

# Food loss reduction interventions and food security: The case of Russia

Ekaterina A. Galaktionova\*, Nataliya A. Karlova

*Institute for Agrarian Studies, HSE University, Moscow, Russia*

---

## Abstract

It is often taken for granted that food loss and waste (FLW) reduction leads to better food security on the local, national and global levels. However, in reality, relations between food security and FLW are not direct, and reduction of food losses and even the increase of food availability do not automatically mean the rise in affordability and access for the most vulnerable people. In this paper, the authors explore food losses on the example of grain primary production and chicken meat processing in Russia. They identify the causes of food losses in each case and provide a number of possible solutions for food loss reduction. However, it is also highlighted and explained in the paper why not every measure to reduce food loss will result in better food security overall and the increase of well-being for the most vulnerable population.

*Keywords:* food loss, FAO, food security, food basket.

*JEL classification:* Q1, Q18.

---

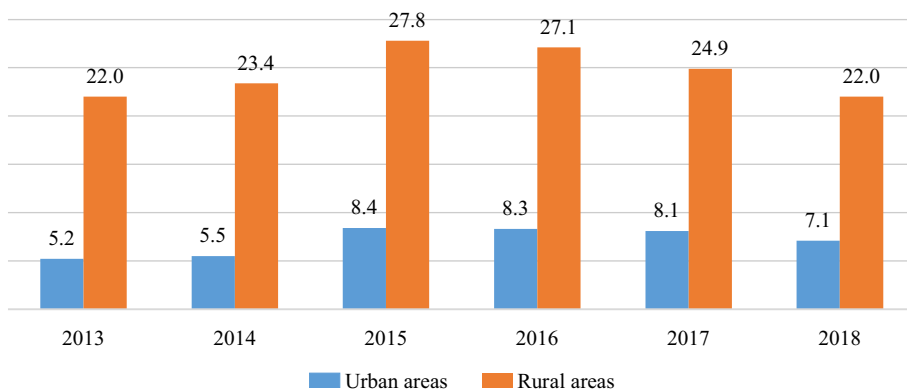
## 1. Introduction

According to Food and Agriculture Organization of the United Nations (FAO), food loss and waste (FLW) have a significant impact on sustainability and resilience of agricultural and food systems and their ability to ensure food security and nutrition for everyone today and in the future. FLW reduction also supports better use of natural resources (Committee on World Food Security, 2014). Although it is implicitly assumed that the reduction of FLW will contribute to improving food security and nutrition for the poor, the studies show that it is not always the case as the increase of available food may be, for example, countered by higher prices.

FAO states that food losses occur due to a deterioration or disappearance of the product caused by the (mal)functioning of the food production and supply

---

\* Corresponding author, E-mail address: egalaktionova@hse.ru



**Fig. 1.** The share of the poor in the total population of the corresponding group (%).

Source: Arefieva et al. (2021, p. 59).

system (Fabi and English, 2019). Thus, the causes of FLW would be mainly related to operations, processes, infrastructure, i.e., something that is usually out of the reach of a single farm or organization, and demands an interference on the part of the government or/and a collective business initiative.

In this paper, we are going to focus on the rural poor. According to Russian State Statistics Service (Rosstat), in the period from 2013 to 2018, the share of the poor in the total population in rural areas was consistently higher than the corresponding share in urban areas—22.0% and 5.2%, respectively, in 2013 and 22.0% and 7.1% in 2018 (Fig. 1).

We are going to examine two separate cases of food loss—production of grain and processing of chicken. Grain production case is based on an expert interview as well as related publications. The chicken meat processing case is based on an in-depth interview with a company owner and director. Finally, we are going to use a qualitative analysis to examine the issues regarding food loss reduction and how possible interventions may increase or decrease food security.

Filimonau and Ermolaev (2021) highlight the lack of research on FLW and its impact on food security in non-western markets despite the fact that developing and transition economies hold the largest shares of FLW occurring in the upstream stages of the global food supply chain. For example, Russia accounts for 10–23% of the world’s total grain and wheat exports. At the same time, research on its sustainability here is scarce, despite the country producing circa 17 million tonnes of FLW per annum.

In Russia, research regarding FLW started only with the launch of FAO Liaison Office with the Russian Federation in 2015. Since then numerous attempts to promote FLW onto the political agenda were carried out. However, despite some achievements in this field, there is still no state-supported research or a comprehensive country study. Current food loss is quantified by the balance method, and many questionnaires and concepts have been preserved from the Soviet period.

Russia has no national strategy on FLW prevention. The major environmental program currently realized in Russia is the national project “Ecology” under the Ministry of Natural Resources and Environment. The concept of FLW prevention is not even mentioned in it (Galaktionova et al., 2022).

Current research in the country faces quite a lot of obstacles, namely:

- in Russia, there is no single definition of FLW. Although the definition of FAO is used by the government, there is no clear distinction between food loss and food waste; *FLW* is often used interchangeably with *organic waste*;
- there is no concept of FLW prevention/reduction in the political agenda;
- existing legislation does not facilitate efforts to reduce FLW and often may be an obstacle (e.g., food donations are still subject to VAT, thus limiting the possibilities of food banks);
- there are no incentives for companies to reduce their food losses or even disclose this information. Companies are worried about potential reputational damages and even fines from the state as there is no general understanding of systemic causes of food loss (Galaktionova et al., 2022).

Thus, more research on FLW in Russia is needed. Moreover, the link between FLW, on the one hand, and food security, nutrition and poverty, on the other, has not been sufficiently studied. The absence of reliable and consistent data on the impacts of food loss and waste impedes comparisons between regions and countries (FAO, 2019). This article is aimed at bridging some knowledge gaps and contributing to overall FLW research.

## 2. Main concepts

### 2.1. Complex relations between FLW and food security

FAO (2019) defines food security as a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life. Although it is often taken for granted that FLW reduction straightens food security, their relations are not so direct. For example, a certain level of oversupply is needed as a buffer to ensure food availability, e.g. if production goes down or consumption expands. Maintaining such buffers inevitably causes a certain amount of FLW (FAO, 2019). Moreover, any increase in food supply does not automatically mean more food for people who are food insecure. For example, the costs of new equipment or technologies at the production stage will ultimately be covered by final consumers, and the most vulnerable may not be able to afford the product due to low income.

At the same time, there is the perception that food saved from being lost or wasted could be made available for human consumption without taking into account the costs needed to reduce FLW. For example, to improve storage conditions one should invest in storage capacities. However, potential investors may not be convinced in the return or they may not have access to credit or willingness to take the risk. Another example — shops would waste less if they were to stock up several times per day and if households were to buy their food daily from these shops. However, while this would certainly lead to better purchase planning and, consequently, less FLW, there would be higher costs for the retail shops and households. The impact on resource efficiency is also not at all clear (Koester, 2014).

Thus, to outline the measures to reduce food loss, decision makers should carry out a cost-benefit analysis to make sure that the measures are economi-

cally feasible, identify all stakeholders and calculate the winners and losers of those measures (Koester and Galaktionova, 2021). For example, some types of packaging can prolong the shelf life of chicken meat. However, the price of packaging is high, and it will inevitably increase the final price for consumers at the retail stage. Consequently, such products will become less affordable, decreasing food security. There is an ongoing discussion of extended producer responsibility, according to which manufacturers/importers of goods must process and dispose 10% of packaging after using the product. It means that businesses should use more eco-friendly and recyclable packaging; however, they will have to either increase prices to cover their growing costs or, to avoid losing their consumers, carry a good share of this financial burden. Currently, the implementation of the corresponding document is postponed.<sup>1</sup>

## 2.2. The consumer basket in Russia

The consumer basket in Russia was introduced in 1992 and was used to determine the minimum subsistence level and the minimum wage.<sup>2</sup> In 2021, the Ministry of Labor and Social Protection prepared a draft order to abolish it because of switching to another system for minimum wage calculation.<sup>3</sup> We should note that in Europe and the United States, the consumer basket has a completely different function: it reflects the average real consumption of citizens and is compiled on the basis of surveys and diaries of purchases by citizens. Such a basket is used to calculate not the minimum subsistence level, but the Consumer Price Index.<sup>4</sup>

Since 1992, the categories of food in the Russian consumer basket have not changed. However, in quantitative composition, it has fewer bread products, potatoes and fats. The volume of fruits increased more than three times, meat products—almost twice. The official cost of the food part of the consumer basket before it was abolished was 5305 rubles per month. Fig. 2 demonstrates household food consumption by income level—the first (the poorest) percentile in comparison with the tenth (the wealthiest) percentile.

During 2016–2020, the rural (more vulnerable) population reduced the consumption of bread products (by 5.1%), potatoes (by 7.1%), sugar and confectionery (by 5.6%). At the same time, the consumption of fruit and berries (by 7.7%), meat and meat products (by 3.7%), eggs (by 4.5%) increased. This indicates an improvement in the nutrition structure of rural residents (Table 1; Arefieva et al., 2021).

The economic crisis has negatively affected the diet of consumers in both urban and rural areas. Consumers have to switch to cheaper types of food, preferring bread, potatoes and dairy products over vegetables and fish. According to the global company Nielsen, the share of the low price food and consumer goods reached 17.7% against the annual average of 16.9%. At the same time, the share of

<sup>1</sup> <https://www.vedomosti.ru/ecology/regulation/articles/2022/02/17/909698-upakovka-ne-speshit-pererabativatsya> (in Russian).

<sup>2</sup> <https://legalacts.ru/doc/federalnyi-zakon-ot-03122012-n-227-fz-o/> (in Russian).

<sup>3</sup> <https://regulation.gov.ru/projects#npa=115371> (in Russian).

<sup>4</sup> <https://www.kommersant.ru/doc/4800082> (in Russian).

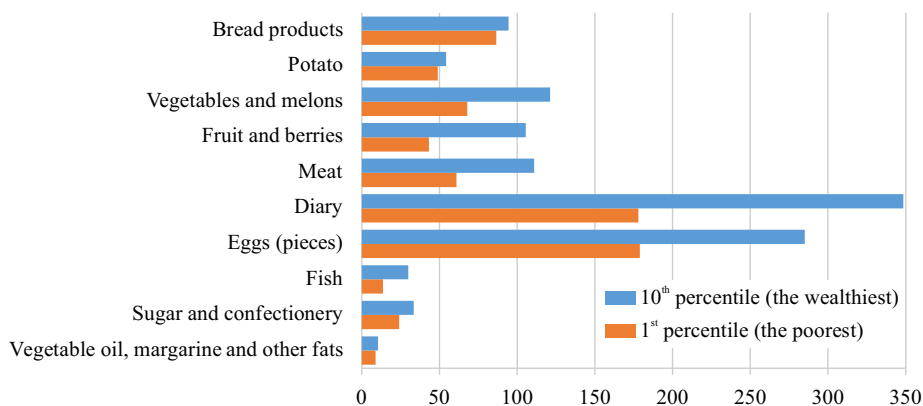


Fig. 2. Household food consumption by income level in 2020, in average per capita (kg).

Source: Rosstat (2021, p. 22).

Table 1

Consumption of basic foods in rural and urban households, per household member per year (kg).

Basic foods	Rural area					Urban area	Rural area to urban area, %		Rural area 2020, %	
	2016	2017	2018	2019	2020	2020	2020	to 2019	to 2016	
Bread products	117	119	114	110	111	90	123.3	0.9	-5.1	
Potato	70	71	67	66	65	54	120.4	-1.5	-7.1	
Vegetables and melons	104	102	106	105	105	104	101.0	0.0	1.0	
Fruit and berries	65	68	69	70	70	79	88.6	0.0	7.7	
Meat	82	86	83	84	85	94	90.4	1.2	3.7	
Diary	261	261	261	255	260	275	94.5	2.0	-0.4	
Eggs, in pieces	221	226	231	229	231	242	95.5	0.9	4.5	
Fish	22	23	23	22	22	22	100.0	0.0	0.0	
Sugar and confectionery	36	36	36	34	34	30	113.3	0.0	-5.6	
Vegetable oil and other fats	12	13	12	12	12	10	120.0	0.0	0.0	

Source: Arefieva et al. (2021).

premium price goods decreased from 35.8% on average for the year to 34.4%.<sup>5</sup> In 2020, the consumption volume of bread by rural residents exceeded that by urban residents by 23.3%, sugar—by 13.3%, and potatoes—by 20.4%. Still, the consumption of rural residents lags behind in fruit by 11.4%, and in meat by 9.6%.

### 2.3. Causes of food loss in the region of Europe and Central Asia (ECA)

Although there is no country report on FLW in Russia, there are regional reports prepared by international organizations. Table 2 provides the causes of FLW common in the ECA region based on two sources from 2013 and 2022. The first source is the Synthesis report of 2013 based on the country reports on Ukraine, Armenia, and Turkey (Koester et al., 2013). The second source is the presentation

<sup>5</sup> <https://rg.ru/2021/02/25/rossijskie-domohoziajstva-v-2020-godu-snizili-potreblenie-na-86.html> (in Russian).

**Table 2**

Causes of FLW in the ECA region.

Reduction of FLW in Europe and Central Asia (2013)	Stocktake of UNFSS outcomes (2022)
a) Inadequate technology	a) Lack of modernization of value chains
b) Specific consumer preferences	b) Lack of digital technology and innovation
c) High opportunity costs	c) Lack of environment for entrepreneurship
d) Worldwide trends	d) Lack of education, research, and institutional capacity
e) High transaction costs	e) Not enough emphasis on food and nutrition security
f) Education	f) Lack of enough measures for climate adaptation and mitigation
g) The length of the supply chain and the location of production as compared with the location of consumers	

Sources: Koester et al. (2013); Wellesley (2022, slide 8).

**Table 3**

Cereal yield in 2018 (kg per hectare).

Country	Cereal yield
Bulgaria	5,464
Germany	6,220
Moldova	3,683
Norway	2,430
Russia	2,616
United Kingdom	6,789
USA	8,692

Source: World Bank (<https://data.worldbank.org/indicator/AG.YLD.CREL.KG>).

Stocktake of UNFSS outcomes in the ECA region: Preliminary findings of 2022 (Wellesley, 2022).

Some points in these lists highlight the same problems, for example, outdated technologies, high transaction costs, lack of education, etc. The issue is that smaller households and businesses are usually unable to purchase expensive technical equipment; moreover, they use outdated methods of production and harvesting, which may lead to spillages, leaving some crops in the field, and damaging fruits and vegetables. Better storage technologies, as well as the correct application of plant protection agents, are the ways to reduce food losses. According to the expert interview with Singenta company, many agricultural businesses in pursuit of short-term income do not follow crop rotation or crop zonation, making it impossible to have good harvests in the long term. Moreover, producers tend to pay little attention to plant protection in an attempt to save some money; however, it usually results in food losses—and monetary losses as well.

Another issue is that grain yields per hectare are much lower in Russia than in most Western countries (Table 3). The reasons can be attributed to lack of technology, farm financing system, extension service, and adequate know-how.

### 3. Grain and chicken cases

In this paper we study two cases from Russian agriculture. They concern grain (mainly wheat) production and chicken meat processing. Grain and grain products play a crucial role for the poor. According to Rosstat (2021), the first

percentile (the poorest) consumed 86.5 kg of bread and bread products in 2020 on average per capita. This is the second highest number only after dairy — 178.0 kg. At the same time, chicken is the most consumed meat, and in 2020, the consumption in the category birds' meat equaled 25.5 kg on average per capita in rural (i.e., poorer) households against 9.8 kg of beef, 1.8 kg of ram and goats, and 16.5 kg of pork correspondingly.

### 3.1. The grain case

Based on the expert interview, the overall picture of grain losses at the production stage in Russia by regions is as following.

*Southern Federal District.* Overall, this region is characterized by dry weather, which is favorable, because when harvested grain is dry, losses are less. Local producers generally have high quality equipment, advanced grain warehouses and fans, etc. Many have their own laboratories. The larger the enterprise, the better the equipment. Losses in this region are insignificant.<sup>6</sup>

*Central Federal District.* This region is characterized by higher precipitation. Farmers here are not as rich as in the South, and generally have no money for laboratories. There are more losses. By rules, grain should be transported to elevators, processed there, then loaded on to trains and transported to the destination. However, farmers tend to keep their grain in their own warehouses in order to save money. Since there are no proper conditions there (usually they are sheds), self-heating and damage occur. Losses in the region as a whole are not so significant; however, for individual actors, they may cost up to 40% of revenue.

*Ural Federal District.* In this region, the elevators are mainly small-sized, thus there is not enough space for all harvested grain. Harvesting can be carried out under rain, and even snow. Usually farmers dry harvested grain in swathes, where some of the losses occur, before taking it to an elevator. Losses here are significantly higher. If there is a large farm with its own elevator, then losses are considerably smaller.

The main causes of food losses there include lack of technology (elevators) and money, when farmers choose to dry grain in their own warehouses or even in the fields. Thus, the focus should be on better financing and better technologies (elevators). Higher productivity was not touched upon by the expert; however, the emphasis on it may not only reduce losses but also increase yields both for domestic use and exports.

One of the steps towards increasing the efficiency of grain production is the creation of the federal state information system for the traceability of grain and grain processed products. After its successful pilot phase in the Altai region, it became obligatory on the federal level since September 1, 2022.<sup>7</sup> The system includes all local enterprises that produce grain and oilseeds and provides information on the volume of production, export and supplies to elevators, as well as the class of products, place of production, gluten content and other characteristics. These data will help to decide on sales volumes, sales quotas, etc. It is expected

<sup>6</sup> The authors doubt the “insignificance” of losses. Obviously, the unexploited production potential is not taken into account and at least yield/ha proportion could be much higher.

<sup>7</sup> <https://specagro.ru/fgis> (in Russian).

that the system will solve the problem with large unaccounted grain volumes in Russia that reportedly amount to about 10 million tonnes.<sup>8</sup>

### 3.2. The chicken case

An interview was held with a small chicken processing company with 25–48/50 employees, and productiveness of up to 20 tonnes per day. According to the company, its annual losses are approximately 3–5% of the weight of the truck. In the case of second-class birds, this amount increases to 7–8% due to feathers, broken wings, legs, etc., which are removed; therefore, there is weight loss.

*Technological aspects.* There are no domestic manufacturers of equipment, and foreign machinery (which usually comes from Austria, Germany, and Poland) is very expensive. Therefore, small- and medium-sized poultry farms use mainly manual cutting. Large poultry farms, on the other hand, have almost zero-waste production. For example, bones are crushed into minced meat and bone flour, skin and blood are processed into animal feed. In such companies, the main losses are connected to the expiration dates due to the errors in sales and marketing departments and consumer demand.

*Logistics.* On average, 80% of truck drivers do not comply with transportation conditions, and simply do not turn refrigerators on, trying to reduce costs of gas, as a refrigerator demands 3–6 liters of fuel for every 100 km. The cheaper the refrigerator, the more fuel it needs. The problem is also that the drivers do not interact with suppliers directly; there are dispatcher companies working as intermediaries. Currently, poultry farms have refused to provide logistics services, as this is an extra burden in terms of taxes, and truck-related expenses can be bigger than the revenue from transportation.

*Customers.* For processing companies, the largest losses at the consumer stage are associated with catering. There, the orders are tied to the weight of the incoming raw poultry and its weight after cooking. Canteen-like places cause less loss at the processing stage, as, for example, sending a kilo of chicken for a soup incurs considerably fewer losses than cutting chicken into pieces that weigh exactly 250 grams each.

*Power outages.* Severe losses can occur due to power outages that happen mainly because of old infrastructure and failures of backup power. Many companies install generators, but they are usually low-power—enough to provide the light, but not to keep the necessary temperature in refrigerators. That is why large enterprises usually have their own substations.

## 4. Discussion

To outline possible interventions for each case to reduce food losses, we will use five questions formulated by Cattaneo et al. (2020). They are as follows:

1. Do we know how much food is lost or wasted?
2. What are the causes of FLW?
3. What interventions are best suited to address FLW and how should we target them?

<sup>8</sup> <https://rosng.ru/post/sistemu-proslezhivaniya-zerna-zapustyat-v-altayskom-krae> (in Russian).



4. What is the rationale for public intervention?
5. Are there trade-offs and unintended consequences of reducing FLW?

#### 4.1. *The grain case*

1. The general answer for the production stage is “no”, due to the limitations of the balance method. The supplementary information is mostly internal, for industry actors, and not a part of governmental statistics. The traceability system allows to calculate the overall production, which will help to better assess losses.

2. Weather conditions and the lack of proper storage. In some cases, producers choose to allow some losses instead of sending grain to elevators, as the cost of grain loss is less than the cost of storage. The issue of lower grain yields per ha was not even covered in the interview.

3. The first step is to identify the producers whose losses are the most significant, and the implementation of a traceability system on the country level is a good solution. Cooperatives may be an answer to the lack of grain elevators/money, however it is important to include the state in the development of cooperatives and liaisons between different actors along the supply chain (see Filimonau and Ermolaev, 2020).

4. The rationale is that smaller producers struggle; they are unable to compete with huge agroholdings that often act as monopolists. Entrepreneurship in Russian agriculture is not supported enough, and the existing measures are far from satisfactory.

5. Attracting more grain to the market through better traceability or more efficient storage means a greater supply of grain that will result in lower prices for consumers. However, it may also mean that the producers will struggle even more as lower prices for their products mean less income for their households. At the same time, the focus on the increase of yields is also necessary, as it will make grain production more effective and efficient both for domestic and international markets.

#### 4.2. *The chicken case*

1. We have the data on a by-company basis, but not on a by-industry basis.

2. The causes are various and range from cold chain breakages to low quality supplies and power outages.

3. First, better possibilities for small companies and entrepreneurs are needed. As is highlighted in Götz et al. (2022), poultry production in Russia is dominated by large agricultural organizations which have on average about 320,000 chickens per organization. Their share in production increased since 1996 from 60% up to 92% in 2019, thereby decreasing the importance of households, which have, on average, 33 chickens. In 2018, the top 20 poultry companies accounted for two-thirds of the production of Russia’s broilers. Although they have enough resources to minimize food losses, they control the prices and keep them relatively high making small companies survive. More competition will make prices more flexible—and better reflect the state of the market. Currently, smaller companies struggle and try to reduce all possible costs, including logistics. Plus, they cannot afford expensive equipment.

Second, better infrastructure. Renovation and proper maintenance of energy supplies are necessary.

Third, catering is a large source of food waste. Canteen-style food organizations may be a solution.

4. The situation will not change as long as agro holdings act as monopolists. Locals cannot maintain the infrastructure by themselves. Catering becomes more popular due to urbanization and a growing number of people belonging to the middle class; however, cafes and restaurants are a source of considerable losses at the processing stage.

5. Increasing the number of small actors in the market will change price equilibrium; however, lower prices for consumers tend to impact producers the most. Processors then will be able to purchase chicken meat cheaper. At the same time, as smaller actors are usually unable to purchase expensive equipment, food loss on their side may increase.

Using refrigerators will increase expenses on logistics as well as GHG emissions. More technologically advanced refrigerators may be a solution. However, although the volume of food losses will decrease, the price may not go down, but even surge due to higher costs. As a result, one cannot say for sure whether this intervention will be positive or negative for the rural poor without a cost-benefit analysis for a specific case in a specific territory.

## **5. Conclusions**

In Russia, there are practically zero interventions aimed directly at FLW reduction. Usually the purposes of the policies upstream the food supply chain (i.e., production, storage, processing, and transportation) concern better market operations, and ignore the consumer.

Russian agriculture is vastly represented by agricultural organizations—agro holdings. On the one hand, they create work places and have assets to purchase quality equipment. Food losses of those enterprises are relatively small. On the other hand, they often behave as monopolists who simply suffocate smaller actors, and this trend negatively impacts the market and pushes many businesses out of competition. Overall, there is a need for smaller farms with more client-oriented approach, thus a more favorable environment for entrepreneurship is necessary. It will allow decreasing prices along the food supply chain and will result in higher food availability; however, better food affordability will depend on various factors.

In the case of logistics issues and power outages, the solution lies beyond market actors. Drivers switch off refrigerators in order to save money for their households. Here, refrigerators switched on may mean less food availability for the driver's household, as dispatchers pay them minimum salaries. Power outages are unfortunately characteristic of rural areas. Better infrastructure is needed, and installing it may require budget money.

Overall, having food loss reduction in mind, as well as the interests of the most vulnerable, may create more opportunities for interventions that are now being overseen. Certainly, it is important to remember that there is no one fit all solution, and each case should be assessed separately, with at least cost-benefit analysis, as the relations between food security and food loss reduction are not that simple and linear.

## Acknowledgement

The authors thank Prof. Ulrich Koester for his very helpful comments.

## References

- Arefieva, V., Galaktionova, E., & Saraykin, V. (2021). Diets of rural and urban residents in the period 2015–2020. *Economy, Labour, Management in Agriculture*, 1(12), 58–65 (in Russian). <https://doi.org/10.33938/21121-58>
- Cattaneo, A., Sánchez, M. V., Torero, M., & Vos, R. (2020). Reducing food loss and waste: Five challenges for policy and research. *Food Policy*, 98, 101974. <https://doi.org/10.1016/j.foodpol.2020.101974>
- Committee on World Food Security (2014). *Food losses and waste in the context of sustainable food systems*. Rome: Food and Agriculture Organization of the United Nations.
- Fabi, C., & English, A. (2019). Methodological proposal for monitoring SDG Target 12.3. Sub-indicator 12.3.1.A. The Global food loss index design, data collection methods and challenges. *FAO Statistics Working Paper Series*, No. 18-13.
- FAO (2019). *The state of food and agriculture 2019. Moving forward on food loss and waste reduction*. Rome: Food and Agriculture Organization of the United Nations.
- Rosstat (2021). *Household food consumption in 2020 according to the results of the Sample Survey of Household Budgets*. Moscow: Federal State Statistics Service (in Russian).
- Filimonau, V., & Ermolaev, V. (2021). Mitigation of food loss and waste in primary production of a transition economy via stakeholder collaboration: A perspective of independent farmers in Russia. *Sustainable Production and Consumption*, 28, 359–370. <https://doi.org/10.1016/j.spc.2021.06.002>
- Galaktionova, E., Kok, M., & Bos-Brouwers, H. (2022). Ways to monitor FLW: Review and recommendations on data collection and reporting for the Russian context. *Russian Journal of Economics*, 8, 81–94. <http://doi.org/10.32609/j.ruje.8.78613>
- Götz, L., Heigermoser, M., & Jaghdani, T. J. (2022). Chapter 4: Russia's food security and impact on agri-food trade. In S. K. Wegren, & F. Nilssen (eds.), *Russia's role in the contemporary international agri-food trade system* (pp. 115–137). Cham: Palgrave Macmillan. [https://doi.org/10.1007/978-3-030-77451-6\\_5](https://doi.org/10.1007/978-3-030-77451-6_5)
- Koester, U. (2014). Food loss and waste as an economic and policy problem. *Intereconomics*, 49(6), 348–354. <http://doi.org/10.1007/s10272-014-0518-7>
- Koester, U., Empen, J., & Holm, T. (2013). *Reduction of FLW in Europe and Central Asia*. Synthesis Report prepared for Food and Agriculture Organization of the United Nations. Budapest: Regional Office for Europe and Central Asia (REU).
- Koester, U., & Galaktionova, E. (2021). FAO food loss index methodology and policy implications. *Studies in Agricultural Economics*, 123(1), 1–7. <http://doi.org/10.7896/j.2093>
- Wellesley, L. (2022). *Stocktake of UNFSS outcomes in the ECA region: Preliminary findings*. London: Chatham House.