It is based on data analyses of federal-level statistics, which may exclude strong agriculture–food manufacturing linkages in regions where the sector is more developed than the national average. In addition, as discussed earlier, the large agri-enterprises, or agro-holdings, are highly vertically integrated businesses and have a peculiar reporting structure that reduces the role of food manufacturing business within the agro-holding. Nevertheless, more analyses may be required for in-depth understanding of the linkages between food manufacturing and agriculture sectors.



## Policy Context: Can It Unleash the Potential?

Based on the analyses from the previous sections, this section establishes that investments in agricultural public goods underperform or demand qualitatively new approaches. The previous sections showed that selected advanced Russian farms benefit from low labor and land costs, and these farms are catching up with their comparators in productivity and farm performance indicators. In addition, the food manufacturing sector is demonstrating good prospects for growth, as evidenced by the fact that its productivity growth is exceeding the productivity growth of the aggregate manufacturing sector. Despite these seemingly positive signs, important bottlenecks for agri-food sector competitiveness may inhibit its long-term success. The first obstacle is that farm productivity performance is limited to selected high-performing farms. The second is that the food manufacturing sector does not fully support agriculture sector growth because domestic value chains and backward linkages are weaker than expected. Third is that most profitability gains on-farm level are achieved as a result of high domestic prices and low land and labor costs, which tend to reverse and thus to pose significant risks. These bottlenecks may reduce the agri-food sector attractiveness to foreign investors, hold back the flow of investments and innovation in the sector, and constrain export competitiveness.

Progressively raising the quality and targeting of public expenditure in agricultural services (extension, research, education, and food safety and quality) and supporting infrastructure development to the levels like those of Russia's closest EU, BRICS,

and G-20 comparators would do much to increase the competitive edge of the sector.

Russia's agricultural policies have been focused on import substitution and on stimulating the production of commodities much more than on enhancing public services and infrastructure. The reasons for this lie in the legacy of Soviet Union and post-Soviet development challenges. The agriculture sector severely contracted after the collapse of the Soviet Union. The livestock sector, which was strongly supported by producer and consumer subsidies and price controls in the USSR, lost its competitiveness after the transition to a market economy. The sector collapsed, and Russia transformed from an importer of feed grains to sustain the livestock sector to become the world's largest importer of meat (Liefert and Liefert 2012). In the 2000s the government pushed for the transformation of the grain and livestock sectors by improving agriculture support policies (Box 4). In this context, the agricultural policies achieved their main objectives—increasing domestic production of key commodities to an almost self-sufficient level. Because the government's priority is switching to export and domestic competitiveness, the main question going forward remains whether the same policies can sustainably support agri-food sector's global competitiveness and help continuously attract investment that would improve technology.

Total (federal, regional, and private) capital investments in agriculture, hunting, and forestry comprised around US\$8.41 billion in 2015—a 5 percent increase from the previous year and an almost threefold increase over 2005.<sup>15</sup> Investment through federal programs amounted to US\$3.87 billion in

<sup>15</sup> These data are from the ROSSTAT Database.

#### Box 4. Types of Agriculture Support Measures in the Russian Federation

**Area payments.** Area payments were introduced in 2012. They are provided by the federal government via regional administrations to all commercial agricultural producers as a decoupled subsidy. This procedure was triggered by Russia's World Trade Organization (WTO) accession as an attempt to repackage direct WTO amber box production subsidies into the green box. However, it seems that many regional governments began to incorporate various additional preconditions to eliminate "negligent" farmers.

**Direct subsidies to agricultural machinery manufacturers for selling domestically manufactured agricultural machinery to domestic farmers.** Such subsidies were introduced in 2012. The subsidy includes a discount of 15 to 30 percent for farmers if they acquire domestically manufactured agricultural machinery. This is an indirect subsidy to domestic agricultural producers and is provided as a support measure to domestic manufacturers. If agricultural machinery is produced abroad but assembled in Russia, under this scheme it qualifies as "domestically" manufactured.

**Interest rate subsidies.** There are two types of interest rate subsidies: (1) working capital, and (2) investment loans. These subsidies comprise the largest share of funding of agricultural support measures.

There are also some other less sizable, indirect farm support programs, such as the program of melioration and soil conservation, the program of rural development, subsidies for breeding activities, and so on. These programs, however, make up only a small portion of government support.

2016.<sup>16</sup> As stated in the State Program for Agricultural Development 2013–2020 (State Program), the government aims to achieve a 3.1 percent annual increase in investment to the sector and a cumulative growth of 38 percent by 2020 from the 2012 level.<sup>17</sup> The program allocates only US\$0.5 billion to facilitate the modernization of agricultural technologies, and possibly to finance some ongoing R&D projects. However, the biggest chunk of the funding is allocated to support private goods—for example, around US\$1.4 billion is earmarked to enable farmers' access to inputs, predominantly through concessional credit for equipment and machinery.

Livestock sectors (dairy, pork, and poultry) have been the largest recipient of government subsidy programs in recent years. Overall almost 75 percent of direct capital grant investment projects were directed to livestock production capacity building, notably in the dairy, pork, and poultry sectors (OECD 2016). Over the last 10 years, the average share of fixed asset investments in the livestock sector has been 62 percent,<sup>18</sup> which includes both government (regional and federal) and private investments. It is conceivable that government priorities supported the turnaround in the sector and helped attract considerable private investments. Pork producers are now advocating for a temporary suspension of

<sup>16</sup> Ministry of Agriculture of the Russian Federation 2012. State Program on Agriculture Development, 2013 – 2020. July 2012 (Rev. December 2014). State Program on Agricultural Development 2013–2020. The source is [www.mcx.ru](http://www.mcx.ru)

<sup>17</sup> Ministry of Agriculture of the Russian Federation 2012

<sup>18</sup> This is an average, calculated using ROSSTAT's figures.

federal support to capital investments in pork production because the sector's growth is posing risks of overcapacity. The impact of subsidies at the farm level is explored in detail below.

The key distinguishing characteristic of government support policies has been that public expenditure has been heavily directed at private goods to the detriment of public goods (Table 6). Concessional credit has been the major support instrument in the form of subsidies on interest rate payments. Starting in 2005, support measures also included direct capital grants (from 25 percent to 35 percent of investment depending on activity) for funding investments in priority sectors, to some extent supporting some value-adding productions, such as slaughterhouses and milk processing.

Overall, the level of investment in public goods has been consistently low compared to OECD and BRICS comparators. Although we did not conduct a quality assessment of public expenditures, a very quick comparison of general services support estimates of Russia (Figure 40a) and the OECD

(Figure 40b) reveals that Russia is consistently underperforming OECD comparators in the types of public investments in agriculture that normally generate productivity gains throughout the industry. Investment levels in extension, education, research and development, and other public goods are persistently low. Another interesting characteristic of public investments in agriculture is that they are heavily skewed toward so-called miscellaneous categories—that is, those categories that do not fit the general description of public investments. As the breakdown of miscellaneous expenditures in Figure 51 shows, the majority of such investments in 2014 were for capitalization of state banks and leasing companies.

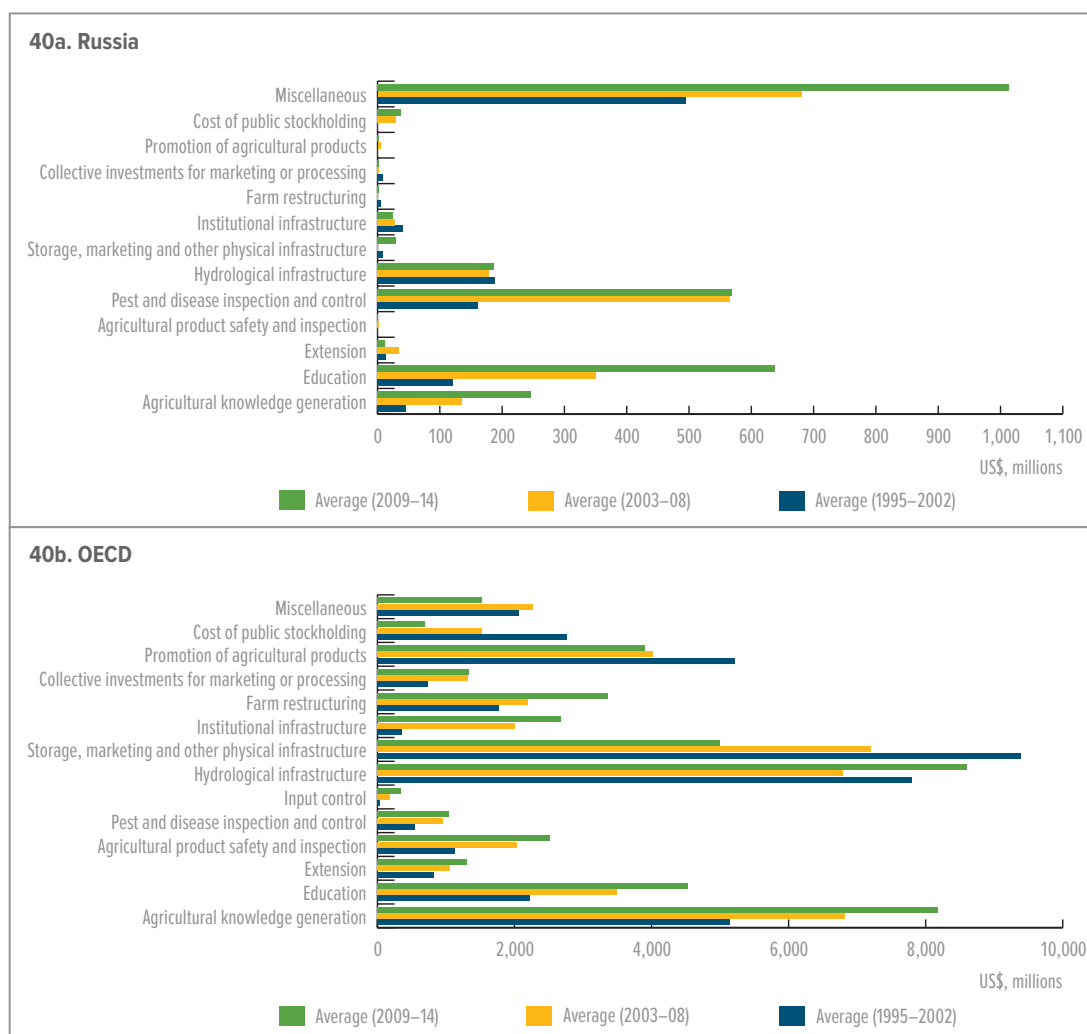
Public policies that support investments in public goods can establish important enabling environment elements for sector development. Our analyses found that the amount of public spending and expenditure on agriculture support services did not seem to impact productivity in the agri-food sector significantly. We did not investigate this matter further, but background research and interviews with

**Table 6. Directions of Financial Support and Volumes from Federal Budget of the Russian Federation in 2016 (Rubles, millions)**

<b>Total from the federal budget</b>	<b>155,356</b>
<b>Of which</b>	
Subsidies for short-term loans	12,000
Subsidies for investment loans	55,500
Subsidies for compensation a part of the direct costs for construction and modernization of agricultural objects	11,600
Subsidies for a part of the costs of agricultural producers to pay insurance premium calculated under the contract of agricultural insurance in crop production	2,300
Subsidies for a part of the costs of agricultural producers to pay insurance premium calculated under the contract of agricultural insurance in animal production	240
Subsidies for price discount refund, given by manufacturers of agricultural machinery to farmers	11,200
Area payments to growers	23,045

Source: Government of the Russian Federation 2017.

Figure 40. General Services Support Estimates, 2009–14



Source: OECD Production Support Database, <http://www.oecd.org/tad/agricultural-policies/producerandconsumersupportestimates-database.htm>

stakeholders indicate that a more in-depth analysis of impact of public investments in agriculture and food industry productivity may be required. Most countries that achieved significant results in agriculture and agri-food sector productivity succeeded in boosting their agriculture and food industries by investing considerably in public goods, such as agricultural advisory services and education, veterinary and animal health, research and development, and

so on. The literature has many empirical examples that demonstrate such success in China (Jin, Huang, and Rozelle 2010), Australia and New Zealand (Mullen 2010), Canada (Veeman and Gray 2009), as well as many other countries.

We identify three areas in which the public sector may be able to use policy and programmatic interventions to spur productivity, competitiveness, and

exports. In each of these areas, further analysis would be merited to identify such policy and programmatic interventions in detail and to suggest operational plans for implementing such interventions. These areas are:

**Investing in broadening productivity gains in priority sectors.** As demonstrated earlier, Russian agricultural subsectors are catching up with those of competitors in terms of productivity and are close to achieving competitiveness with international comparators. Considerable investments have been made in new modern technologies, which have replaced old and obsolete technologies as more financial resources became available both from public and private in-

vestments. However, these investments have not yet resulted in broad-based productivity gains for the whole industry, although selected individual enterprises have successfully outperformed their peers. Going forward, more broad-based productivity gains could be achieved and growth maintained by introducing policies that support the spread of innovation and technology throughout the entire industry. See Box 5 for an example of public policy intervention that supports technology transfer and broadening productivity gains.

In addition, our analyses show that most profitability in priority subsectors is a result of low labor costs, while a closer look at the cost structure of key prior-

#### **Box 5. Public Investments Encourage Technology Transfer and Broaden Productivity Gains: Learning Organizations that Support Innovation for Small and Medium Farmers in Mexico**

Before the 1990s, Mexico's public agricultural research and extension system was largely supply-driven and did not support the productivity growth and technology transfer required to boost competitiveness of the country's agriculture sector. As a result, large farm organizations and enterprises were relying either on imported technology and expertise, which was not available to small or medium farmers. The government responded by converting the inefficient supply-driven system into a program that aimed to provide technical advice to develop markets. One of the interventions the government supported was the establishment of Mexico's Produce Foundations—a federal farmer organization that funds and implements research, innovation, and extension projects. The objectives of the organization were to mobilize funds for the national agricultural research organization and to transform supply-driven research into demand-driven systems. The Produce Foundations affected the Mexican agricultural innovations systems in several ways. Examples include:

- ✓ they funded research projects that helped open new export markets, boosted the profitability of agriculture, solved serious production constraints (for example, improved pest control), and increased the sustainable use of natural resources;
- ✓ they promoted farmer networks that helped disseminate new approaches and foster innovation;
- ✓ they implemented development projects to expand production bases to small-scale farmers; and
- ✓ they opened opportunities for researchers to interact with farmers directly, thereby fostering applied innovation.

Source: World Bank 2012.

ity commodities shows that physical labor productivity is low compared with comparators in North America and Europe, because Russian wages continue to be low. Farms also benefit from favorable market conditions because market prices for most agricultural products are high in Russia as a result of border protection measures. In this situation, capital seems to be the only constraining factor: capital costs are high and investments depend on many externalities. In the short term, incentives to improve labor productivity might not exist, but labor productivity would be required for long-term competitiveness. The favorable configuration of relative price factors poses medium- to long-term risks. Wages are likely to rise over time, as they have elsewhere (for example, in East Asian markets). Market protection measures do not benefit the economy overall, are harmful to the consumers, and may not be enduring. Therefore policies should gradually shift toward spreading innovation and technology throughout agriculture industry, and helping farms to stay profitable in the long term.

**Strengthening value chains and value-addition in food industry.** Our analyses show that the food manufacturing industry is small compared to the agriculture sector as a whole and to the rest of the economy. But it is productive. Productivity growth in the food manufacturing shows some good prospects for sector expansion. However, why the food manufacturing sector is not expanding or supporting agriculture sector growth to a greater extent is unclear. Our analyses show that the backward linkages of the food manufacturing to the agriculture sector are not strong. Adequate infrastructure and effective modern public policies that support food manufacturing-agriculture linkages and stronger value chains would strengthen the performance of the agriculture and rural economy in general. See Box 5 for an ex-

ample of a public funding mechanism that supports better integration of primary agriculture producers with value chains. The key question is whether the food manufacturing sector has the potential to grow, or it is unique to Russia to have a relatively small food manufacturing sector compared with other competitors. Both short-term and long-term factors may address this question. In the short term, market protection measures may deter investments in the agri-food processing industry because high domestic farm prices incentivize investing in primary agriculture, making it more attractive than investing in food manufacturing (all other factors held constant). However, as experience in other countries shows, in the long term demand for processed food will increase, primarily because of dietary transition and the increasing incomes of the urban middle class (Minten, Reardon, and Chen 2017). Public policy may consider gradual steps for promoting investments in food manufacturing industry with a view to improving the competitiveness of both primary and processed food sectors (Box 6).

With this in mind, we recommend in-depth studies and analyses of the barriers for growth and expansion of the food manufacturing sector with a focus on strengthening linkages with the agriculture sector. Further growth in this sector would depend on carefully designed public policies and support programs.

**Promoting human capital through capacity building in agricultural sciences and farm management to improve labor productivity.** As demonstrated by empirical evidence, an important constraint for productivity gains in agri-food sector is the availability of skilled labor. This study has not focused on the reasons why this is the case; additional studies may be needed to understand why rural labor is a con-

### Box 6. A Funding Mechanism that Supports Linkages in Agri-Food Value Chains and Foster Innovation: The China Technology Transfer Project

At the end of 1990s, China's agri-food sector was in a time of urgent and challenging structural transformation. This urgency was dictated by lagging agricultural production that was unable to meet domestic demand, pressure from natural resources, changing consumer demand, pressure to advance domestic food processing and marketing, and the need to take advantage of opportunities to compete in global markets. A critical bottleneck in this transformation was the slow transfer and adoption of technology and the lack of knowledge-intensive agriculture. Because of its fragmentation, the farming sector was unable to effectively connect with higher-value markets, and the domestic food manufacturing sector was unable to effectively source raw materials to cater to changing consumers' tastes and preferences. One way to respond to these challenges was to promote a viable model for implementing public investments that would promote the modernization of agricultural production, strengthen linkages with food manufacturing, and improve marketing.

The World Bank-funded China Technology Transfer Project helped introduce a model of public-private partnership that assisted in facilitating public sector support to the agri-food sector and established a national framework for targeted implementation of public investments for the sector. Among others, the project helped in the following areas:

- ✓ It combined public sector support for research, extension, and training with private investments. The government funded the development and dissemination of public goods, but these activities were implemented by the private sector to foster the integration of public and private investments.
- ✓ It established farmer associations that would benefit from learning and technology transfer, and at the same time these associations would collectively supply raw materials to food manufacturing enterprises. Funding support for food manufacturing enterprises was contingent on their agreement to directly support farmer associations that provide raw materials to these enterprises.

Source: World Bank 2012.

straint and what can be done to overcome it. Our interviews with farm operators and industry representatives confirm that skilled labor is indeed a significant constraint for growth in the sector. Filling the demand gap for skilled workers in the food manufacturing industry would require direct and indirect employment generation, particularly at the regional level, with improved access to and quality of education and other services (see Box 7).

There are reasons why workers are not moving to rural areas fulfilling the demand. It may be that labor markets are not functioning efficiently, as evidenced

by the growing skilled labor gap that is filled with unskilled workers either through abundant unskilled rural labor available or through migration policies. Such labor market failure may not affect the productivity and profitability of agricultural enterprises as long as unskilled labor is able to generate high productivity because wages are low. When wages increase, this will no longer be sustainable. Therefore a successful agri-food sector will demand highly skilled workers in the future, and public policy should direct its attention toward ensuring an enabling environment and policies for promoting education and training programs.

### **Box 7. Designing Education and Skills Policies for Agri-Food Sector**

Education policy affects innovation in at least three ways: (1) a high level of general and scientific education in a population facilitates acceptance of technological innovation by society at large; (2) innovation systems require well-educated researchers, teachers, extension officers, and producers to develop relevant innovations; (3) it is generally easier for farmers and business operators with higher education and skills to adopt some technological innovations. Continuous skills development (training, re-training) is essential to improve the matching of skills demand in an evolving agri-food sector, which needs to adopt productivity and environmentally enhancing technologies and practices.

To evaluate the effectiveness of skills development policies for the agri-food sector, the following questions can be asked:

- ✓ What are the characteristics of the education and training system? What is the place of science in formal education? Are there programs to promote life-long skills development and re-training? Are they successful)?
- ✓ Is agricultural education available? Is it adapted to labor market needs? Do graduates remain in the agricultural and related sectors?
- ✓ Are there specific measures to address evolving labor market needs in the food and agriculture sector?
- ✓ Are there specific education and training programs dedicated to natural resources, efficiency of resource use, environmental pressure (sustainable farm practices), and climate change (adaptation and mitigation)? Which community do they target (students, farmers, or agri-food managers and workers)?

Source: OECD 2013.



## Conclusion

Despite advances in agricultural production, TFP, and trade balances, Russia continues to lag behind many comparator countries in measures of crop and livestock productivity. This report has aimed to provide a vehicle for dialogue with government on agri-food sector collaboration to address this situation. It has identified policy recommendations to address selected challenges and to support the government's aim of attracting investments in the agri-food sector, approached from the point of view that increased productivity will improve the competitive-

ness of agri-food value chains, result in higher profitability, and encourage more investment, including FDI, in Russian agriculture. In practical terms, this report has identified three areas in which the public sector may be able to use policy and programmatic interventions to spur productivity, competitiveness, investment, and exports: investing in broadening productivity gains in priority sectors, strengthening value chains and value-addition in the food industry, and promoting human capital in rural areas through capacity building in agricultural sciences and farm management to improve labor productivity. Some progress has been made, but more is needed.

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