PRODUCTIONS OBTAINED FROM AGRICULTURAL CROPS AS A FUNCTION OF RISK FACTORS IN THE LOCATION OF IERMATA, ARAD COUNTY, IN THE PERIOD 2020-2023

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Abstract. *In this work, we took into account the evolution of the production of the main crops grown in the area of Iermata, Seleus commune, Arad county, over a period of four years, between 2020-2023. In order to correlate the production data with certain meteorological indicators, we took into account the meteorological data provided by the Banat Crisana Regional Meteorological Center, for Arad county, Chisineu Cris meteorological station. Seleus commune is located in the eastern part of the Crişului Alb Plain, on the course of the Cigher river. It is located 12 km from Ineu, 6 km from Pâncota and 45 km from the municipality of Arad. It is also crossed by the Cigher river, the Morilor canal, to the north is Crisul Alb and to the west the Matca Canal. The Seleus commune is composed of three localities: Seleus, Moroda and Iermata. The area is characterized by a temperate climate with moderate continental accents, with warm summers and mild winters, characteristic of the Western Plain. It can be appreciated that the influences of the Mediterranean climate are easily felt. The multiannual air temperature average is 10.6°C. The warmest month is July (20.7°C) and the coldest is January (-1.1°C). The absolute maximum and minimum temperatures (+40.4°C and -30.1°C, respectively) demonstrate the possibility of recording a very hot summer or rather cold winter and mark the climatic continentalism. In general, the winters are moderate, without strong frosts due to the western climatic influence and due to the fact that the area has a more sheltered position from the polar-continental air invasions from the east and northeast. In the spring, under the influence of the western circulation and the extension of the ridges of the Azorean anticyclone over the south of Europe, the de-spring is faster than in the eastern part of the country. In the summer months, the air temperature is not too high, due to the western influences. It is between 18.9°C in June and 20.7°C in July. In autumn, the multiannual averages of these months vary between 16.2°C in September and 6.2°C in November. This decrease in temperature is due to the advection of cold air under the action of the ridge of the Euro-Asian anticyclone. The area being frequently subject to warm air invasions from the south-western sector, means that even in this season the temperature is 1°-2° higher than in the eastern part of the country.*

Key words**:** *climatic continentalism. polar-continental air, anticyclone, months, south-western sector*

INTRODUCTION

The southwest of Romania, like the whole country, due to its geographical position - in the temperate zone, is exposed to a wide range of risk weather and climate phenomena with the potential to occur throughout the year (ONCESCU, N., 1965).

The multiannual air temperature average is 10.6°C. The warmest month is July (20.7°C) and the coldest is January (-1.1°C). The absolute maximum and minimum temperatures (+40.4°C and -30.1°C, respectively) demonstrate the possibility of recording a very hot summer or rather cold winter and mark the climatic continentalism (MIHUT C., ET. AL., 2018).

In general, the winters are moderate, without strong frosts due to the western climatic influence and due to the fact that the area has a more sheltered position from the polar-continental air invasions from the east and northeast (ŢARCĂ, M. 1998). In the spring, under the influence of the western circulation and the extension of the ridges of the Azorean anticyclone over the south of Europe, the de-spring is faster than in the eastern part of the country. (CASIANA MIHUŢ ET AL., 2022; MIHUŢ, ET AL., 2023; BOGDAN, OCTAVIA, NICULESCU, ELENA,

1999). In the summer months, the air temperature is not too high, due to the western influences. It is between 18.9°C in June and 20.7°C in July.

In autumn, the multiannual averages of these months vary between 16.2°C in September and 6.2°C in November (BOGDAN, OCTAVIA, NICULESCU, ELENA, 1999). This decrease in temperature is due to the advection of cold air under the action of the ridge of the Euro-Asian anticyclone. The area being frequently subject to warm air invasions from the south-western sector, means that even in this season the temperature is 1°-2° higher than in the eastern part of the country (MIHUT C., ET. AL., 2018).

MATERIAL AND METHOD

The southwest of Romania, like the whole country, due to its geographical position - in the temperate zone, is exposed to a wide range of risk weather and climate phenomena with the potential to occur throughout the year. The purpose of this paper is to report certain production values obtained for agricultural crops over a period of four years, the interval 2020-2023, in the area of Seleus commune, Iermata village. In order to best describe this aspect, we took into account the meteorological data provided by the Banat Crisana Regional Meteorological Center, more precisely, the data from the Arad and Chisineu Cris meteorological stations (MIRCOV V. D. ET AL., 2022), (NICHITA C., 2021). The more detailed analysis of certain phenomena was done to capture exceptions, special situations or more significant meteorological elements.

The area is characterized by a temperate climate with moderate continental accents, with warm summers and mild winters, characteristic of the Western Plain (MIRCOV, V. D., ET AL., 2019). It can be appreciated that the influences of the Mediterranean climate are easily felt.

In autumn, the multiannual averages of these months vary between 16.2°C in September and 6.2°C in November. This decrease in temperature is due to the advection of cold air under the action of the ridge of the Euro-Asian anticyclone (BARBU, I., POPA, I.,2003; MUNTEANU, RODICA, 2001). The area being frequently subject to warm air invasions from the south-western sector, means that even in this season the temperature is 1°-2°C higher than in the eastern part of the country (table 1).

Table 1

Average air temperature (°C)

Monts	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
	1.1	1.2	6.2	10.9	16.0	18.9	20.7	19.8	16.2	11.2	6.2	1.5

The particularities of the thermal regime are also indicated by a series of elements, among which we mention. Frost days (min. temp. <0°C) - absent only in the summer months (PATRICHE, C.V., 2009; ŢARCĂ, M. 1998). The highest frequency is in January, and the lowest in May and September. From a practical point of view, the freezing regime is of particular importance. The average date of the first and last frost shows that the first autumn frost occurs in the second or even the third decade of October, and the last in the second decade of April, with an average interval of 186 days without frost, practically the interval it is much higher, in some years exceeding 250 days.

Winter days (max. temp. < 0°C) disappear at the end of March and only appear rarely in November, their number during the year is approx. 24 days.

The appearance of these days is caused by the penetration and stagnation of arctic or polar continental air, they can cause damage to crops, when the ground is not covered with snow.

Summer days (max. temp. < 25°C). appears from April to October inclusive, with the highest frequency in July and August. Accidentally they can also appear in March and November (once every ten years). Tropical days (max. temp. <30°C) occur more in the summer months, with an average annual number of approx. 33 days in atmospheric drought conditions, during these days damage to agricultural crops can occur (DUMA COPCEA, A. ET AL., 2018), (OKROS, A. ET AL., 2021), (ONCESCU, N., 1965). For the climatic characterization of the studied area, the local records of the Ineu weather station (observation interval 1964 - 1979), as well as of the Arad weather station (interval 1896 - 1955) were used (table 2).

Table 2.

Rainfall regime (l/m^2)

Monts	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Total
	29.5	42.1	32.9	49.8	72.1	94.3	57.7	61.1	55.3	37.5	41.4	52.0	625.6

On the ground, the winds from the south-eastern sector and those from the northern sector have the highest frequency. Winds from the western sector have a fairly high frequency (more than twice as frequent as those from the eastern sector) (table 3).

Table 3

The wind regime recorded in Arad

	N	NE	E	SE	S	SV	V	NV	Calm
speed (m/s)	4,4	3,33	2,7	6,5	3,7	3,4	4,0	4,1	-
frequency %	12,4	7,0	3,8	13,7	13,0	10.1	8,0	10,7	21.3

In the cold season, on the ground, the wind from the north predominates, and during the summer, the circulation from the east and west intensifies.

RESULTS AND DISCUSSIONS

Our family works 200 hectares, of which 30 hectares are our property, the difference of 170 hectares being leased. In our farm we have three tractors of different power, a combine, a stubble seeder, precision seeder, three ploughs, a disc, a combine and a vegetable shredder. The land I work on is located in the area of Seleus, and as a credit score on a scale from 1 to 10, the worked land is at level 6.

I cultivate the sunflower starting with the year 2022, the other three crops being present all the other years since the establishment of the farm. Of the four years considered, in the interval 2020-2023, 2020 was the rainiest, but also the first five months of 2023. In 2020, we have two consecutive months in which the amount of precipitation exceeded 100 mm. In June and July it rained 255 mm, more precisely, in June 145 mm, and in July, 108.7 mm. In the year 2022, in September we had a surplus record of 148.9 mm, but also a dry month during the summer, in June only 3.5 l/m2 were recorded. From a thermal point of view, we can say that in 2020 the thermal regime was the coolest, with an average temperature in January of -1.3 degrees C, and the average in August was 22.3 degrees C. Year 2021 it was the warmest year among the four studied, with positive temperatures and in winter, an average of 1.9 C was recorded in January, and the summer was very warm, with an average of 24.8 degrees C, in July. In this month, values of 33 to 34 degrees C were frequently reported. The year 2022 was characterized by normal values from a thermal point of view, with late spring frosts that were

reported in the last decade of March, more precisely in period 23.03.- 27.03.2022 (figure 1, 2 and 3 and table 4).

Fig. 1. Sunflower culture in 2023

Fig. 2 and fig. 3 The sunflower crop destroyed in July 2023 and the crop from August 2023

Table 4.

The productions obtained from the main cultivated crops in the period 2020-2023

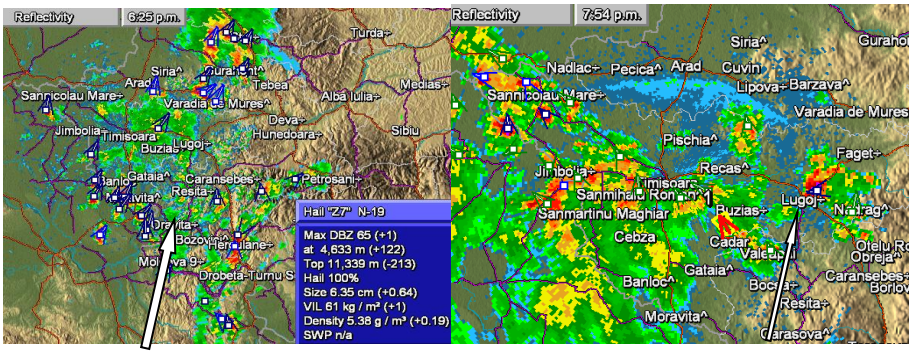
Culture/production (t/ha)	Years			
	2020	2021	2022	2023
Maize	7.2	8.0	3.7	9.0
Rape	1.8	2.3	3.4	3.48
Wheat	4.5	4.8	5.6	5.2

In 2023, it rained enough in the first five months, the hectoliter weight of wheat decreased and that is why we had a lower production compared to 2022. In the first four months, over 400 l/m^2 were recorded, which was a pluviometric excess for this period, in the last ten years. There were days when it rained 30 - 35 l/m^2, in five days, in March and over 30l/m^2 were recorded in 4 days in April. On July 21, 2023, a strong storm was recorded in our area. Itrained 39 l/m^2, but this rain was followed by the entry into our region of a front accompanied by clouds with high vertical extension, of the Cumulonimbus type, clouds accompanied by strong hail. This phenomenon compromised certain productions, especially in the sunflower culture, where we obtained a production between 1400 kg/ha and 1500 kg/ha. It should be noted that sunflowers are cultivated only starting with the year 2022, the year in which we achieved an average production of 3200 kh/ha.

With the help of the meteorological radar located within the Banat Crisana Regional Meteorological Center, the main direction of evolution of the frontal systems affecting the west of Arad county was identified. The first is the western atmospheric circulation and which corresponds to the general circulation at the level of Romania. Such traffic usually affects the entire county, from west to east.

The second most important component is the southern atmospheric circulation which, although initiated in the south of Arad county, tends to develop in our area of interest. The amplification of convection can be attributed to the contribution of relative humidity from the Mureş River and from the forests in the south, through the process of evapotranspiration.

Wind rotates in the atmosphere on a vertical axis, being in correlation with air convection movements; it is accompanied by black storm clouds, cumulus and cumulonimbus clouds. The vortex tube rises from the surface of the earth to the level of the clouds, this definition of Alfred Wegener (1917) is still valid today. Tornadoes produced in the temperate zone have a weaker intensity and are less frequent, with about 10 tornadoes occurring annually in Romania, due to the decrease in the centrifugal force and the increase in the Coriolis force. Bogdan Antonescu on his blog comes with more detailed specifications related to the climatology of tornadoes. Without specifying their intensity, Antonescu Bogdan also locates in the western part of Romania, even in Arad county, the presence of tornadoes, the interval of the study is over a period of more than a hundred years.



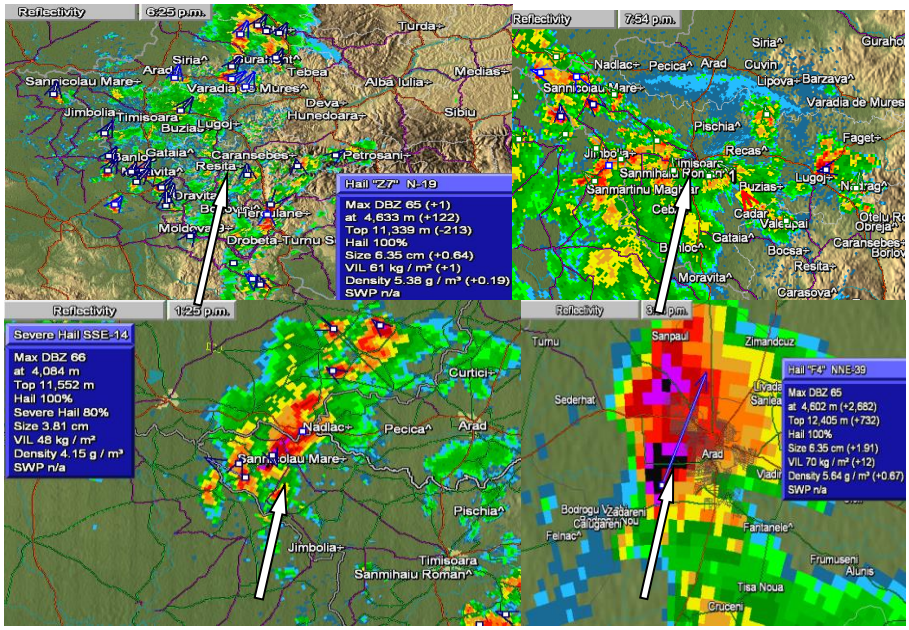


Fig.4 Convective systems with south-north movement and their amplification in Arad county (direction of movement with the white arrow)

CONCLUSIONS

The southwest of Romania, like the whole country, due to its geographical position - in the temperate zone, is exposed to a wide range of risk weather and climate phenomena with the potential to occur throughout the year. The multiannual air temperature average is 10.6°C. The warmest month is July (20.7°C) and the coldest is January (-1.1°C).

In the paper I used the data provided by CMR Banat Crisana, more precisely those from the weather station Chisinau Cris and the station Arad. Due to the climatic conditions, which were favorable both thermally and rainfall-wise, in the fall of 2020 and the first months of 2021, we obtained the highest corn production in 2021, a quantity of 8000 kg/ha. It is worth noting the excess rainfall regime recorded in the first two months of 2021, in Chisinau Cris 137 l/m^2 were reported, while in the first four months of 2023 it rained 410 l/m^2. This favorable rainfall regime will give a production of approximately 9100 kg/ha, in the fall of this year. Also in this, for wheat we obtained 5200 kg/ha, while for rape the production was 3480 kg/ha.

In 2023, it rained a lot and the hectoliter weight decreased and that's why we had a lower wheat production. In the first four months, more than 400 l/m^2 were recorded, which was a pluviometric excess for this period, in the last ten years. There were days when it rained 30 - 35 l/m^2, in five days. On July 21, 2023, it rained 39 l/m^2, but this rain was followed by the entry into our area by a front accompanied by clouds with high vertical extension, of the Cumulonimbus type, clouds accompanied by strong hail.

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