

Proceeding paper

The Impact of COVID-19 on Grain Sector in Estonia [†]

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Abstract: A single paragraph of about 100 words to give a brief introduction to your work.

Keywords: COVID-19; supply chain; resilience; self-sufficiency; grain sector

1. Introduction

The onset of COVID-19 pandemic in 2020 exposed the agri-food systems to unprecedented challenges related to labor availability, industry shutdowns, input availability, transport and logistics bottlenecks [1]. Restrictions on movement and social gatherings, shutdowns of the hospitality industry and people isolating at home resulted in short-term panic buying followed by shifts in the use of retail channels and in consumption patterns, including demand for specific products such as flour and [2–5]. While the initial concerns related to the breakdown on food supply chains and food shortage did not materialize [1], the income and job losses [6] and soaring food prices in 2020 and 2021 [7], the uncertainties related to the global markets and ongoing pandemic continue to raise the concerns about food security and national self-sufficiency. Food self-sufficiency can be defined as the ability to produce enough food to cover the consumption needs of its population [8].

In the time of crisis, the production of staple foods such as grains and the resilience of their supply chains are of particular interest as grains can be easily stored. The research on the impact of the pandemic on grain markets demonstrated high global prices and high global demand despite large crops in 2020 [9]. This trend continued as 2021 was characterized by strong global demand, tighter supplies as well as a new record for global grain production [10].

Estonian trade balance for food stuff and agricultural products has been negative with the exception of milk and grains. However, the Estonian grain production has been going through several changes in the last decade. As the grains have vital role in ensuring food security at the time of crisis, the present research focuses on what have been the impact of COVID-19 on the Estonian grain sector. The analysis focuses on the changes of production and on the COVID-19 impacts reported by the grain supply chain stakeholders.

2. Methods

The present paper uses mixed approach. At first, Estonian grain production data retrieved from [11] is viewed to provide context for the grain sector developments in Estonia. Self-sufficiency ratio (SSR) is calculated for wheat, rye and barley.

$$SSR = \text{Production} \times 100 / (\text{Production} + \text{Import} - \text{Export}), \quad (1)$$

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SSR of 100% shows that the production is equal to consumption. SSR over 100% shows that countries are self-sufficient and produce the commodity more than they consume. SSR under 100% indicates that in case of this commodity the production does not cover the consumption needs [8,12].

The analysis of quantitative data is combined with qualitative data. In 2021, 16 semi-structured interviews with grain producers and focus group interview with 7 grain supply chain stakeholders was conducted to study their preparation for crises and the impact of COVID-19 on their supply chains. The interviewees were selected with purposeful sampling. Half of the interviewed farmers had more than 500 ha under grain with the largest producer cultivating more than 2000 ha. The focus group participants represented grain farmers and export cooperatives, farm input suppliers, feed industry, flour and milling industry, retail grocery chain. The interviews were recorded, thematically coded. The interviewees were asked to assess the impact of COVID-19 restrictions set in March 2020 and the later restrictions in 2020 and 2021, the impact of pandemic on their supply chain and operations. The results summarize that effects of the COVID-19 pandemic reported by the different segments of the supply chains.

3. Results and Discussion

3.1. Estonian Grain Sector

From 2010–2021, Estonian grain sector has seen strong growth fueled by number of developments in Estonian agriculture. Traditionally, dairy farming has been the most profitable activity in Estonian agriculture. In the last decade, dairy and beef and pig farmers went through several crises, incl. Russian export ban on agricultural products, outbreak of African swine fever that resulted in reduction of herds [13,14] and refocus on grain production. At the same time, there is ongoing structural change with number of farms decreasing and average size increasing [15,16]. From 2010 to 2020, the number of farms growing grains decreased by 21% from 5408 in 2010 to 4269 in 2020 [11], while the area under cultivation grew increased by 33.4% from 275,269 to 367,237 ha in 2021. The 3-year average yield of cereals increased by 53.9% to 4113 kg/ha (Figure 1). Growth in cultivated area and yield resulted with 87.5% growth of 3-year moving average production of cereals, which reached increased 1.51 million tons in 2021.

Increase in cereal production has significantly increased self-sufficiency ratios (Figure 1). In 2020, Estonia was 658% self-sufficient with wheat (321% in 2019) that is one of the highest levels on the record and meaning that Estonia produced six times more wheat than its population would need for consumption. The respective ratios for rye and barley were 232% and 188% in 2020. High self-sufficiency ratios refer to a need for well-functioning export channels. From 2013–2020, export of cereals of Estonian origin doubled and reached 200 million EUR (Table 1). During this period, the most prominent export destinations were Middle East, North Africa and the Netherlands and Germany in EU as the exports to these countries comprised 55.8% of total exports of the period [11].

Table 1. Main trends in Estonian grain production [11].

Year	Area under Cultivation, ha	3-Year Moving Average Production, t	3-Year Moving Average Yield, kg/ha	Grain Export ¹ of Estonian Origin, Mil EUR
2010	275,295	805,351	2673	34
2013	311,032	912,762	3049	90
2016	351,353	1,230,294	3570	104
2019	364,364	1,285,432	3684	196
2020	370,120	1,392,396	3832	206
2021	367,237	1,510,214	4113	70 ¹

¹ 2010 data for all grain exports (not only Estonian origin); 2021 data is from January until August.

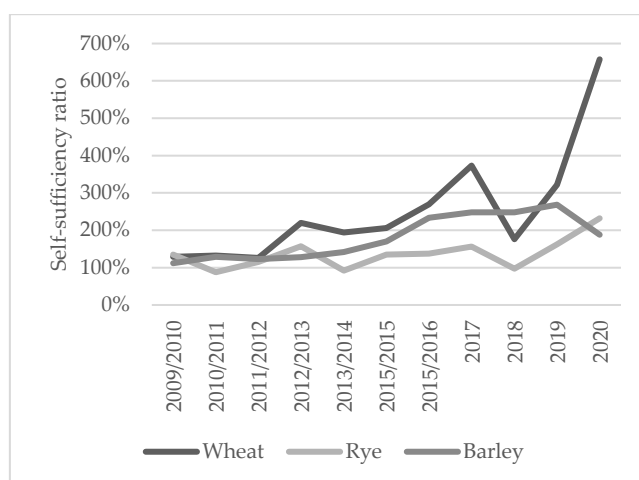


Figure 1. SSR of wheat, rye and barley in Estonia, 2010–2021, authors' calculations [11].

3.2. COVID-19 Impacts on Grain Supply Chain Stakeholders

The COVID-19 related restrictions on movement, social gathering, cross border movement implemented by Estonian government in the middle of March 2020 affected mostly processing industry and retail. Trade was affected by the closure of Polish borders in March 2020 as Poland is one of the main transportation corridors for trade with the EU. The border disruptions were short, but both the feed industry receiving inputs from Western Europe and milling industry that had processing units in other countries mentioned the problem with movement of people and goods. Most of imported farm inputs (fertilizers, seeds, pesticide) had already been delivered to Estonia by the beginning of March, so the disruptions did not impact the farmers (Table 2). Farm input suppliers that sell also PPE and disinfectants for farmers and food industry experienced strong demand and shortage of those goods, but within 3–4 months the supply increased sufficiently.

Table 2. COVID-19 impacts on farm input suppliers and grain farmers.

	Input Suppliers	Grain Farmers	Grain Exporters/Cooperatives
Preliminary restrictions in March 2020–June 2020	Rearrangement of work activities, incl remote work Delays in deliveries Foreign suppliers' shutdown Increase in demand and shortage of PPE and disinfectants	Limited impact	No impact
Long term impacts	Oversupply of PPE Price increase of inputs Input delivery delays	Input delivery delays Increase in input prices Increase in energy prices High grain prices High global demand	Rearrangement of operating procedures Considerable increase in maritime transport costs Container congestion Increase in energy prices High grain prices High global demand

The initial delays of delivery times were connected mostly with certain inputs, e.g., foreign factory for certain packaging materials and equipment producer were shut down. In the following months of 2020 and 2021, stakeholders in all segments of grain supply chains noted that the delivery times for international orders have increased considerably

along with overall strong increase in various input prices. The grain exporters have felt the increase in maritime shipping costs as well as container shortage.

As farmers usually work with their machinery alone, the risk of infections was low and the direct impact of COVID-19 on the farming operations was very limited. The processing industry and retail industry experienced COVID-19 outbreaks. As the operators of processing machinery and retail workers cannot work remotely, the situation was made worse by the lack of PPE at the first months on pandemic in Estonia. Stakeholders in both segments were able to reorganize some of its work operations. In retail chains there has been a strong increase in online ordering and the retailers had to prioritize the types of goods that could be ordered. Processing industry had to review the operations, including those related to loading of trucks and movement of truck drivers to minimize the contacts.

Both retail sector and processing industry mentioned increase in labor supply (Table 3). As enterprises in other fields laid employees off, the food industry and grocery stores that remained operating had no problem finding new employees. In Estonia, the panic buying was a short-term event. While the demand in retail increased for certain products, the processing industry was unable to meet this demand shock. The processing industry does not change its production plans quickly and the industry was also impacted by problems with packaging supply. The short-term demand shock for staple goods was followed by decrease in the demand in following months. Retail groceries have experienced continued strong demand and profits, particularly as the activities of restaurants and catering sector have been restricted. With high number of suppliers, they have had options to switch suppliers and at the time of interviews, the struggles in the upstream industries (i.e., with packaging) had had very limited impact on them.

Table 3. COVID-19 impacts on processing industry and retail chains.

	Feed Industry	Flour and Milling Industry	Retail Grocery Chains
Preliminary restrictions in March 2020–June 2020	Disruptions in delivery of certain inputs	Disruptions because of movement restrictions on borders Unable to meet the increased demand in the retail	Short term panic buying of staple good followed by drop in their demand PPE shortage
	Change in shipping methods of some inputs	Lack of technical support from foreign supplier	Enforcement of distancing rules and restrictions in retail shops
	Rearrangement of work activities	Rearrangement of work activities for office workers COVID-19 infections	Reorganization of operations COVID-19 infections
		Shortage of packaging materials	Increase in e-shopping
Long term impacts	Change of suppliers	Rearrangement of operating procedures for truck drivers	Continued work rearrangement
	Lack of supply for certain inputs	Increase of labor supply	Strong demand
	Increase in input prices	Technical support from foreign suppliers	Increase of labor supply
	Increase in energy prices	Increase in input prices	Distancing measures
		Increase in energy prices Delays in delivery times	Delays in delivery times Change of suppliers Price increases

One specific problem for the processing industry was that their equipment and technology manufacturers are foreign technology companies and the movement restrictions and factory shutdowns created a problem with delivery of spare parts and with getting maintenance and technical support from the manufacturer.

4. Conclusions

Grain production has become one of the most prominent sectors of Estonian agriculture and a significant export commodity. Part of it is a readjustment and reaction to the crises in animal husbandry, but grain production has been facilitated also by the favorable global market demand and prices. The first years of pandemic, 2020–2021 has been the period of record production and largest area under grains since the beginning of the 1990ies. The initial effects on the pandemic on the grain farmers were very limited and grain supply chains suffered little disruptions, results similar to those demonstrated by [1,9]. As the global demand for grains remains high and the pandemic increases demand for staple goods [1], it can be expected that the grain production levels in Estonia will remain high in the coming years. The biggest concerns are related to the price of inputs and energy that have continued to increase throughout 2021. Stakeholders in all segments of grain supply chain mentioned the increase in global delivery times and prices that will impact their production costs.

So far, the stakeholders have adapted to the pandemic and the availability of food has not been affected as demonstrated by [6]. High self-sufficiency ratio demonstrates that Estonia produces enough grain to feed its population in the time of crises and at present, most of grain it is exported. However, the bottleneck at the time of more severe crises may be in processing industry. The COVID-19 has had more direct impact in flour and milling industry. The negative effects have been in high potential for COVID-19 infections among workers who have to be present, challenges related to foreign inputs and technology providers. The strong demand for flour and staple goods [1], increase in labor supply have been favorable, including in downstream grocery chains that have been making record profits [6].

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Institutional Review Board Statement: The study was conducted according to the guidelines of the Declaration of Helsinki. A full ethical review was not required for the study on human participants in accordance with the Code of Conduct for Research Integrity and the regulation on Good Academic Practice and Implementation of Principles of Academic Ethics in Estonian University of Life Sciences.

Informed Consent Statement: Informed consent was obtained from all participants in the study.

Data Availability Statement: The statistical data analyzed is publicly available at Statistics Estonia (<https://andmed.stat.ee/en/stat>, accessed on). The data from interviews and focus group are not available due to containing information that could compromise the anonymity of research participants.

Conflicts of Interest: The authors declare no conflict of interest.

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