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ANALYSIS OF ROMANIAN FARMERS TRADING BEHAVIOUR IN THE COMMODITIES EXCHANGE UNCERTAINTY CAUSED BY CLIMATE CHANGE, COVID-19 PANDEMIC AND EXTERNAL MARKET CHANGES

Horia Nicolae CIOCAN, Toma Adrian DINU, Elena STOIAN, Agatha POPESCU, Reta CONDEI

University of Agronomic Sciences and Veterinary Medicine Bucharest of Bucharest, 59 Marasti Boulevard, District 1, 011464, Bucharest, Romania, Phone: +40213182564, Fax:+40213182888, Mobile:+40744 6474 10, Emails: ciocan.horia@managusamv.ro, tomadinu@yahoo.fr, stoian_ie@yahoo.com, agatha_popescu@yahoo.com, r_condei@yahoo.com

Corresponding author: ciocan.horia@managusamv.ro

Abstract

Starting with the summer of 2020, the farms inputs prices, especially for diesel, seeds, fertilizers and pesticides as well as of grains (cereals and oilseeds) started fluctuating excessively. This phenomenon caused great uncertainty in farmers economic activity, especially for the crop farms that are bulk selling all their products to traders. The uncertainty was primarily caused by the overlap of several factors, some of which were more predictable and some of which took everyone by surprise and caused panic and volatility on the stock markets. The unfortunate events sequence began in early 2020, with the outbreak of the COVID-19 pandemic that caused disruptions in supply chains, import-export bans and lockdowns that reduced the consumption of agri-food products in the HORECA industry. For Romanian farmers, the disturbance created by the pandemic also overlapped with the severe drought that affected production levels in 2020 and 2022, as well as with the hostilities in the region which started at the end of February 2022, and led to the agricultural inputs excessive price increase and high volatility on the commodities exchange. In this sequence of unfortunate events, the farmers' decision regarding the stored grains volumes, inputs purchasing timing and grains selling timing, made a major difference for their business' financial stability and profitability.

Key words**:** *trading behaviour, economic uncertainty, drought, profitability, commodities*

INTRODUCTION

After a long period of approximately 6 years (2014-2020), in which both inputs prices and grains and oilseeds prices did not experience large fluctuations, in the last 3 years, Romanian farmers have had a difficult time finding the most profitable strategy for their business [20].

Especially in crop farms, the cereals selling strategy can make the difference between a profitable year or a year in which costs are barely covered [18].

Following 2007, Romanian farmers benefited from the advantages of Romania's integration in to the E.U. They carried out projects to access the European funds available both during the pre-accession period through SAPARD program and through post-accession programs, National Programme for Rural Development - NPRD 2007-2014, NPRD 2014 – 2020 [14]. They also collected the subsidies for the cultivated areas. This influx of capital helped to develop and modernize Romanian agriculture in the last decade [14]. With the help of these funds, the farmers were able to modernize their machinery, improve their cultivation technologies and become an important player in the E.U. agricultural commodities market [11,13]. Due to the poorly developed livestock sector and the lack of processing capabilities, a large part of the Romanian's grains and oilseeds production is exported, mainly to Egypt, Saudi Arabia and other countries from the Middle-East or even Asia through the Constanța port from the Black Sea [15,16].

Also, during this period, Romanian farmers had to face the fluctuations in the global market of agricultural products and inputs.

The most important fluctuations occurred in 2007-2008 period during the Global Financial Crisis and in 2011-2014 period [3]. Obviously, in both periods the higher incomes obtained from selling cereals at higher prices were necessary to offset the increased fertilizers prices and other categories of agricultural inputs such as fuel and crop protection products.

Also, the increased use of biofuels in the last decade has put pressure on the grains and oilseeds prices [17].

Romanian farmers started to adapt their business to global market demands and tried to reduce the impact of some agriculture risks, respectively, commodities market fluctuations and the persistent drought and increased number of extreme weather phenomena caused by the global warming [2, 8, 22].

During the 2014-2019 period, the absence of major disturbances in the commodity market and a meteorological climate without serious droughts or other helped the Romanian farmers to consolidate and capitalize their businesses [4]. They managed to increase the capacity of their grain storage facilities and they started to use more often the future or forward contracts sale options in their commercial relationship with the main commodities traders. These changes in business approach helped them to reduce their risk with low grain price uncertainty during the harvest period and to obtain better prices in winter or spring when they sold their stored grains [19, 28].

The disturbances that took place in the commodities market in the last three years took many farmers by surprise. Some of them had just started to get used to this trading behaviour and benefit from it. Others were in the first years of implementing risk limit strategies by signing future or forward contracts with traders and by using grains storage. Most of them had contracted loans to finance their investments in storage facilities.

This paper aims to analyse how farmers perceived and reacted to the commodity markets disturbances caused by the COVID-19 pandemic lockdowns and import/export bans and the unexpected hostilities in the region.

Also, the study aims to find out the farmers perspective regarding their business strategy in this context of climatic and socio-economic uncertainty.

MATERIALS AND METHODS

In this paper creation, both the quantitative research method and the qualitative research method were used.

The quantitative research method is based on the statistical processing and interpretation of data obtained from a questionnaire that was applied on 52 Romanian farmers in 2023 spring.

For the qualitative research, 20 individual interviews were organized with some of the farmers who responded to the questionnaire applied to the quantitative research.

The respondents' farms where split in four main categories depending on their size and their access to grain storage facilities.

The main indicators considered in conducting this study were: farm structure (crops only/mixed farm), farm size, number of employees, land ownership structure, grains storage capacity, crop irrigation percentage, average crop yields, stored production percentage, average storage costs, percentage of contracted production, grains selling time and commodities selling prices.

Study limitations: even if sustained efforts were made to prevent sample error and to ensure that the sample adequately represents the entire population, some non-response error was caused by the relatively small number of farmers that chose to respond the questionnaire.

The questions related to the percentage of the area with available irrigation; the percentage of goods for which futures sales contracts were signed with traders and the percentage of cereals sold in the 2022-2023 period that was split in seasonal categories, the data obtained refer to the percentages of the total area and the percentages of the total production without specifying exactly which crops received the water, in which amount or for what exact type of grain or oilseeds the futures sales contracts were signed and what types of crops were sold in each season category. Unfortunately, these

limitations were necessary due tosome farmers refusal to respond to all questions.
The questionnaire had a complex structure and some farmers did not have the necessary time to accurately respond to all questions. Also, in this study, only the four main crops were considered: wheat, corn, sunflower and rapeseed.
In the crop rotation of some farms, especially in mixed farms, there were also other crops, such as barley, rye, peas, soybeans or alfalfa. Data regarding these crops were not included in the study due to the reduced proportion of these crops in the total cultivated areas.

RESULTS AND DISCUSSIONS

The results obtained following the questionnaire responses interpretation and interviews transcript analysis can outline the Romanian farmers economic struggle during the last years and their business strategy for the next years.
Romanian agriculture has achieved a significant development in the last decade, the production of grains and oleaginous plants experiencing an upward trend [26].
As shown by the statistical data presented in Figure 1, the yields obtained by Romanian farmers were seriously affected by the droughts that occurred in 2020 and 2022.
Romanian farmers business strategy in the last three years was marked by a whole series of uncertainties, some of them impossible to anticipate, which significantly affected their financial stability and their development perspective.
As can be seen in Figure 2, the price of the main commodities that influence farmers' business has had a high volatility in the last 20 years. The increase in prices caused by the economic crisis of 2008 and the one caused by the COVID-19 pandemic and the hostilities in the proximity represented the greatest risks of destabilization for all farm businesses.

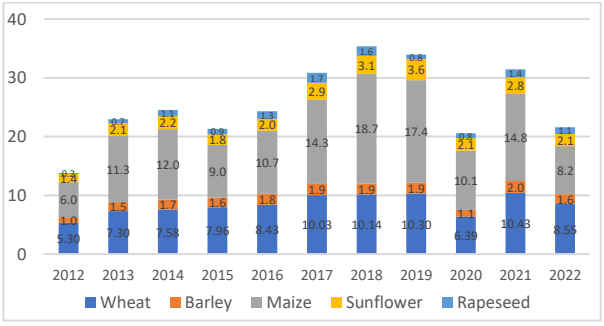

Fig. 1. Evolution of Romania's main crops productions in 2012-2022 period (Mt).
Source: National Institute of Statistics, NIS, Tempo online database [10].

The 2019/2020 agricultural year, represented a turning point in the economic activity of Romanian farmers. This year was marked by a severe drought that affected cereal production, especially for spring crops. Because of the drought, farmers had to sell a large share of their reduced production in the summer, shortly after harvest, in order to pay for their inputs. Therefore, they failed to profit from the increase in grain prices that took place towards the end of 2020.
The drought of 2020 seriously affected the economic stability of all farmers due to low yields, but in particular it greatly affected those who had signed contracts with traders at the beginning of 2020, at lower prices.
At harvest, these farmers had to buy grains from their neighbours at higher prices in order to honour their contracts and to avoid disastrous legal consequences. This event led to a sharp decrease in the number of farmers who signed futures contracts with grain traders in the following years, as can be seen in Fig. 3.
It should be mentioned that in 2020, farmers who were not greatly affected by the drought and managed to obtain normal productions that were stored and sold at the end of 2020 or at the beginning of 2021, obtained higher profits because of reduced fertilizers prices in the previous year that lowered their production costs.

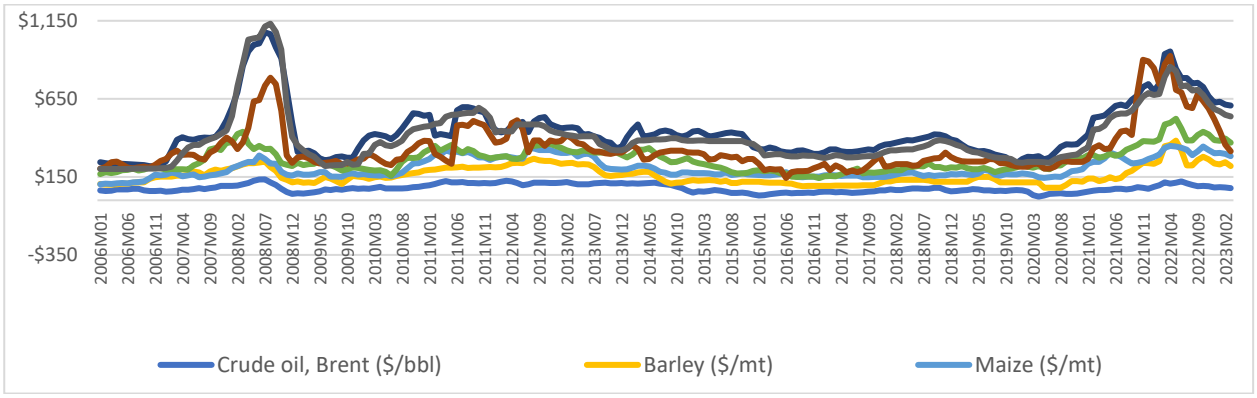

Fig. 2. Commodities prices evolution graph
Source: The World Bank, DataBank database [29].

That year, buying fertilizers early and selling grains late was by far the most profitable strategy for Romanian farmers.

The end of 2020 was characterized by commodity prices increase on the main exchanges, both for grains and oilseeds and for fertilizers.

With the beginning of 2021, amid the disruptions caused by the COVID-19 pandemic, the volatility of commodity prices continued to increase [7].

The general trend was prices increase for most commodities, but, starting from January 2021, a detachment can be observed between the prices of cereals and the prices of fertilizers, in the sense that the price of fertilizers increased much more sharply compared to the grains price. This fertilizer prices increase reduced the 2021 production profit margin, especially for the farmers who signed most of the fertilizers purchase contracts in the spring.

Similar to 2020, farmers who signed the purchase contracts for most fertilizers at the end of 2020, took advantage of better prices for fertilizers.

Following more favorable weather conditions, the summer of 2021 brought agricultural record productions that were significantly higher than in the previous years.

The enlarged crops yield obtained by the majority of Romanian farmers in the summer-autumn of 2021 and the increase in grains and oilseeds prices, helped them to exceed their production costs that increased significantly due to the increased fertilizers prices and to recover their losses caused by the previous year drought.

Regarding the grains' future sale contracts perspective, the farmers who signed the contracts in early spring of 2021 obtained lower prices and implicitly a smaller profit margin, and those who signed the contracts in late spring benefited from higher prices and achieved a higher profit margin.

Farmers who managed to store a share of their production and managed to sell it in the spring of 2022, after the beginning of the conflict in Ukraine, obtained higher prices and managed to obtain some consistent profit margins.

In the 2021/2022 agricultural year, farmers' crops were again affected by drought, especially spring crops, where maize yields decreased by 44.7%.

Some of these economic difficulties that affected crop farms businesses were alleviated by grains and oilseeds price increase that occurred immediately after the war began. Farmers who signed futures contracts with traders between March and mid-June secured the sale of the contracted quantities at record prices for the last 14 years. Even the farmers who did not prefer sign futures contracts, managed to sell their grains at favourable prices at harvest.

As can be seen in Figure 3, after the problems caused by the 2020 drought, the percentage of farmers who signed contracts dropped substantially, from 29% in 2020 to 17% in 2021.

The percentage increased to 23% in 2022, because of the high prices caused by the Ukraine invasion. Until the beginning of April 2023, only 15% of farmers signed future contracts due to the low prices offered by

traders, but some respondents mentioned that they intend to sign some contracts in the near future because they are worried about the future price drop.

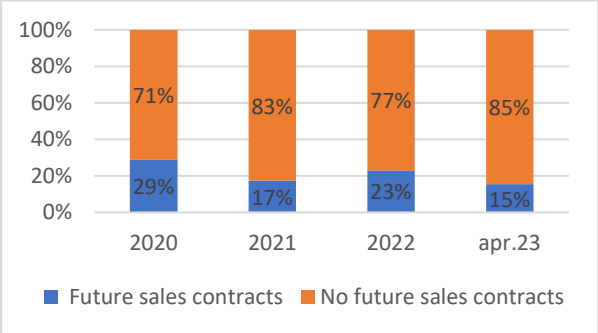

Fig. 3. Share of farmers who signed futures contracts with traders in 2020- 2023 period.
Source: Own processing.

In addition to the crops yield reduction caused by the drought, in 2022, farmers were also affected by the massive increase in fertilizers price. The prices boom started at the beginning of 2022, more exactly since the end of February. The fertilizers prices tripled, and in some cases even quadrupled during the summer [9, 12]. During that period of stock market speculation, the ratio between the price of fertilizers and the price of grains experienced the biggest difference in the last 14 years. A larger detachment took place only during the 2008 global financial crisis [6, 30].
Farmers who managed to sign the fertilizers purchase contracts before February 2022 benefited from lower inputs prices so their spring campaign expenses were shrunken compared to those who bought the fertilizers after the hostilities in the region had begun.
The chaotic evolution of prices on commodity exchanges in the last year disturbed the farmers' business strategy. In 2022, the wheat prices decline began with the start of the harvest campaign in June, dropping from over € 400/ton at the beginning of the month, to € 350/ton at the end of the month. Afterwards between July and November the price of wheat fluctuated between €315/ton and € 350/ton. Starting with December 2022, the wheat price declined constantly, reaching in April 2023 at approximately €250/ton. Maize price had a relatively similar trajectory with wheat, but with greater price fluctuations.

Regarding oilseeds, after their price exceeded €800/ton in the period March-May 2022, with maxima around €1,000/t in mid-April, starting with June 2022, it constantly decreased, reaching around €450/ton in April 2023.
This price level is much lower than the early 2022 spring, and even lower than in the 2021 spring, when the economy was starting to recover after the lockdowns caused by the COVID-19 pandemic. The prices volatility determines farmers to be reluctant in signing future contracts with the grain traders and input distributors. Apart from the global socio-economic context, there is another particular problem that affects Romanian grain growers and also the ones from Bulgaria and Poland. The owners of crop farms in Romania are extremely upset because of the influx of grains of lower quality and at a lower price from Ukraine that has affected domestic grains demand and is causing congestion in the Constanța port. The international grain trading companies are more interested in transferring an important amount of imported grains through the port of Constanta [12, 23]. As can be seen in Figure 4, the overwhelming majority of 84.6% of Romanian farmers declare themselves disadvantaged by the influx of grains.

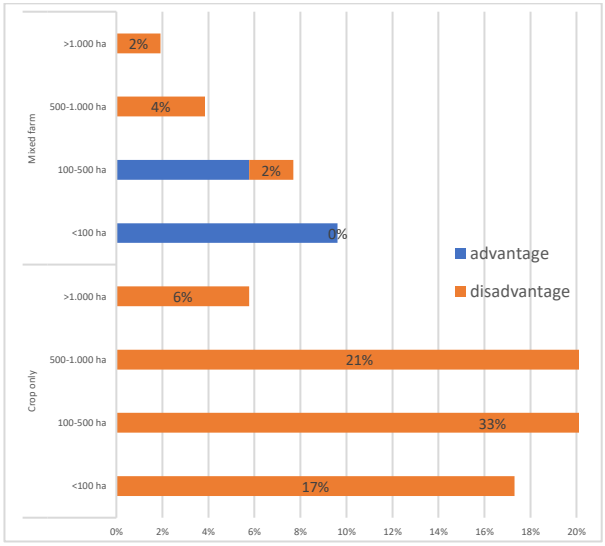

Fig. 4. Romanian farmers opinion regarding the influx of grains from abroad
Source: Own processing.

However, 15.4% of farmers, in this case those who own farms focused on animal husbandry

and cultivate areas of land smaller than 100 hectares, declared that the grain price drop had a positive impact on their livestock raising side of the business. With one exception, almost all respondents from the category of mixed farms working on areas larger than 100 hectares answered that they consider themselves disadvantaged by the influx of grains. The most affected farmers are those who stored their grains in the hope of selling them at better prices in the spring.

This old strategy is well known, used all over the world because it has given very good economic results since the beginning of modern agriculture [24, 27]. It should be noted that in 2020 and 2021, the farmers who stored their production and sold it in winter or spring obtained much higher prices and implicitly managed through this strategy to mitigate both the negative impact caused by the drought that reduced their productions and the production costs surge caused by the increase in the prices of fertilizers and other categories of inputs. As can be seen from Figure 5, the largest share of the production made by the surveyed farmers in 2022 was sold in summer, respectively 47% at harvest and 34% in autumn. The difference of 19% was stored for a longer period, and of this merchandise, 6% was sold in the winter, 7% was sold in early spring, until the beginning of April, and 6% is still in the farmers' silos.

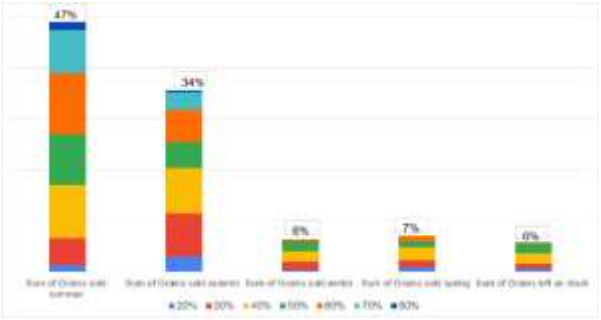

Fig. 5. Production selling timing and the traded volumes share from the total production in 2022
Source: Own processing.

Table 1. Farm structure depending on size categories, type of activity, storage capacities and share of owned land areas

Farm structure/ Storage capacity	<10%	10-20 %	20-30%	30-50%	50-70%	<70%	Grand Total
<100 ha	6%	10%	4%	4%	2%	2%	27%
Crop only	6%	10%	2%	0%	0%	0%	17%
0 t	6%	0%	0%	0%	0%	0%	6%
<100 t	0%	10%	2%	0%	0%	0%	12%
Mixed farm	0%	0%	2%	4%	2%	2%	10%
100-500 t	0%	0%	2%	4%	0%	0%	6%
500-1,000 t	0%	0%	0%	0%	2%	2%	4%
100-500 ha	13%	15%	2%	8%	2%	0%	40%
Crop only	13%	12%	0%	6%	2%	0%	33%
100-500 t	13%	2%	0%	0%	0%	0%	15%
500-1,000 t	0%	10%	0%	4%	0%	0%	13%
1,000-2,000 t	0%	0%	0%	2%	2%	0%	4%
Mixed farm	0%	4%	2%	2%	0%	0%	8%
100-500 t	0%	4%	0%	0%	0%	0%	4%
500-1,000 t	0%	0%	2%	2%	0%	0%	4%
500-1,000 ha	10%	13%	0%	2%	0%	0%	25%
Crop only	10%	12%	0%	0%	0%	0%	21%
100-500 t	8%	0%	0%	0%	0%	0%	8%
500-1,000 t	2%	12%	0%	0%	0%	0%	13%
Mixed farm	0%	2%	0%	2%	0%	0%	4%
1,000-2,000 t	0%	2%	0%	2%	0%	0%	4%
>1,000 ha	6%	2%	0%	0%	0%	0%	8%
Crop only	6%	0%	0%	0%	0%	0%	6%
1,000-2,000 t	4%	0%	0%	0%	0%	0%	4%
2,000-5,000 t	2%	0%	0%	0%	0%	0%	2%
Mixed farm	0%	2%	0%	0%	0%	0%	2%
2,000-5,000 t	0%	2%	0%	0%	0%	0%	2%
Grand Total	35%	40%	6%	13%	4%	2%	100%

Source: Own processing.

Table 1 presents the analysed farms structure according to a series of criteria related to the company's capitalization degree.

Depending on the cultivated area, the surveyed farms were divided into four size categories, according to which we have the following percentages: <100ha -27%; 100-500ha -40%; 500-1,000ha -25%; >1,000ha-8%.

In recent years, most Romanian farmers have tried to purchase a share of the land they work on lease and have invested in grain storage facilities [25].

From the perspective of the land areas owned, it can be seen that 35% of the surveyed farms own less than 10% of the land, 40% of the farms own 10-20% of the cultivated land, 6% own 20-30% of the land, 13% own 30-50% of the land and only 6% of the surveyed farms own more than 50% of the cultivated surface.

It can be observed that in most cases small and medium-sized farms, from the category up to 500ha with mixed activity, own a larger share of the cultivated land.

The share of the land owned in property is very important for farmers because it guarantees farmers the stability necessary to invest more in modern machinery, storage facilities and irrigation systems.

As can be seen in Table 1, with the exception of a few small farms of less than 100 ha that deal only with growing plants and do not have storage spaces, 94% of the analysed farms have storage facilities in halls or silos or declared that if necessary they used and will use the option of cereals temporary storage in silo-bags.

The grain storage capacity is very important, especially for the owners of mixed farms who represent 23% of the respondents and constantly need animal feed, but also for the crop farms that store their grains to get a better price.

The following paragraphs present the situation of wheat and maize crops, which have the largest share of the cultivated area in the analysed farms.

Figure 6 shows the wheat yields obtained in 2022, and the expected share that is intended to be sold through futures contracts in the summer of 2023.

Also, the graph bars are divided according to the percentage of land surfaces that can be irrigated in each farm.

The following wheat yields were obtained in 2022: 29% of the analyzed farms fell into the 6-7 t/ha category; 23% in the 5-6 t/ha category; 17% in the 4-5 t/ha category; 10% in the 7-8 t/ha category; 13% in the 3-4 t/ha category; 6% in the 2-3 t/h category, only 2% obtained over 8 t/ha.

It can also be observed that higher productions were obtained in farms that have irrigation systems.

This fact is not necessarily due to the use of the irrigation system for wheat cultivation. Most farmers use the irrigation system mainly for the maize crop.

Regarding the maize yields obtained by farmers in 2022 (Fig. 7), it should be mentioned that, due to the drought problems recorded in previous years, 8% of the surveyed farms did not cultivate corn in 2022.

In the case of the farms that cultivated corn:13% of them obtained corn productions of less than 2t/ha; 10% were in the 2-3 t/ha category; 13% in the 3-4 t/ha category; 27% in the 4-5 t/ha category; 13% in the 5-6 t/ha category; 15% in the 6-7 t/ha category; 6% in the 7-8 t/ha category and only 4% of farms obtained over 8 t/ha. In most cases, higher yields were obtained only in farms that have irrigation systems.

The results clearly show that maize crop was the most affected one by the 2022 drought.

Regarding the drought problem, in Table 2, the structure of the surveyed farms is presented according to their size, the number of employees and their irrigation infrastructure.

It can be seen that 62% of the surveyed farms do not have any kind of irrigation infrastructure and are extremely vulnerable to climate change.

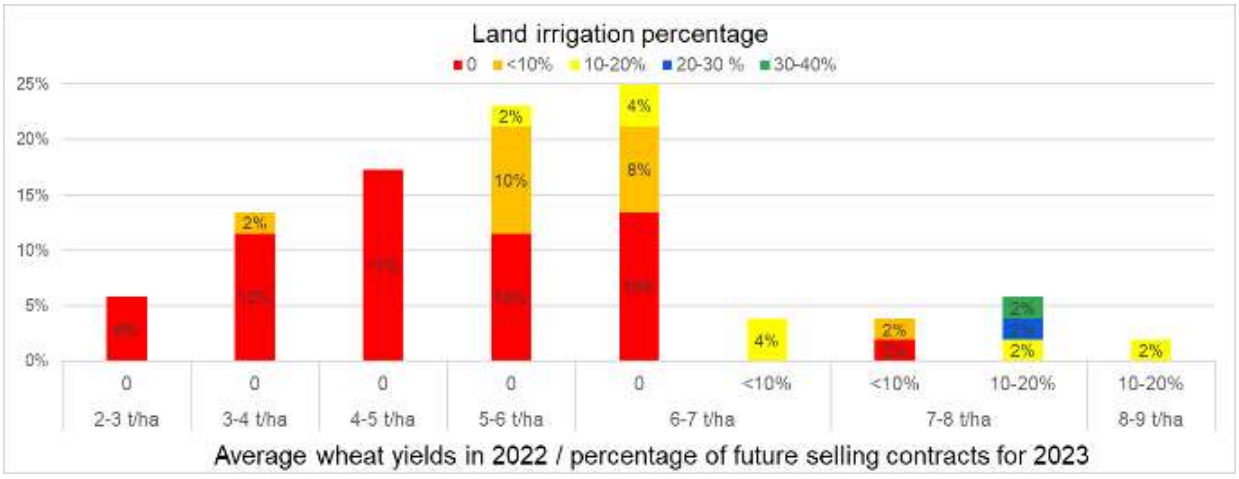

Fig. 6. Average wheat crop yields in 2022 and the production share intended for futures contracts in 2023
Source: Own processing.

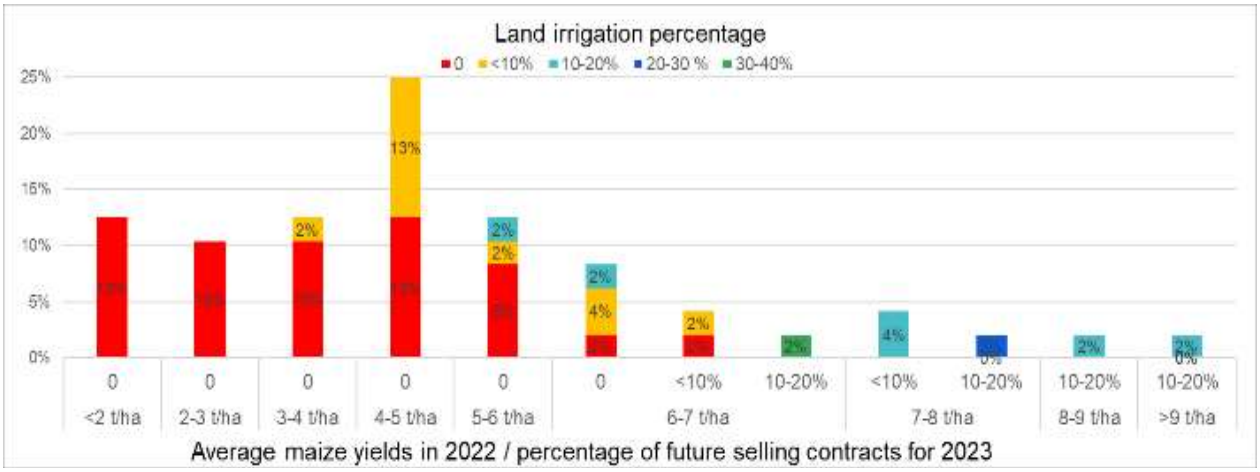

Fig. 7. Average maize crop yields in 2022 and the production share intended for futures contracts in 2023
Source: Own processing.

Among the farms that have irrigation systems: 55% can irrigate less than 10% of the cultivated surface, 35% can irrigate between 10 and 20% of the cultivated surfaces and only 10% of the farms have irrigation systems that cover more than 20% of cultivated areas.

Considering the fact that most farmers use irrigation systems such as traveling sprinkler type that are moved successively to the plots that have nearby water sources, the number of employees in these farms is higher compared to farms where irrigation is not used.

The use of irrigation systems requires a significant amount of labour needed for their transport, installation, operation and maintenance [21].

The mixed farms are more advantaged in this regard because they have a larger number of employees that can be used for the operation and guarding of the irrigation systems [1].

Although this aspect is important for farmers' budgets, the biggest problem reported by farmers is related to the absence or inoperability of irrigation canals and the bureaucracy that slows down and sometimes even blocks deep bore well drilling.

However, more than half of the farmers who irrigate have introduced irrigation systems in their farms in the last three years and declare that they want to expand the areas.

Also, approximately 26% of the respondents who do not irrigate at the moment, stated that they have started investments and hope that in the next two years they will be able to irrigate some of their crops.

The following paragraphs presents the situation of rapeseed and sunflower. These two oleaginous crops have an important proportion in the analysed farmers' crop rotation.

It should be mentioned that the areas cultivated with these crops have increased in recent years, both due to high selling prices and due to better outcome in drought years

Table 2. Farms structure depending to their size, activity profile, number of employees and the irrigated land percentage

Farm structure by size/ by type/ by employees number	**0%**	**10%**	**10-20%**	**20-30%**	**30-40%**	**Total**
<100 ha	19%	4%	2%	0%	2%	27%
Crop only	17%	0%	0%	0%	0%	17%
1	10%	0%	0%	0%	0%	10%
2	8%	0%	0%	0%	0%	8%
Mixed farm	2%	4%	2%	0%	2%	10%
2	2%	4%	2%	0%	0%	8%
3	0%	0%	0%	0%	2%	2%
100-500 ha	23%	10%	8%	0%	0%	40%
Crop only	19%	8%	6%	0%	0%	33%
2	10%	0%	0%	0%	0%	10%
3	10%	8%	0%	0%	0%	17%
4	0%	0%	4%	0%	0%	4%
5	0%	0%	2%	0%	0%	2%
Mixed farm	4%	2%	2%	0%	0%	8%
5	2%	0%	0%	0%	0%	2%
8	0%	2%	0%	0%	0%	2%
9	0%	0%	2%	0%	0%	2%
6	2%	0%	0%	0%	0%	2%
500-1,000 ha	17%	6%	2%	0%	0%	25%
Crop only	17%	4%	0%	0%	0%	21%
2	2%	0%	0%	0%	0%	2%
3	6%	0%	0%	0%	0%	6%
4	6%	0%	0%	0%	0%	6%
5	2%	2%	0%	0%	0%	4%
7	0%	2%	0%	0%	0%	2%
6	2%	0%	0%	0%	0%	2%
Mixed farm	0%	2%	2%	0%	0%	4%
14	0%	0%	2%	0%	0%	2%
11	0%	2%	0%	0%	0%	2%
>1.000 ha	2%	2%	2%	2%	0%	8%
Crop only	2%	2%	2%	0%	0%	6%
9	2%	0%	0%	0%	0%	2%
10	0%	2%	0%	0%	0%	2%
13	0%	0%	2%	0%	0%	2%
Mixed farm	0%	0%	0%	2%	0%	2%
27	0%	0%	0%	2%	0%	2%
Total	62%	21%	13%	2%	2%	100%

Source: Own processing.

Rapeseed is an autumn crop that reaches maturity in early summer, avoiding high summer temperatures. Also, sunflower crop is more resistant to drought compared to maize crop.

In the case of the rape crop presented in Fig. 8, the results show that 29% of the surveyed farms did not harvest rapeseed in 2022. This phenomenon is found especially in smaller farms that avoid introducing this oleaginous plant in their crop rotation due to the higher complexity of the cultivation technology, which implies higher costs compared to other crops.

It should be mentioned that among the 29% who did not harvest rapeseed last year, approximately 18% sowed rapeseed in the fall of 2021 but replaced the crop in the spring of 2022 due to problems caused by the drought.

From the perspective of rape seed production, 46% of the farms fell into the 2-3 t/ha category; 38% fell into the 3-4 t/ha category; 5% obtained more than 4 t/ha and 11% obtained only 1-2 t/ha.

The results of sunflower cultivation presented in the above figure reveal average productions that fell into the following categories: 3-4 t/ha for 34% of the farms; 2-3 t/ha for 38% of farms; 1-2 t/ha for 22% of farms; less than 1 t/ha in 4% of cases; more than 4 t/ha in 2% of cases. In 4% of the surveyed farms, sunflower wasn't cultivated in 2022.

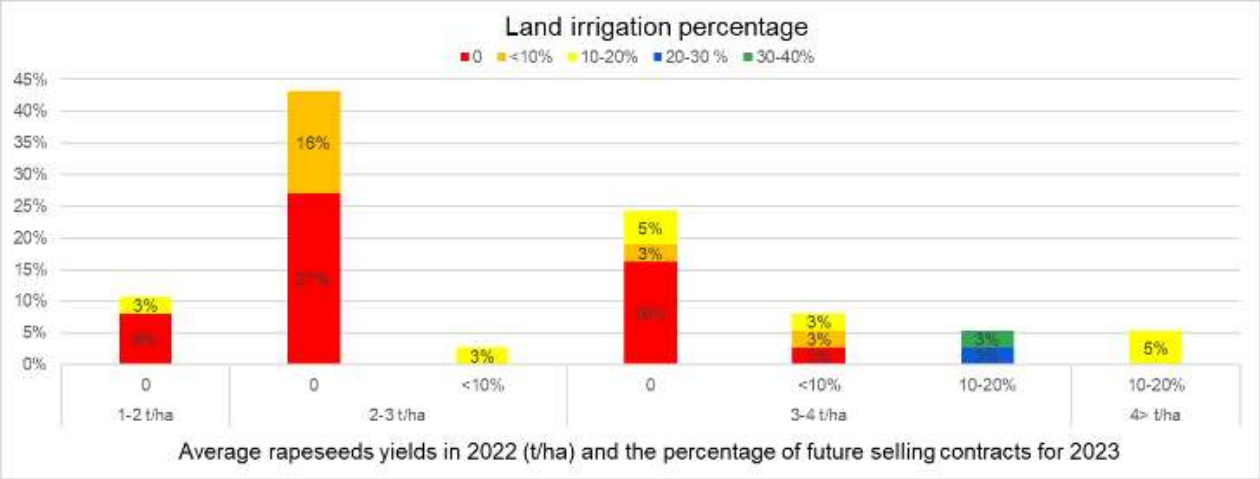

Fig. 8. Average rapeseed crop yields in 2022 and the production share intended for futures contracts in 2023
Source: Own processing.

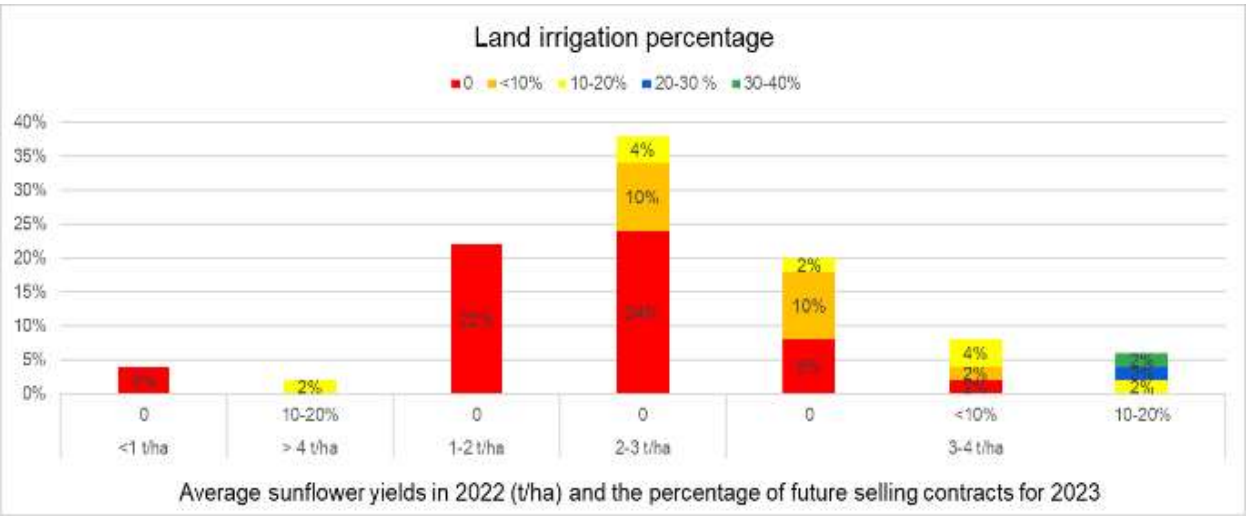

Fig. 9. Average sunflower crop yields in 2022 and the production share intended for futures contracts in 2023
Source: Own processing.

As it can be seen from the analysed crops graphs and Figure 3 and Table 3, until the beginning of April, only 15% of farmers signed future sale contracts with traders. The analysis shows that mostly, only those who obtained above average yields in 2022 and use irrigation systems signed futures contracts for a percentage of the harvest in the summer of 2023. In this way they protect themselves against economic uncertainties, securing the selling price for approximately 5-20% of the expected production. Table 3 presents the analysis of farmers trading behaviour according to their farms size and their education level. As can be seen in Table 3, 48% of the respondents analysed in this study have completed higher education, 21% are students and 31% have secondary education.

Depending on the size categories, it can be observed that, with the exception of the categories below 500 ha, in the case of larger farms, most farmers have higher education. Even in the 100-500 ha category, almost half of the respondents have higher education. In the size category over 1,000 ha, all respondents have higher education.

Table 3. Farmers trading behaviour according to farm size, signed future contracts, grains left on stock and farmers education level

Farm size/ future contracted % of 2023 expected yields/ remaining stocks in April 2023		Higher education	Secondary education	Students	Total
<100 ha	Stocks	6%	12%	10%	27%
0%		6%	12%	10%	27%
	0%	4%	10%	10%	23%
	10%	0%	2%	0%	2%
	20%	2%	0%	0%	2%
100-500 ha		19%	12%	10%	40%
0%		13%	12%	10%	35%
	0%	4%	10%	6%	19%
	10%	2%	2%	4%	8%
	20%	6%	0%	0%	6%
	30%	2%	0%	0%	2%
<10%		4%	0%	0%	4%
	0%	2%	0%	0%	2%
	20%	2%	0%	0%	2%
10-20%		2%	0%	0%	2%
	0%	2%	0%	0%	2%
500-1,000 ha		15%	8%	2%	25%
0%		10%	8%	2%	19%
	0%	4%	4%	2%	10%
	10%	2%	2%	0%	4%
	20%	4%	2%	0%	6%
<10%		6%	0%	0%	6%
	0%	4%	0%	0%	4%
	10%	2%	0%	0%	2%
>1,000 ha		8%	0%	0%	8%
0%		4%	0%	0%	4%
	10%	4%	0%	0%	4%
10-20%		4%	0%	0%	4%
	0%	4%	0%	0%	4%
Total		48%	31%	21%	100%

Source: Own processing.

It can be observed that all respondents who signed future contracts with traders have higher education. From the perspective of the grain storage decision, it can be observed that the majority of farmers who still have grains in stock have higher education and most of them own farms between 100 ha and 500 ha. Around 94% of the farmers who still have grains in stock have not signed contracts with traders until now and the 6% who have signed contracts have secured the price for less than 10% of the 2023 expected yields. Only 6% of the surveyed farmers have signed contracts for quantities between 10% and 20% of the expected production.

At the beginning of April 2023, 36% of the surveyed farmers still have a part of the 2022 production in stock. Half of them still have about 10% of the production stored and the other half have 20%.

Approximately half of the 36% of farmers who still have grains in stock at this moment declared that in previous years they stored smaller quantities or even did not store grains. After observing the substantial gains obtained by other farmers in the springs of 2020 and 2021, some of them started the construction of storage halls or paid specialized companies to help them store grain in silo-bags. To their disappointment, now they find themselves in the situation of selling the cereals at prices lower by up to 50% compared to the 2022 summer prices and also having to bear the storage costs.

Considering the fact that the 2022 drought decreased their yields and the fertilizers

prices, their grains production cost is high and the expenses continue to increase with each week of grain storage. The trading strategy that gave very good economic results in 2021 and 2022, turned out to be quite damaging for their business in the spring of 2023.

Another business strategy that gave very good results in the spring 2020-spring 2022 period was the early purchase of inputs, especially fertilizers because their prices tripled during that period.

Despite the fertilizer prices decline on commodity exchanges, starting from the second half of 2022, Romanian input distributors pursued a speculative selling strategy, trying to get farmers to sign fertilizer purchase contracts as soon as possible. Some respondents stated that although the prices were high, they signed the purchase contracts earlier because the distributors suggested them that there would have been numerous bureaucratic problems and logistical blockages in the fertilizers import process which would have led to problems with the availability of fertilizers in the autumn and spring agricultural campaigns.

As can be seen in Figure 10, in the agricultural year 2022/2023, the strategy of early signing purchase contracts for fertilizers has proven to be detrimental to some farming business.

From the analysis of fertilizer purchasing behavior, it can be seen that 44% of the total volumes purchased by farmers for the autumn agricultural campaign were contracted in August; 29% in September; 13% in July, 8% in October; 4% in June and 2% in November.

Fig.10. Fertilizer prices evolution in the period June 2022-April 2023 and the farmers purchase timing behaviour
Source: Questionnaire responses and Eurostat [5].

A proportion of farmers who bought some fertilizers in June and July, stated that they hurried because they were worried about a possible price increase. Also, some of the farmers who purchased large volumes of fertilizers in August declared that normally they would have purchased some of those fertilizers in September, but they were influenced by the pessimistic explanations given by the distributors.

In case of the spring agricultural campaign, the volumes of fertilizers started with 2% in December, continued with 9% in January 2023; 26% in February, the highest share - 48% in March and only 15% in April. It should be mentioned that the farmers' answers regarding the month of April 2023 are only from the first week. Also, the purchasing behaviour of the farmer was influenced primarily by the offers received from the distributors, price reductions depending on the purchased volumes, payment terms and credit facilities. Most of the farmers declared that they postponed as much as they could the purchase of fertilizers in order to benefit from themarket falling prices. Just as in the autumn

campaign case, some farmers who made purchases in the months of January-February are no longer satisfied with their decision.

CONCLUSIONS

According to the literature review and from the survey and the face-to-face interviews conducted with Romanian farmers, the following conclusions and farmers concerns can be drawn.

In addition to the problems caused by the droughts of 2020 and 2022, which will certainly repeat in the following years due to climate change, the high volatility of commodities market in the last three years caught many farmers off-guard and had seriously affected their businesses financial stability.

The global economic instability caused by COVID-19 pandemic, rising inflation, the conflict in the proximity and the tensions caused by territorial disputes in other parts of the globe, set signs of a global recession that have led to the commodity market decline in the spring of 2023 [23].

In this uncertain economic climate, Romanian farmers will have to plan their business strategy extremely carefully in the coming years.

Many market forecasts anticipate a grains price and also a low demand for domestic grains and the congestions in the Constanța port to continue.

According to an optimistic scenario, it is expected as it will take several more years until the natural gas market will stabilize at cost effective values for fertilizers synthesis in European factories.

The interviewed farmers' showed concerns inclined to a pessimistic scenario in which their grains production costs will continue to stay high due to the increased fertilizers prices, and the grains prices on commodities exchanges will be reduced. In this scenario, farmers' potential profit margin will remain small in the coming years.

Many farmers tended to trade impulsively and to adjust their strategy based mostly on the last years experiences.

In 2020 and 2021, the business strategy in which the farmers bought fertilizers early and stored and sold the grains in late spring substantially increased the profit margin of those who did that. Observing this aspect, even more farmers adopted this trading behavior in 2022. Unfortunately for them, the evolution of commodity markets in the agricultural year 2022/2023 was diametrically opposed to previous years. Starting with the summer of 2022, both the price of fertilizers and the price of grains have dropped considerably, and farmers who purchased fertilizers sooner and sold the grains later have substantially reduced their profit margin. Some of them even lost money because they bought fertilizers at high prices, the drought reduced crops yields consequently increasing the production costs and, in this spring, they ended up having to sell some of their grains at prices that did not cover production costs.

The commodities trading behaviour that gave very good economic results in 2021 and 2022, turned out to be quite damaging for crop farming business in the spring of 2023.

Because of this precarious economic context, some respondents declared that they no longer know what business strategy to follow in the coming years.

Only few farmers fully understood the speculative nature of commodity markets and managed to obtain consistent profits in the last three years by constantly changing and adapting their business strategyand effectively using risk hedging instruments such as crop insurance, future contracts and split grains sales and inputs purchases.

In conclusion, the only long-term sustainable solution to reduce the crop farmers dependence on traders' exports and to lower the commodities exchanges price volatility risks consists in the development of the animal husbandry sector, the increase of processing capacities of domestic agricultural products and the development of irrigation infrastructure.

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