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DROUGHT RISK AND ITS IMPACT ON THE MAIN AGRICULTURAL PRODUCTS IN THE REPUBLIC OF MOLDOVA

Natural risk is a function of probability of a damage occurrence and possible consequences as a result of a certain event, being understood as the measure of the magnitude of the natural “threat”. In other words the risk is given by the expected loss level in case of occurrence of the expected natural event.

Natural processes and phenomena, although natural, have their random character. Although they appear to be a necessity in the evolution of the system, they manifest themselves as a random occurrence being included, from this point of view, into the sphere of chance, of the unexpected. However, the term “hazard” in US literature only designates exceptional natural phenomena with a high risk potential. In this sense, the term “hazard” from English has long been used as the equivalent term for the “risk” from French language.

Natural hazard implies the possibility of a potentially devastating event occurring at a given time and in a given area. In any aspect, the hazard contains a certain degree of danger, involving, most of the time, extreme events. It may also include latent conditions, which may represent future dangers. Natural hazard can manifest itself in the form of singular events, combined or sequentially intertwined in causes and effects. Any hazard can be characterized by a certain geographical location, intensity or magnitude, frequency and likelihood of occurrence.

The classification of hazards can be estimated by: climatic zones, genetic types, seasons, by way of manifestation (slow or violent), by the damage caused, etc. According to the genetic types and the factors that can trigger their manifestation as disasters and / or catastrophes, we distinguish hazards and risks of a techno genic and natural character which in turn, according to the factors involved in their occurrence and their triggering, are subdivided into: geological, hydro meteorological and biological. [1]

Climate risks are the possibility of getting losses due to climate change. Any climatic risk phenomenon, by its manifestation, is a deviation from the multiannual average, and the extent of this deviation depends on its consequences. Climate risks include: drought, hail, torrential rains, floods, frosts, snowfalls, polarities, etc.

The Republic of Moldova, being located in a climatic zone with insufficient humidity, is regularly subject to the influence of particularly strong droughts (once in 50 years), strong (once in 6 years), averages (once in 4 years). [1]

Drought is characterized by high temperatures of the air layer at the soil surface over a long period of time, accompanied by the lack of the necessary reservoir of moisture and precipitation in the soil, necessary for plant growth. The drought in the Republic of Moldova is one of the most dangerous natural phenomena, representing the specific feature of the regional climate, conditioned by the uneven distribution of the atmospheric precipitation in time and space against the background of increased air temperature.

Of all the climatic phenomena, droughts can be considered as the most complex, as there

are several factors involved in their triggering: atmospheric precipitation, plant water availability, air moisture and temperature, evapotranspiration, wind speed etc., these being the main climatic parameters that define the occurrence of dry or droughty time.

Although droughts can be recorded throughout the year, the most numerous droughts occur at the end of the summer and in early autumn. In the country this phenomenon occurs at a frequency of 3 to 5 years and it generally includes the south and the center of the country. Drought leads to significant losses (from 10% to 50%) of the agricultural crop. Cutting down rivers and lowering groundwater levels can make difficult the water supply in localities.

In the Republic of Moldova in the spring season droughts and catastrophic droughts predominate, more extreme droughts occur in summer and in autumn a high frequency of catastrophic droughts is recorded.

The consequences of the drought are determined both by the degree of intensity, duration, and by the affected area. The droughts that cover an area of up to 10% of Moldovan territory are assessed as local; 11% - 20% are considered vast; 21% - 30% - very vast; 31% - 50% - extreme, and above 50% are considered as catastrophic droughts, because they cause large losses to the national economy [2].

In the last two decades droughts have been more frequent, and they are becoming more and more intense. Thus, during the period 1990-2016, in the Republic of Moldova there were registered 11 years (1990, 1992, 1994, 1996, 1999, 2000, 2001, 2003, 2007, 2011, 2015) with droughts of varying intensity, that led to the reduction of crops production.

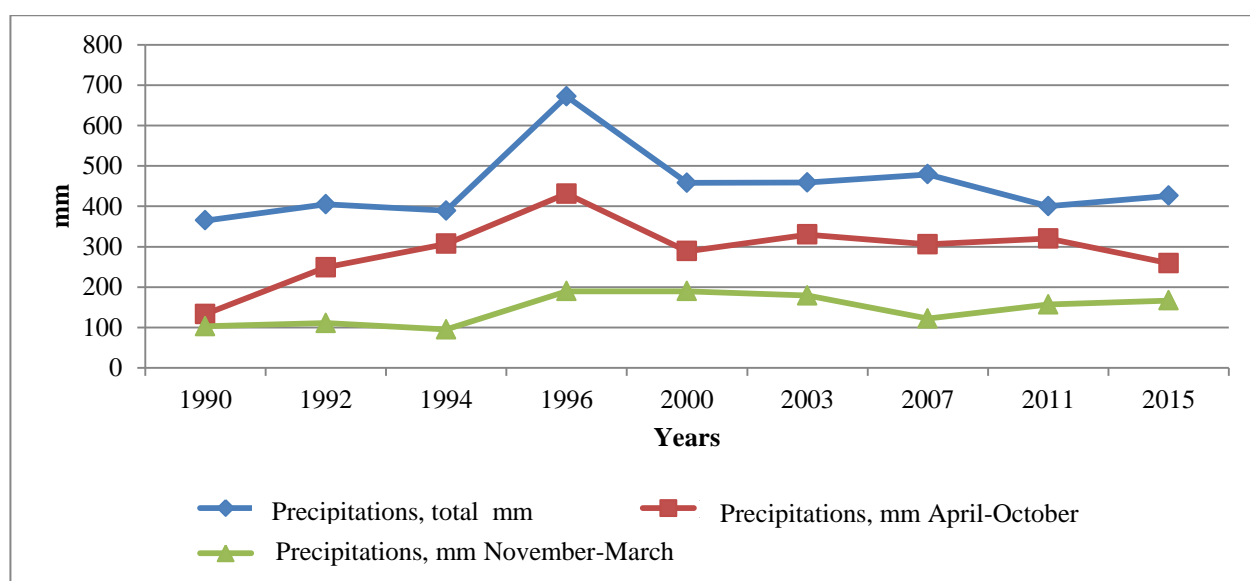


Figure 1. The amount of precipitation in the arid years in the Republic of Moldova

Source: elaborated by the authors on the database of the State Hydrometeorological Service [3]

From the data presented in Figure 1, we can observe that during the analyzed period, the smallest amount of rainfall occurred in 1994, followed by 2011 and 2015, and in 1996 the highest rainfall occurred.

The low amount of rainfall in the driest periods has affected the productivity of the main cereal crops in Moldova.

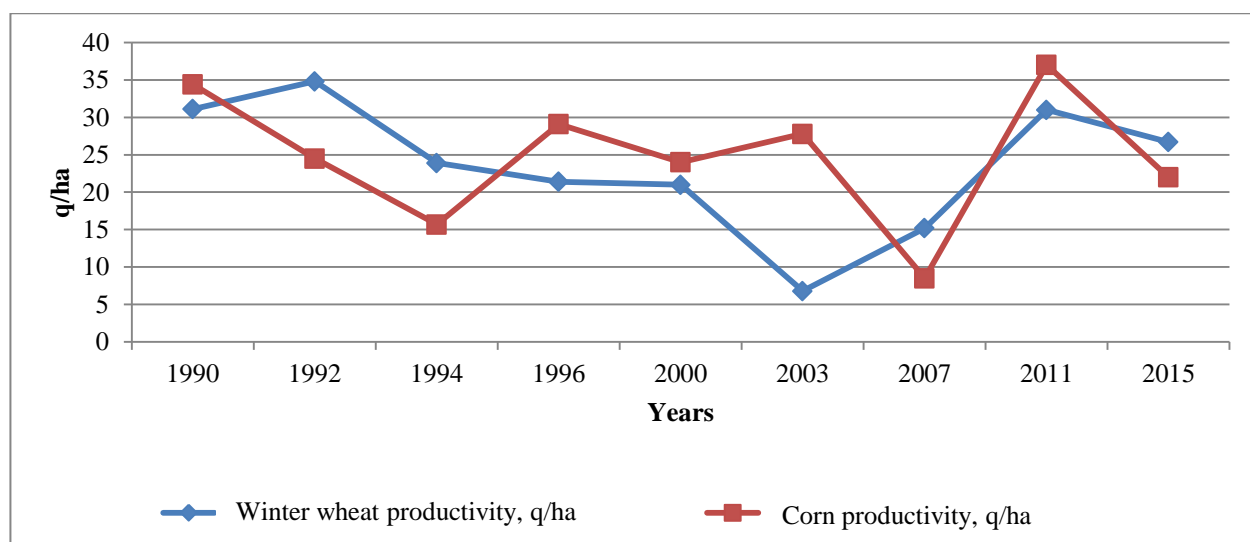


Figure 2. Productivity of the main cereal crops in the Republic of Moldovain the driest years

Source: elaborated by the authors on the database of the National Bureau of Statistics [4]

The data presented in Figure 2 show that the lowest productivity of winter wheat in the driest years was registered in 2003, namely 6.8 q / h, the highest productivity being registered in 1992 - 34.8 q /Ha. The situation is different with regard to corn crops, the lowest productivity was registered in 2007 - 8.5 q / ha, and the highest in 2011 - 37 q / ha.

The reduced amount of precipitation during the droughts has influenced the modification of the crop yield per hectare of the main cereal crops in the Republic of Moldova. The lowest productivity of winter wheat in the most recent years was registered in 2003, namely 6.8 q / ha, with the highest productivity recorded in 1992 - 34.8 q / ha. The situation is different with regard to corn crops, the lowest productivity was registered in 2007 - 8.5 q / ha, and the highest in 2011 - 37 q / ha. According to the initial data in Figures 1 and 2, we have made the calculations reflecting the correlation between the amount of precipitation and the yield of wheat and corn in the arid years. The results of these calculations are shown in Figure 3.

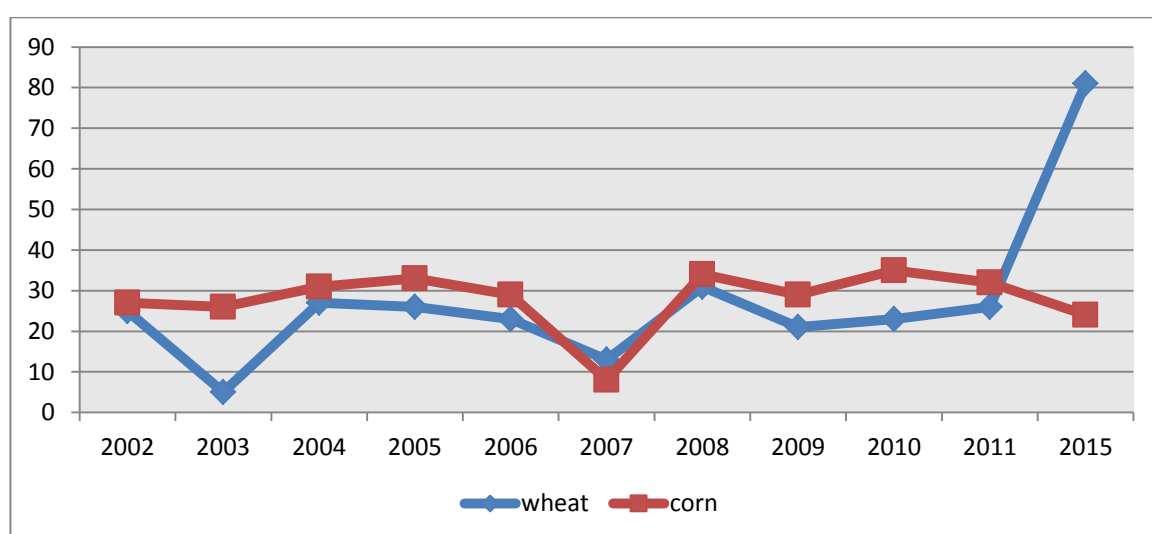


Figure 3. Correlation between the amount of precipitation and the productivity of the main cereal products in the arid years in the Republic of Moldova

Source: elaborated by authors

So, the amount of precipitation in the arid years has influenced 28% of the wheat

production and 33% of the corn production.

The consequences of the drought are determined both by the degree of intensity, duration, and by the affected area. The droughts that cover an area of up to 10% of the territory of the Republic of Moldova were assessed as local; 11-20% is considered to be vast; 21-30% - very vast; 31-50% - extreme, and above 50% are considered as catastrophic droughts, because they cause big losses to the national economy. In the Republic of Moldova during the spring season there are very vast droughts and catastrophic droughts, in summer and in autumn extreme and catastrophic droughts are frequent.

Thus, the droughts in the years 1994, 2000, 2003, 2007, 2011 and 2015 were rated as the most intense in terms of intensity and catastrophic by occupied area. The total losses due to drought constituted approximately six billion lei in 2015.

The drought in 2015 was characterized by the lack of regional rainfall, the precipitations were predominantly local, and the lack of precipitation in some regions of the country between May and July. Water shortages had a negative impact on the productivity of the main cereal crops. For winter wheat, the best results were recorded in the northern area in Briceni, Edinet, Râșcani, Falesti, Floresti, as well as in Comrat, where productivity was over 32 q / ha. A lower productivity, compared to the average in the republic, was recorded in Strășeni, Telenești and Nisporeni districts (15-20 q / ha).

One of the consequences of the drought is the impact it has on the market situation of cereal crops, by increasing market prices of wheat, corn and other cereal crops by 20-30 percent compared to previous years.

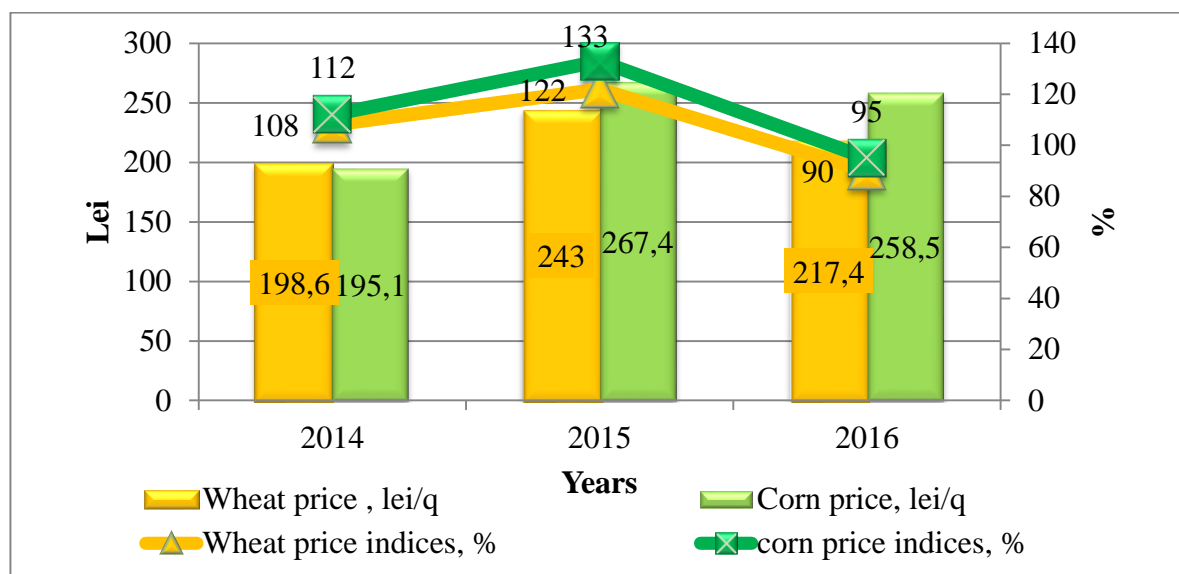


Figure 4. Prices and price indices of the main cereal products during the period 2014-2016

Source: elaborated by the authors based on data from the National Bureau of Statistics [5]

From the data shown in Figure 4, an increase in wheat price by 22% and in corn price by 33% in the dry year 2015 can be observed compared to the previous year 2014 which was not dry. Subsequently, in 2016 (the year with no drought), the prices of these products were reduced by 10 % and 5% respectively.

The increase in prices for cereal products can lead to a rise in prices for fodder crops, which will generate higher prices for livestock products - milk, meat, eggs, etc. Also,

from the experience of previous years, we can mention that because of the lack of fodder, the livestock will be reduced.

The impact of the drought risk can be reduced by taking the following measures:

- restoration and development of irrigation systems;
- implementation of varieties and hybrids of agricultural crops, including the indigenous ones, with a high genetic potential for drought resistance, adapted to the pedoclimatic conditions of the Republic of Moldova;
- subsidizing the production of the seed crop material resistant to droughts;
- subsidizing insured drought risks;
- institutional strengthening of the risk management system in agriculture at the national level.

Conclusions:

1. On average, our country faces droughts once in five years in the north of the country and once in three years in the southern and central districts. The most recent and severe droughts occurred in the years 2003, 2007, 2012 and 2015.

2. One of the consequences of the dispersed nature of the rain in the country during the dry years is the high variation in agricultural crop productivity, especially in cereals, and the difficulty of assessing the negative impact of the drought.

3. At national level, the drought has no significant impact on the country's food security if there are grain reserves made in previous years.

4. At the level of the economic entity, the consequences of the drought can be quite representative, as agricultural producers assume most of the impact of the drought as a result of the poorly developed insurance sector in the Republic of Moldova. The current insurance system in agriculture has insufficient coverage and, consequently, its impact on the mitigation of both ordinary and catastrophic risks is insignificant.

5. The negative impact of the drought is more severe on the living conditions of the rural population because that most of the food comes from households.

6. The drought has a negative impact on the market as a result of reduced supply and raising prices.

References:

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