

Changes in Russia’s agrarian structure: What can we learn from agricultural census?

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Abstract

The classification of agricultural producers by legal-organizational form (agricultural enterprises, peasant (family farms), household plots and gardening associations), traditionally used by the Russian official statistics, is outdated and masks the dynamic changes that have taken place. Due to the lack of output and sales data in 2016 agricultural census, the paper uses some assumptions to calculate the so called “standard revenue” as a measure of the potential output in each census farm. The results highlight that there is only a small share of commercial production units in Russia and there is high heterogeneity of agricultural producers within each legal-organizational farm type. Contrary to *a priori* expectations, a large number of household plots became commercialized between the previous census in 2006 and the latest census in 2016 and they contribute 19% of the standard revenue of all commercial census units, more than the share of family farms. These results suggest that the old classification used for statistical purposes does not reflect adequately the dynamic changes stemming from the response to market signals.

Keywords: agricultural census, agrarian structure, farm classification in Russia.

JEL classification: Q12, Q18.

1. Introduction

Historically in Russia’s statistical system, farms are classified into four legal-organizational forms:

- agricultural enterprises (corporate farms);
- peasant farms (family farms);
- household plots (subsistence farms of rural residents that produce mainly for family consumption and sell only the surplus);
- gardening associations (small subsistence plots of mainly urban residents).

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The classification by legal-organizational form is a legacy of the Soviet system. Many researchers have concluded, however, that the legal-organizational form is not a good measure of farm size. We see from Table 1 that the maximum size of peasant farms is ten times greater than the average size of agricultural enterprises; even among household plots the maximum size is substantially greater than the average size of either agricultural enterprises or peasant farms. Some peasant farms in Rostov and Saratov oblasts control more than 40,000 hectares of land and are thus bigger than some agrohholdings. There is an orders-of-magnitude disparity in the land size of farms of different types. Agricultural enterprises average more than 3,000 hectares of agricultural land, while peasant farms average about 300 hectares and household plots or plots in gardening associations have substantially less than 1 hectare of agricultural land per farm. Agricultural enterprises and peasant farms account for just 0.5% of the total number of agricultural producers, and the whole farm size distribution is strongly skewed by the numerical predominance of very small farms (Table 1).

Agricultural Census 2016 made it possible to obtain a large array of data, on the basis of which a new classification of farms by size can be proposed. In international practice, farms are typically classified by size, with size measured by land area, by value of output, or by sales revenue.¹ Land as a physical size measure does not reflect the farm's operations mix. Information about the value of output is notoriously difficult to collect in surveys and, although sales revenue is an incomplete measure of size as it corresponds only to the part of the output that the farmer decides to sell, it provides the best approximation when the value of output is unavailable. Indeed, in the United States, farms are traditionally classified by the annual sales revenue and so-called economic classes of farms are defined by sales thresholds. The Russian census (in 2006 and in 2016) did not collect information about either output or sales revenue. Yet sales revenue is available in the annual reports filed by a subset of Russian farms—some 20,000 agricultural enterprises or corporate farms (*SKhO—sel'skokhozyaistvennye organizatsii* in Russian).

In this article, we tried to devise a farm classification based on sales revenue, similar to the U.S. system (USDA, 2019), but had to overcome the difficulty created by the missing sales revenue for farms other than agricultural enterprises. To this end, the so-called standard revenue methodology was

Table 1

Descriptive statistics of the size of farms of various types by agricultural land, 2016 (quantiles, median, and mean per farm in hectares).

Ag land	Min	5%	25%	Median	Mean	75%	95%	Max
Ag enterprises	0.0	0.0	128	953	3187.0	3422	13 587	341 092
Peasant farms	0.0	0.0	9	60	329.6	270	1490	40 443
Household plots	0.0	0.01	0.05	0.10	0.52	0.21	0.77	16 073
Gardening associations	0.0	0.01	0.02	0.04	0.05	0.05	0.09	84.3

Source: Rosstat (2017).

¹ Another common size measure is the value added, i.e., output minus variable input costs. It was used by Eurostat in the form of the so-called Standard Gross Margin for farm size classification in the EU countries until about 2010, when it was replaced by the so-called Standard Output (which includes costs).

used;² standard revenue was calculated and new farm classification by economic activity was made.

2. Methodology and database for the calculation of standard revenue

Our methodology uses two sources of data: (1) the agricultural census (2006 and 2016) that covers all farms (agricultural producers) in Russia and presents strictly quantitative (non-monetary) information—excluding quantities produced; (2) annual reports of agricultural enterprises (corporate farms) consolidated regionally and nationally, with monetary information about production costs and sales revenue. None of the sources provides price information or information about the value of output.

2.1. Standard area and standard headcount

In order to calculate standard revenue, we must introduce the concept and calculate standard area and standard headcount for each farm.

Classification by land area is straightforward: the agricultural census (for both 2006 and 2016) provides detailed information about the area of the respondent farms (broken down by land type and by crop). Total land area is determined by adding up the different types of land (arable, orchards, hay meadows, pastures, etc.) and the land sown to different crops from the census without any weighting.

Each farm is characterized by its own cropping pattern, i.e., the mix of areas sown to different crops. The areas sown to different crops are all expressed in physical hectares and in principle, can be added up to give the total sown area of a farm. Yet each hectare may be valued differently depending on whether it is used to grow wheat, corn, or potatoes, just for example. To reflect the cropping pattern of the farm, the areas sown to different crops are aggregated into a so-called standard area of the farm. The standard area is the weighted sum of all crop areas as reported in the census, with the weights calculated nationally as the production costs per hectare of a particular crop relative to the production cost of cereals per hectare (the production costs are aggregated for all of Russia for each crop). The standard area is thus expressed in so-called “wheat hectares.” The costs are not reported in the census: they are obtained from the annual reports filed by farm enterprises, which are consolidated nationally by the Ministry of Agriculture (the annual reports also give the respective cropped areas). The cost-based standard-area weights are thus macro-level (not farm-level) coefficients that are calculated nationally from consolidated annual reports.³

The livestock herd of each farm is similarly characterized by a certain composition of animal species. Unlike the sown area, animals of different species cannot be directly aggregated, and we first have to convert them into standard head that can be summed. The standard headcount, similarly to the standard area, is the weighted sum of the animal heads as reported for the census farm, with

² For original definitions and methodology in Russian, see Uzun et al. (2010).

³ Another common approach in the literature is to aggregate the land area with weights defined as the ratio of the area sown to each particular crop by the total sown area of the farm (both in hectares). This approach avoids the use of costs and relies completely on census data.

the weights calculated nationally as the production costs per physical head of each species relative to the production costs per cow. The standard head is thus expressed in “cow units” (or “livestock units” in Eurostat terminology).

To conclude the first part of the methodological description, we summarize that standard land and standard livestock headcount are calculated for each census farm using the physical land areas by crop and the physical headcount by animal species, as reported in the census. Physical hectares sown to different crops and physical animals of different species are summed using national, country-level (not farm-level!) cost-based weights from annual reports of farms of one particular type—so-called farm enterprises or corporate farms. At the end of this process, we have the standard areas (in wheat hectares) and the standard headcount (in cow units) for all census farms.

2.2. Standard revenue

Neither quantities produced, nor the value of output, nor sales revenue is reported in the Russian agricultural census (or in other periodic farm surveys): only information about sown areas and livestock headcount is collected (by crop or animal species). Eurostat calculates the value of output as the product of the quantity produced by the average market price (over three or five years). In Russia, this approach has been ruled out for practical reasons: Russia is much larger than any of the Eurostat countries, and no reliable price information is available with sufficiently high regional resolution.

In the absence of price information for the calculation of the value of output, Russian researchers have to rely on the sales revenue as the only monetary indicator of farm operations. Sales revenue (by crop and by animal product) is available in annual financial reports, but only those of one particular farm type: farm enterprises or corporate farms. Farms of other types (peasant farms, household plots, individual entrepreneurs), in most cases, do not have to prepare annual reports, and no sales revenue is available for them in the statistical databases. By calculating the reported revenue numbers (in rubles) for crops and animal products, we would obtain respectively the aggregated crop sales revenue and the aggregated livestock revenue in each corporate farm.

While the annual reports are indeed available for some 20,000 agricultural enterprises in Russia, considerations of practical access limit the use of these data to regional aggregates (consolidated regional reports for some 80 administrative units, including oblasts, federal republics, and krays). For each region, we use the methodology described in the previous step to calculate the standard area and the standard animal headcount for the active agricultural enterprises by applying conversion coefficients derived from national cost data in nationally consolidated annual reports.

Dividing the regional crop sales by the regional standard area, we obtain the standard crop revenue per (standard) hectare; similarly, dividing the regional livestock revenue by the regional standard headcount, we obtain the regional standard livestock revenue per (standard) head.

Thus, for active corporate farms in each region, we have the standard area, the standard headcount, and the standard sales revenue (from crops and from livestock separately). Given this information, we calculate the standard crop

sales revenue per standard hectare and the standard livestock sales revenue per standard animal head.

We now boldly assume that the regional sales revenue results per standard hectare and standard head obtained for corporate farms hold also for farms of other types (specifically, peasant farms, household plots, and independent entrepreneurs). We accordingly multiply these regional ratios by the standard area and the standard headcount of each census farm in the corresponding region as calculated in the previous step. We, in effect, use the standard sales revenue calculated for corporate farms to fill in the missing sales revenue numbers for all census farms.⁴

The methodology was validated by running the Kolmogorov-Smirnov test on the original distribution of the reported sales revenue of agricultural enterprises and the calculated distribution of standard revenue for the same agricultural enterprises. The test results do not reject the hypothesis of equal distributions providing support to the proposed methodology.

3. Results: Classification of farms by economic activity classes

The stratification by region in the calculation of standard revenue is particularly important as there is considerable variability across regions in both standard crop revenue per hectare and standard livestock revenue per head, which would be lost had we used national averages for revenue. For example, the standard crop revenue in rubles per hectare per year ranged from a maximum of 34,500 in Krasnodar Krai to less than 4,000 in Kirov and Magadan oblasts, Perm and Trans-Baikal krais, and a number of Siberian ethnic republics. The standard livestock revenue similarly varied from a high of 152,700 rubles per head per year in Tula Oblast to a low of less than 50,000 rubles per head per year in a number of Caucasian and Siberian republics. These regional order-of-magnitude differences in crop and livestock revenue per standard unit are naturally carried over to the calculation of per farm standard revenue, as outlined above.

The classification of agricultural producers by standard revenue has led to a breakdown into so-called economic activity classes, which is a refinement of the USDA breakdown into economic sales classes. The Russian farms were grouped into three activity classes by standard revenue in U.S. dollar equivalents:⁵

- residential and recreational farms with standard revenue up to \$300 per year (approximately 10,000 rubles for the 2006 census and 20,000 rubles for the 2016 census);
- subsistence family farms with standard revenue between \$300 and \$1,000 per year (between approximately 10,000 rubles and 30,000 rubles for the 2006 census and between 20,000 rubles and 60,000 rubles for the 2016 census);
- commercial farms with standard revenue greater than \$1,000 per year (approximately 30,000 rubles per year for the 2006 census and 60,000 rubles per year for the 2016 census).

⁴ This approach to extending the sales revenue data effectively assumes that the level of commercialization, i.e., the share of output sold, is the same for farms of all types—the assumption that is not necessarily supported by the empirical data.

⁵ The bounds for economic activity classes were calculated in 2010, when the exchange rates averaged 30.4 RUB/USD and 40.2 RUB/EUR (source: Bank of Russia exchange rates. http://www.cbr.ru/eng/currency_base/daily/).

Table 2

Structure of economic activity classes by legal-organizational form in the 2016 Agricultural Census.

	All census farms	Farms without agricultural production	Agricultural producers		
			residential & recreational farms	subsistence farms	commercial farms
Number of farms, thousands	35 866.8	7405.1	22 383.6	2903.4	3174.7
All census farms by legal form, %					
Enterprises	0.1	0.1	0*	0*	0.8
Peasant farms	0.5	0.8	0.1	0.2	3.3
Household plots	64.4	48.9	60.9	96.3	95.8
Gardening associations	35.0	50.2	39.0	3.5	0.1
Total	100	100	100	100	100
Agricultural land, thousand hectares	141 011.5	7558.3	2181.2	1236.3	130 035.7
Agricultural land by legal form, %					
Enterprises	63.5	53.0	0.4	0.8	65.8
Peasant farms	27.9	25.7	1.2	3.2	28.6
Household plots	8.3	21.3	77.7	95.0	5.6
Gardening associations	0.3	0	20.7	1.0	0.0
Total	100	100	100	100	100
Standard revenue, billion rubles	3 930.4	0	108.5	99.9	3 722.0
Standard revenue by legal form, %					
Enterprises	63.0		0.0	0.0	66.5
Peasant farms	13.8		0.0	0.2	14.6
Household plots	22.3		68.5	97.2	18.9
Gardening associations	0.9		31.5	2.6	0.0
Total	100		100	100	100

Note: * 0 stands for a negligible number.

Source: Rosstat (2017).

In the USDA classification, a farm is defined as “any place from which \$1,000 or more of agricultural products were produced and sold, or normally would have been sold, during the year” (USDA, 2019, p. VIII). The two lowest economic activity classes—residential and subsistence farms—fall outside the USDA definition of a farm, which corresponds to the class of commercial farms in the proposed classification. The results of classification are presented in Table 2.

Most of the commercial farms (96% of the group or 3.2 million producers) are household plots; the group also includes about 100,000 peasant farms and 40,000 agricultural enterprises (Table 2). Furthermore, the commercial household plots generate 18,9% of the standard revenue produced by all commercial farms, more than the share of peasant farms and second only to the category of agricultural enterprises. This goes directly against the prevailing view of household plots as subsistence oriented, non-commercial operations. Dividing the household plots into two groups—subsistence and commercial—we note that the commercial

household plots are characterized by a much larger area of agricultural land and much larger sown area (Table 3). Commercial plots also have a much larger livestock herd and achieve a much higher standard revenue (see Table 3).

A different perspective is gained by examining the change between 2006 and 2016 Agricultural Censuses (Rosstat 2007, 2017) in structure of legal-organizational forms by economic activity classes (Table 4). Most agricultural enterprises and peasant farms are commercial farms. Most household plots (and practically all units in gardening associations) are residential farms. A significant change is observed only for peasant farms: the proportion of commercial peasant farms increased markedly from 68% in 2006 to 92% in 2016. The proportion of commercial agricultural enterprises also increased between 2006 and 2016 but less dramatically in percentage terms. Household plots, on the other hand, shifted more toward residential farms, as many abandoned their commercial orientation.

Table 5 presents the average farm sizes in 2006 and 2016 for farms of all legal-organizational types broken down by economic activity classes. The average farm size increased between 2006 and 2016 for all commercial and residential farms,

Table 3

Characteristics of subsistence and commercial household plots, 2016.

	Subsistence household plots	Commercial household plots
Number of farms, thousands	2837.1	3041.1
Agricultural land per farm, hectares	0.42	2.38
Sown area per farm, hectares	0.13	0.46
Standard area, standard hectares	1.36	3.29
Standard headcount, standard head	0.17	2.32
Standard revenue per farm, thousands rubles	34.71	231.60

Source: Rosstat (2017).

Table 4

Structure of legal-organizational farm types by economic activity classes in two censuses (%).

	2006				2016			
	residential	subsistence	commercial	total	residential	subsistence	commercial	total
AgEnt	2.0	3.5	94.5	100	1.1	1.1	97.8	100
PF	24.9	6.9	68.3	100	3.8	3.8	92.4	100
HH	65.1	16.5	18.4	100	70.0	14.4	15.6	100
GAss	98.8	1.1	0.1	100	98.8	1.2	0.0	100

Note: AgEnt—agricultural enterprises; PF—peasant farms; HH—household plots; GAss—gardening associations.

Sources: Rosstat (2007, 2017)

Table 5

Average agricultural land per farm by statistical farm types and economic activity classes (hectares per farm).

	2006				2016			
	residential	subsistence	commercial	all	residential	subsistence	commercial	all
AgEnt	17.5	21.8	3010	2848	27.8	36.5	3261	3187
PF	3.4	15.0	213	147	6.2	9.2	356	330
HH	0.13	0.40	1.24	0.38	0.12	0.42	2.38	0.52
GAss	0.07	0.11	0.22	0.07	0.05	0.12	0.13	0.05

Sources: Rosstat (2007, 2017).

while subsistence farms generally shrank in size (Fig. 1). Particularly noticeable is the increase of commercial household plots, where agricultural land per farm grew by more than 90% between 2006 and 2016 (see Table 5). We thus observe a certain polarization of farm sizes, with the middle category of subsistence farms disappearing and agricultural land flowing to the two extremes of larger (commercial) and smaller (residential) farms.

Commercial farms are a dominant sector in Russian agriculture. They account for fully 95% of the standard revenue of agriculture and control nearly 98% of agricultural and sown area in Russia (Fig. 2). Performance changes in commercial farms may thus make a major contribution to overall agricultural performance.

While the physical stock of land in commercial farms remained fairly constant (the indicators for total land, agricultural land, and sown area), the so-called standard land area increased, boosting the share of commercial farms from 80% to nearly 90% of the total (see Fig. 2). This suggests transition to more intensive, and presumably higher value-added, crops in commercial farms, as the standard

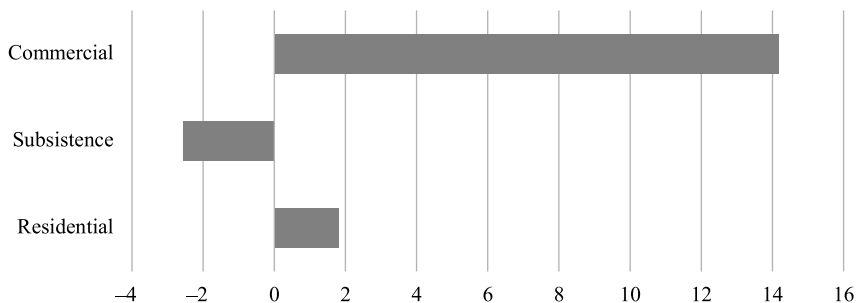


Fig. 1. Changes of mean area of agricultural land per farm by activity class, 2006–2016 (%).

Source: Authors’ calculations based on Table 1 and Rosstat (2007).

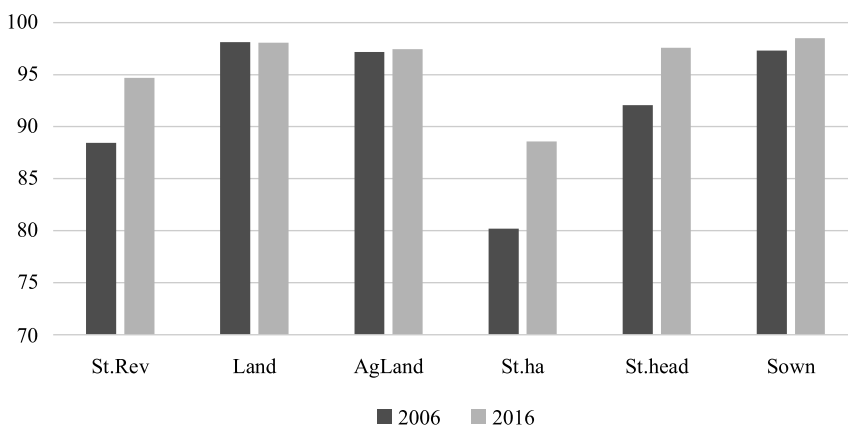


Fig. 2. Share of commercial farms in six performance indicators, 2006 and 2016 (% of respective totals for Russia).

Note: St.Rev—standard revenue, Land—total land area (hectares), AgLand—agricultural land (hectares), St.ha—standard land area (standard hectares), St.head—standard animal headcount (standard head), Sown—sown area (hectares).

Sources: Saraikin (2019); Table 2.

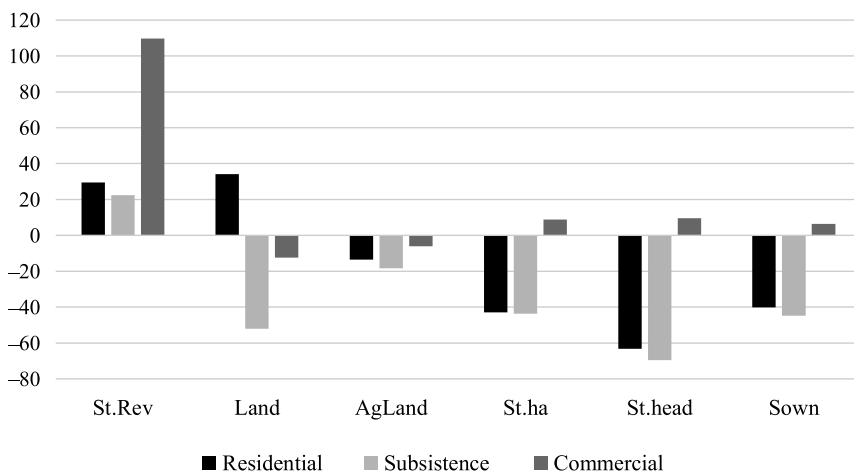


Fig. 3. Changes of six performance indicators by economic activity class, 2006–2016 (%).

Note: St.Rev—standard revenue, Land—total land area (hectares), AgLand—agricultural land (hectares), St.ha—standard land area (standard hectares), St.head—standard animal headcount (standard head), Sown—sown area (hectares).

Sources: Saraikin (2019); Table 2.

area differs from the physical area in that it allows for the cropping pattern and the national-average per hectare costs of the various crops.⁶

Fig. 3 shows the percentage changes in six performance indicators across the three economic activity classes (residential, subsistence, and commercial farms). The commercial farms are the only activity class that showed growth by four of the six indicators between 2006 and 2016: standard revenue, standard land area, standard animal headcount, and a marginal increase in sown area.

The area sown to technical crops in commercial farms increased by 52% between 2006 and 2016, and the area under vegetables grew by 72%, which boosted the standard area despite decreases in the physical area under potatoes (–12%) and perennial orchards (–30%). The standard area in residential and subsistence farms decreased due to the large across-the-board decrease in the sown areas for all crops in these activity classes. The standard animal headcount is also weighted by nationally averaged production costs per physical head, and the increase of this indicator for commercial farms was a direct outcome of the massive increase of about 50% between 2006–2016 in the number of more intensive livestock—pigs and poultry (the number of cows and beef cattle in this period decreased by about 15%). By comparison, the physical headcount of all animal species in residential and subsistence farms decreased quite dramatically (by about 50% and more) between 2006–2016, which naturally resulted in the observed decrease in the stan-

⁶ The standard area of a farm is the weighted sum of all the areas sown to different crops on the farm, where the weights are calculated nationally as the production costs per physical hectare of each crop relative to the production costs per hectare of wheat. Based on national production costs, the intensity of 1 hectare of wheat is equivalent to 0.09 hectares of vegetable, 0.2 hectares of sugar beets, and 1.01 hectares of sunflower (or 1 hectare of vegetable is equivalent to 11.5 hectares of wheat, 1 hectare of sugar beets—to 4.9 hectares of wheat and so on). Thus, a shift from wheat to vegetables (horticultural crop) or sugar beets (technical crop) will increase the standard area of the farm, whereas shifting from wheat to sunflower (another technical crop) will not affect the standard area.

dard headcount in these economic activity classes (see Fig. 3). The commercial farms are now the main livestock producers in Russia, controlling about 98% of the herd (by standard headcount). The livestock production in non-commercial farms has been marginalized since 2006.

4. Subdivision of commercial farms

In the USDA classification by economic sales classes, farms with less than \$1,000 are ignored. In the Russian classification by economic activity classes, \$1,000 is the threshold between non-commercial and commercial farms. Non-commercial farms with standard revenue up to \$1,000 are divided into residential and subsistence family farms, as discussed above, while the commercial farms with standard revenue of more than \$1,000 can be subdivided into four subgroups that also follow the USDA classification by economic sales class:⁷

- Subsidiary family farms with standard revenue between \$1,000 and \$10,000 (first economic sales class in the USDA classification)
- Peasant farms with standard revenue between \$10,000 and \$100,000 (second economic sales class)
- Small capitalist farms with standard revenue between \$100,000 and \$1 million (third, fourth, and fifth economic sales classes in the USDA classification combined)
- Large capitalist farms with standard revenue of more than \$1 million (the top economic sales class in the USDA classification)

The growth of nominal standard revenue between 2006 and 2016 shows a clear upward trend with average farm size (Fig. 4): it is lowest for residential and subsistence farms (80% and 60%, respectively), higher for peasant farms and small capitalist farms (170%), and highest for large capitalist farms (460%). However, as noted previously, the consumer price index rose to 240 in 2016 from the base of 100 in 2006, and it is only the large capitalist farms that showed a positive real

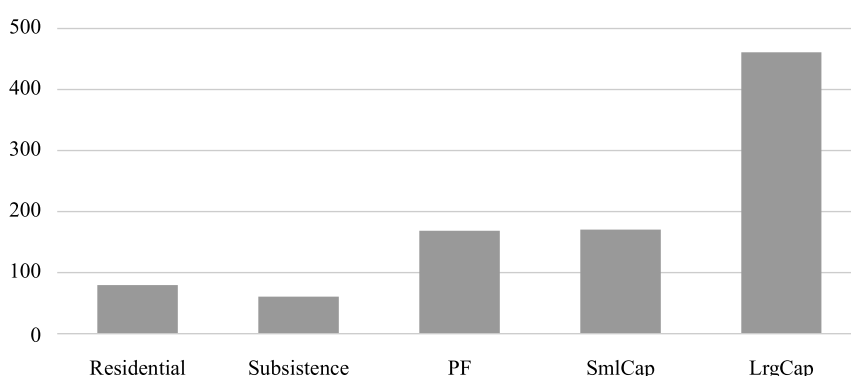


Fig. 4. Growth of standard revenue, 2006–2016 (%).

Note: Changes in absolute values of standard revenue, without normalization as in Fig. 3. PF—peasant farms, SmlCap—small capitalist farms, LrgCap—large capitalist farms.

Sources: Saraikin (2019); Tables 2–5.

⁷ Small capitalist farms and large capitalist farms are sometimes aggregated into one class of capitalist farms with standard revenue of more than \$100,000.

growth of standard revenue between 2006 and 2016. For all other farms, the real (inflation-adjusted) standard revenue in 2016 was less than in 2006.

All the other performance indicators (total land area, agricultural land area, standard area, standard animal headcount, and sown area) showed noticeable growth for large capitalist farms (40%–70% by most indicators) as opposed to general decline for other economic activity classes (Fig. 5).

The share of large capitalist farms in all performance indicators without exception markedly increased between 2006 and 2016 (Fig. 6), whereas the share of

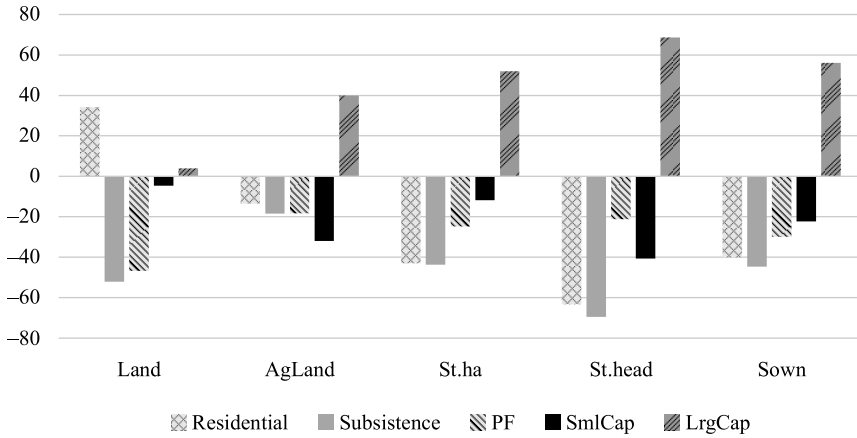


Fig. 5. Changes of physical indicators by economic activity classes, 2006–2016 (%): Growth by all indicators in large capitalist farms, decline in (almost) all other activity classes (exception: slight growth of total land in residential farms).

Note: St.Rev—standard revenue, Land—total land area (hectares), AgLand—agricultural land (hectares), St.ha—standard land area (standard hectares), St.head—standard animal headcount (standard head), Sown—sown area (hectares).

Sources: Saraikin (2019); Tables 2–5.

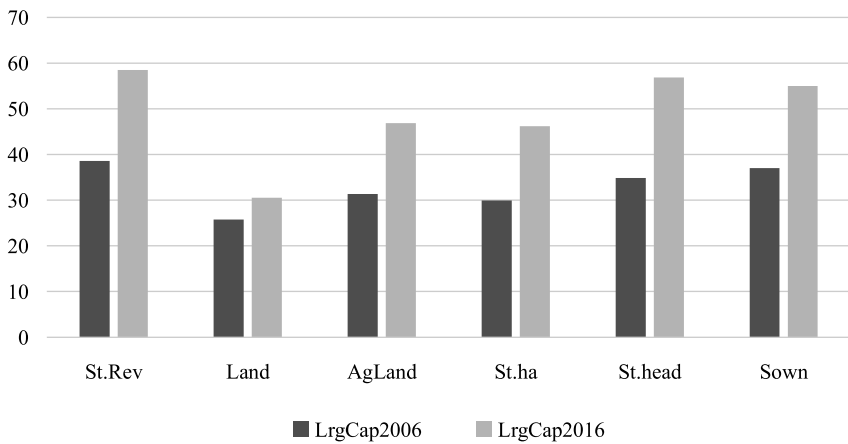


Fig. 6. Share of large capitalist farms in 2006 and 2016 (% of respective totals).

Note: St.Rev—standard revenue, Land—total land area (hectares), AgLand—agricultural land (hectares), St.ha—standard land area (standard hectares), St.head—standard animal headcount (standard head), Sown—sown area (hectares).

Sources: Saraikin (2019); Table 5.

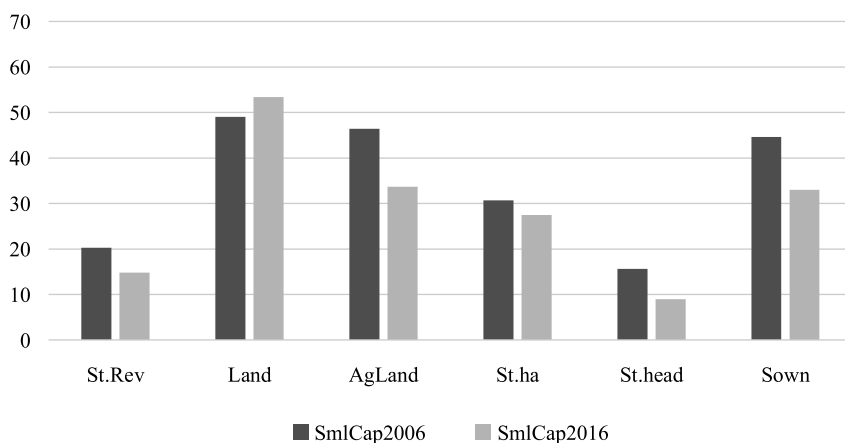


Fig. 7. Share of small capitalist farms in 2006 and 2016 (% of respective totals).

Note: St.Rev—standard revenue, Land—total land area (hectares), AgLand—agricultural land (hectares), St.ha—standard land area (standard hectares), St.head—standard animal headcount (standard head), Sown—sown area (hectares).

Sources: Saraikin (2019); Table 5.

small capitalist farms decreased by most indicators (Fig. 7). The only exception in this group was the total land, where the share of small capitalist farms was smaller in 2006 than in 2016. Here again we observe that only the largest farms show a robust growth of their share, while the share of farms of other activity classes decreases.

5. Regional variability

Russia is a huge country spanning eleven time zones, with a great diversity of geographical and agro-climatic conditions. It is not surprising, therefore, that agricultural performance is highly variable across the 80-odd administrative divisions of the second level (oblasts, krays, republics; Fig. 8). As noted above, standard revenue per hectare and per head range between wide limits over Russia. This variability is preserved even when Russia's regions are grouped into eight first-level administrative divisions—the federal districts (*federalnye okruga*), as in Fig. 8.

The Central Federal District, which includes Moscow and the near-lying oblasts, has the highest performance by both revenue per standard hectare and revenue per standard head (Fig. 8). The Southern Federal District, which includes the strongly agricultural chernozem regions of Krasnodar and Rostov just south of the border with Ukraine, attains a high crop productivity by revenue per standard hectare, and so does the North Caucasus Federal District, where Stavropol is located. Yet their livestock performance is poor. The second highest livestock performance by revenue per standard head (after the Central Federal District) is recorded in the North-Western Federal District, where it is attributable to the Leningrad Oblast; its crop performance is poor, probably due to the harsh northern weather and low-quality soil.

Even the high performing federal districts have very low performing regions (Fig. 9). The variability of agricultural productivity thus cannot be fully explained

by agro-climatic and geographical conditions. It is probably also due to differences in management capacity and lobbying power across regions. The regional variability is substantially greater in livestock production (see Fig. 5). This may be due to uneven entry of livestock agroholdings (such as Miratorg) across regions. Regions with agroholdings benefit from increased investment, including state support funds, and thus attain high efficiency. Regions without the investment boost from agroholding suffer a decline of the livestock herds and have correspondingly low livestock performance indicators. A possible relationship between regional performance and the entry of agroholdings is a subject of ongoing research.

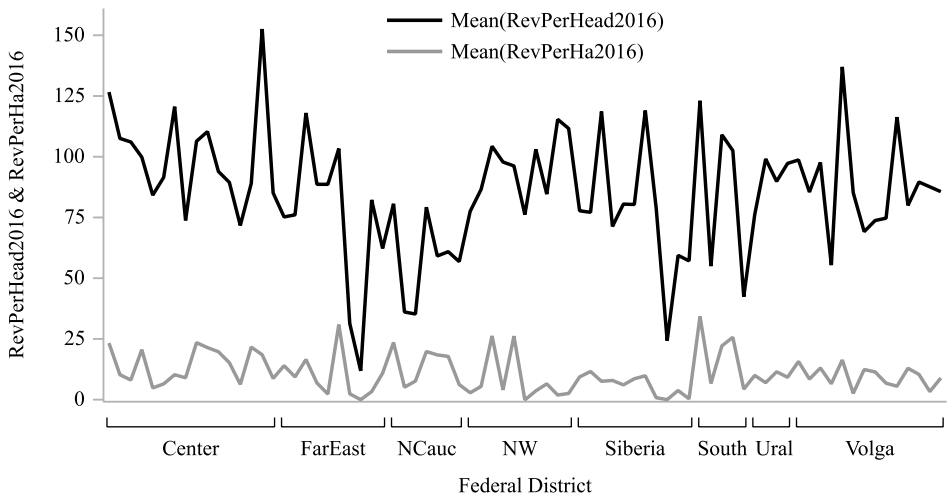


Fig. 8. Variability of crop and livestock efficiency measures (standard revenue per hectare and standard revenue per head in thousand rubles) across regions grouped by federal district, 2016.

Source: Rosstat (2017).

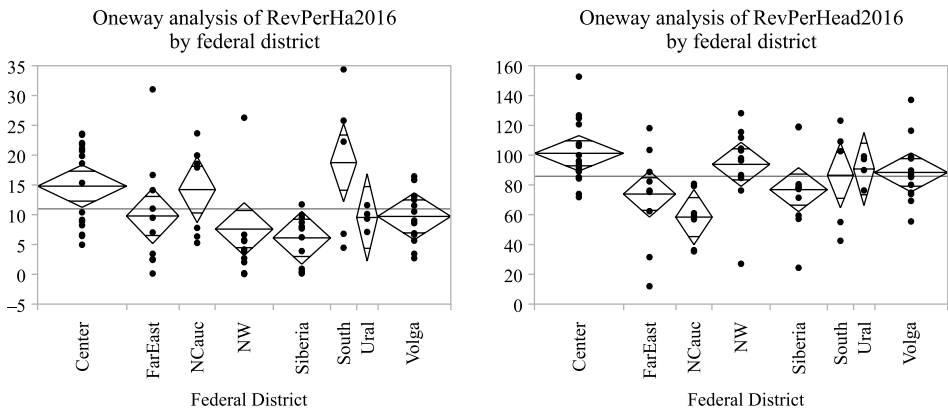


Fig. 9. One-way analysis of variance of crop and livestock efficiency measures by federal district, 2016: Revenue per standard hectare (left panel) and revenue per standard head (right panel), both in thousand rubles.

Note: The horizontal middle bar in each diamond is the mean, the two short horizontal bars near the apexes are the 95% confidence limits.

Source: Rosstat (2017).

6. Discussion of results

Analysis of the 2016 agricultural census (Rosstat, 2017) shows that Russian agriculture remains strongly dual after more than 25 years of policy reforms (this was discussed also in Lerman and Sedik, 2013). Out of a total of 28.5 million agricultural producers in the 2016 census, 25.3 million (or 89% of farms) produce just 5% of marketable agricultural output. On the other hand, commercial farms cultivate 92.2% of all agricultural land and receive 94.7% of all standardized revenue. Unexpected was the high share of household plots and family farms in total standard revenue—together 33.5%, which allows us to conclude that there is a high degree of commercialization among both forms. However, the number of commercial household plots is small—3 million out of a total of 23,1 million, or just 13,2% of all household plots.

The strong duality by standard revenue is demonstrated in Fig. 10, where the long left tail of small farms abruptly gives way to a vertical “cliff” (defined by the horizontal black line) in which 11% of large farms produce 95% of marketable output.⁸ All the farms in the left tail are from the two lower activity classes: residential and subsistence farms; the farms in the right tail are from the top activity class of commercial farms (3.2 million farms, see Table 2). A similar manifestation of dual structure is provided by land, where 11% of relatively large farms (all of them commercial) control 97% of land (Rosstat, 2017).

Analysis of the 2016 agricultural census highlights the heterogeneity of the agricultural producers within each legal-organizational farm type traditionally identified by Russian official statistics (agricultural enterprises, peasant farms, household plots, gardening associations). Agricultural enterprises and peasant farms produce the bulk of commercial agricultural output, while the commercial

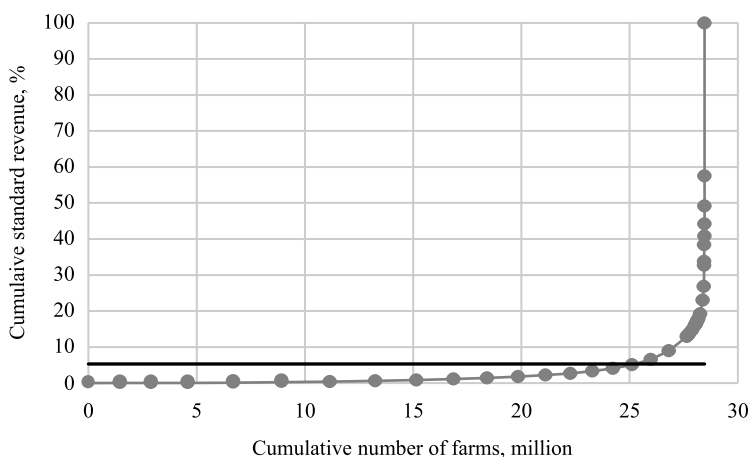


Fig. 10. Dual structure of Russian agriculture:
Concentration of standard revenue in a small number of large farms, 2016.

Source: Rosstat (2017).

⁸ A more detailed analysis of the right tail shows that just 2,016 large farms (less than 0.01% of all farms) produce 43% of standard revenue, i.e., marketable output. This result is illustrated by the last but one point on the ascending branch of the distribution in Fig. 4.

output of household plots is produced by a small subset of this huge category of farms. The classification of agricultural producers by legal-organizational form is outdated: some peasant farms produce more revenue than agricultural enterprises and some household plots match or exceed peasant farms by their production. A new farm classification system is required in the new environment, based on sales volumes of the activity class we have defined as commercial farms—some 3.2 million units or 9% of the census farms with annual sales of at least \$1,000. This relatively small group of farms contributing 95% of agricultural revenue (see Table 2) and controlling 97% of agricultural land (see Fig. 2) should be at the focus of monitoring and policy efforts.

7. Conclusion

These results suggest that the traditional farm classification used for statistical purposes does not reflect adequately the dynamic changes stemming from the response to market signals. In view of the strong skewness of agrarian structure by both standard revenue and land it may be relevant to revisit the sampling criteria for statistical surveys, eliminating the lower tail of small, recreational and subsistence farms and thus bringing the Russian farm survey criteria more in line with the farm-classification criteria in the U.S. and the E.U.

The agrarian structure changed markedly during the decade 2006-2016, as the corporate farm sector—including the new agroholdings—began regaining the ground it had lost to the family-farm sector after 1990. This is a further indication of the development of market mechanisms in Russia's agriculture. However, the decrease in the role of small agricultural producers constitutes a distinct danger to national food security and rural development, while the unchecked growth of super-large enterprises biases lobbying efforts, agricultural policies, and budget allocations in favor of the very large producers. To provide a level playing field for all agricultural producers, the government should strive, on the one hand, to ensure a more uniform distribution of agricultural subsidies and, on the other, to assist by every possible means in the development of alternative rural employment opportunities and in integrated development of rural areas. Development of alternative rural employment and rural infrastructure is crucial if we are to achieve the policy goal of supporting only sustainable and market-oriented producers. Subsistence farms should be supported through social budgets earmarked for the development of alternative sources of rural income, not by agricultural production budgets.

The development of massive agroholdings localized in certain regions has had an unexpected negative effect. The local agroholding becomes the sole employer in the region, and yet from considerations of efficiency it must shed labor: there are not enough jobs in the agroholdings for the entire population. Creation of new non-agricultural jobs is a function of infrastructure development and takes time. In the short term, the new rural unemployed either migrate to urban areas in search of employment or retreat into small-scale subsistence farming on their household plot to supplement their pensions. These negative effects play out with special force when the local agroholding goes bankrupt: an entire region is left without sources of employment and income, which leads to abandonment and depopulation as people move elsewhere in search of work. A rural revitalization program

approved in June 2019 with a budget of 200 billion rubles annually (Government of the Russian Federation, 2019) is intended for government co-financing of large social-engineering projects in rural areas (roads, housing, water and electricity supply), but however important its potential contribution to rural infrastructure, no amount of comfortable modern housing can replace jobs. Policy makers must address alternative job creation in rural areas as a top priority.

References

- Government of the Russian Federation (2019). *State Program for integrated rural development*, Government Resolution No. 696, May 31 (in Russian). <http://government.ru/docs/36905/>
- Lerman, Z., & Sedik, D. (2013). Russian agriculture in transition. In M. Alexeev, & Sh. Weber (Eds.), *The Oxford handbook of the Russian economy* (pp. 514–543). New York: Oxford University Press.
- Rosstat (2007). All-Russia agricultural census 2006. Moscow (in Russian). <https://gks.ru/folder/520>
- Rosstat (2017). All-Russia agricultural census 2016. Moscow (in Russian). <https://gks.ru/519>
- Saraikin, V. A. (2019). Comparative analysis of economic classes of farms according to the all-Russian agricultural censuses of 2006 and 2016. *Ekonomika Selskokhoziaystvennykh i Pererabatyvayushchikh Predpriyatii*, 9, 64–74 (in Russian). <https://doi.org/10.31442/0235-2494-2019-0-9-64-74>
- USDA (2019). *2017 Census of Agriculture, United States, Summary and State Data* (Vol. 1, Geographic Area Series, Part 51, April). Washington, DC: U.S. Department of Agriculture's National Agricultural Statistics Service. https://www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Volume_1,_Chapter_1_US/usv1.pdf
- Uzun, V. Ya., Saraikin, V. A., & Gataulina, E. A. (2010). *Classification of agricultural producers from the 2006 all-Russian agricultural census*. Moscow: VIAPI named after A. A. Nikonov (in Russian).