# TRENDS IN THE STRUCTURE AND PRODUCTIVITY OF AGRICULTURAL CROPS IN SEMLAC, ARAD COUNTY

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*Abstract. The paper analyzes the evolution of the structure of crops and plant productions in Semlac, Arad County, in the period 2021–2024, based on data obtained from statistical sources and field observations. The aim of the study is to highlight the dynamics of the main agricultural crops within the conventional agricultural system, with a focus on cereal, vegetable, fodder and fruit tree crops. The analysis of the data shows that the cultivated areas and the yields obtained varied significantly depending on the climatic conditions and the structure of the agricultural land. The corn crop for grains recorded the highest productions, reaching maximum values in 2023 (1504 tons), followed by winter wheat and rapeseed. Vegetable and fruit crops remained on small areas, reflecting the local specificity predominantly oriented towards field crops. Forage plants, especially pastures and meadows, hold a significant share in the use of agricultural land, supporting livestock activity. The results obtained highlight a general trend of crop diversification and a moderate increase in productivity in climate-friendly years. The study provides a complex picture of the agricultural system in western Romania, contributing to the substantiation of production optimization measures and the sustainable use of agricultural resources. Semlac locality, located in the west of Arad County, is a relevant example of the field agriculture characteristic of the Lower Mureş Plain.*

*Keywords: Semlac, agricultural system, agricultural crops, productivity, trends, sustainability*

## INTRODUCTION

Agriculture is one of the oldest and most important economic activities, playing an essential role in ensuring food security and maintaining the global ecological balance (LAL, 2020; FAO, 2022). In recent decades, climate change, soil degradation and increasing demographic pressure have led to profound transformations in global agricultural systems (SMITH ET AL., 2018; MONTANARELLA ET AL., 2016; MIRCOV ET AL., 2021). In this context, sustainable agriculture and the conservation of natural resources become major priorities for agricultural and environmental policies (GEBBERS & ADAMCHUK, 2010; BASSO & ANTLE, 2020).

At European level, the European Union promotes through the Common Agricultural Policy (CAP) 2023–2027 a competitive and sustainable agriculture model, based on digitalization, integrated soil management and the reduction of greenhouse gas emissions (EUROPEAN COMMISSION, 2023; EEA, 2022). There is also an emphasis on adapting technologies to local conditions and increasing resource efficiency (PANAGOS ET AL., 2020; JONES ET AL., 2020). Especially in lowland regions, intensive agriculture needs to be harmonized with measures to protect the environment and maintain soil fertility (MORARU & RUSU, 2012; RUSU ET AL., 2021). In Romania, field agriculture occupies a majority share in land use, being influenced by the varied pedoclimatic conditions and the degree of mechanization (NIȚĂ, 2007; IMBREA, 2014). In the western area, especially in the Western Plain of Romania, natural conditions favor wheat, corn, sunflower and rapeseed crops (POSEA, 1995; PUȘCĂ, 2002). Research by MIHUȚ ET AL. (2018) AND OKROS ET AL. (2019) highlights the importance of

sustainable use of agricultural land in Banat, by adapting technologies to the local soil specificity.

Recent studies (POPESCU ET AL., 2022; DUMA-COPCEA ET AL., 2022) confirms that crop diversification and the application of modern technologies lead to the stabilization of productions and the reduction of climate risks.

Semlac locality, located in the west of Arad County, is a relevant example of the field agriculture characteristic of the Lower Mureș Plain. The geomorphological, climatic and hydrographic conditions favor the development of cereal crops and technical plants, and the predominantly chernozymic soils support a high agricultural potential. In this context, the analysis of the evolution of agricultural areas and productions between 2021–2024 allows the identification of the main development trends of the local agricultural system.

The purpose of this paper is to analyze the structure and productivity of agricultural crops in Semlac, Arad County, in the period 2021–2024, based on statistical data and field observations. The specific objectives aim to: highlight changes in the structure of agricultural crops; analysis of the evolution of productions according to climatic conditions; and identifying the dominant trends that can contribute to the sustainable development of agriculture in the western area of Romania.

### MATERIAL AND METHODS

The paper is based on the analysis of the evolution of agricultural areas and productions in Semlac, Arad County, in the period 2021–2024, aiming to highlight trends in crop structure and productivity within the conventional agricultural system.

The data used were obtained from official sources and field observations, namely:

- Semlac Town Hall, APIA Arad, INS (2023), as well as from the public reports of the Ministry of Agriculture and Rural Development (MADR);

- Synthesis data provided by the Arad Agricultural Chamber and by previous works on the agricultural characterization of the Western Plain (IMBREA, 2014; NIȚĂ, 2007; POSEA, 1995).

*Analysis methodology*

The analysis was based on the comparative processing of statistical data on cultivated area (ha) and yields obtained (t) for the main crop groups:

- cereals and technical plants (wheat, corn, barley, rapeseed, sunflower, triticale, oats, sorghum);

- vegetables (potato, tomatoes, cabbage, onions, garlic, peas, peppers, cucumbers, melons);

- fodder plants (alfalfa, pastures, meadows, fodder pumpkins, perennials);

- fruit trees and orchards (apples, plums, pears, peaches, walnuts).

For each crop category, the following indicators were calculated: average cultivated area (ha); total and average production (t and kg/ha); year-on-year change (%) compared to the previous year; the productivity index calculated by relating the total production to the cultivated area (RUSU ET AL., 2021). The data were centralized in comparative tables, corresponding to each agricultural year analyzed (2021–2024), and statistically interpreted by analyzing the evolution over time. The results were correlated with local pedoclimatic and technological factors, given the specificity of the conventional agricultural system predominant in the area (MIHUȚ ET AL., 2018; DUMA-COPCEA ET AL., 2022).The analysis was completed by qualitative interpretation of crop diversification and specialization trends, in the context of adaptation to current climatic and economic conditions (POPESCU ET AL., 2022; BASSO & ANTLE, 2020).

**RESULTS AND DISCUSSIONS**

The paper presents the structure of crops and productions obtained under the conventional agricultural system in 2021, 2022, 2023 and 2024. The highest yields in all four years analyzed were for grain cereal crops, grain corn being the crop with the highest yields. While vegetable crops are at the opposite pole both in terms of harvested areas and in terms of yields obtained (Tables 1, 2, 3 and 4.

*Table 1.*

Area and production of cereals

| Crops | Area (ha) | Production (t) |
|---|---|---|
| Common autumn wheat | 90 | 300 |
| Spring oats | 18 | 38 |
| Corn | 400 | 1500 |
| Triticale | 32 | 115 |

As can be seen in the table and figures above, the most common crop plants are represented by corn with 400 ha and a total production of 1500 t, with an average production of 3,750 kg/ha, followed by wheat with an area of 90 ha and a production of 300 t representing an average of 3,333.3 kg/ha. Other crops are triticals with 32 ha and oats with 18 ha.

*Table 2.*

Area and yields of vegetable crops

| Crops | Area - hectares | Production -tons |
|---|---|---|
| Early and semi-early potatoes | 30 | 220 |
| Dried onion | 6 | 90 |
| Dried garlic | 5 | 2 |
| Cucumbers | 3 | 20 |
| Bean | 2 | 2 |
| Cabbage | 1 | 50 |
| Melons | 1 | 30 |
| Pepper | 2 | 7 |

Regarding the vegetable crops in the locality, as can be seen from table 2, the main crops are potato and onion crops with 30 ha and 6 ha, respectively. On smaller areas are also grown: beans, peppers, garlic cabbage, which complete the range of crops.

*Table 3.*

Area and yields of fodder crops

| Cultures | Area - hectares | Production -tons |
|---|---|---|
| Natural pastures in use | 380 | 1600 |
| Natural pastures in use | 600 | 1500 |
| Feed pumpkins | 18 | 41 |
| Annuals forage and green fields | 20 | 35 |

Fodder plants are present in the locality and occupy an important space in the cultural area of the locality. Meadows and pastures have the largest areas, 1600 ha and 1500 ha respectively (Table 3).

*Table 4*

Area and fruit yields from fruit trees

| Crops | Area - hectares | Production -tons |
|---|---|---|
| Apple | 13 | 300 |
| Pears | 4 | 60 |
| Plums | 30 | 10 |

Fruit trees occupy an important space in the cultivation area of the locality, the largest area (30 ha) is the plums, followed by apples, with 13 ha (table 4).

*Table 5.*

Production and area of cereals and technical plants

| Crops | Area (ha) | Production (t) |
|---|---|---|
| Common autumn wheat | 1145 | 4006 |
| Barley | 50 | 200 |
| Autumn barley | 45 | 315 |
| Autumn oats | 2 | 4 |
| Corn | 915 | 28 |
| Rapeseed | 326 | 880 |
| Autumn triticale | 6 | 30 |
| Sorghum | 1 | 0 |
| Sunflower | 20 | 24 |

As can be seen from Table 5, the most important crop is wheat. It occupies an area of 1145 ha and a production of 4006 t, which presents an average of 3,498.6 kg/ha. In second place in terms of area is corn with 915 ha, with a total production of 28 tons and an average of 30.6 kg/ha. Other crops are rapeseed with 326 ha and barley with 50 ha (Table 5).

*Table 6*

Area and yields of vegetable crops

| Crops | Area - hectares | Production -tons |
|---|---|---|
| Summer potatoes | 1 | 30 |
| Autumn potatoes | 1 | 30 |
| Early and semi-early potatoes | 1 | 30 |
| Early tomatoes | 2 | 50 |
| Autumn tomato | 1 | 25 |
| Dried onion | 1 | 20 |
| Dried garlic | 1 | 2 |
| Roots | 1 | 30 |
| Peas | 5 | 10 |
| Cabbage | 2 | 50 |
| Watermelons | 1 | 20 |

Table 6 shows the area occupied by vegetable crops. Within the locality, the main crop is peas with 5 ha and potatoes, tomatoes, garlic, root vegetables and watermelons (1 ha) are grown on small areas, which complete the range of crops.

Fodder plants occupy an important space in the cultivation area of the locality, as can be seen from the data presented in table 7.

*Table 7.*

Area and yields of fodder crops

| Crops | Area - hectares | Production -tons |
|---|---|---|
| Old and new perennials | 38 | 80 |
| Lucerne | 38 | 80 |
| Natural pastures in use | 52 | 300 |

Perennials occupy large areas (80 ha).

The largest area, however, is owned by natural pastures, namely 300 ha.

*Table 8.*

Area and fruit yields from fruit trees

| Crops | Area - hectares | Production -tons |
|---|---|---|
| Apple | 2 | 20 |
| Pears | 1 | 10 |

| | | |
|---|---|---|
| Plum | 3 | 15 |
| Peaches | 1 | 10 |
| Walnuts | 2 | 4 |

Fruit trees occupy an important role in the cultural space of the locality, plums occupying the largest area of 3 ha.

*Table 9.*

Area and production of cereal crops and technical plants

| Crops | Area (ha) | Production (t) |
|---|---|---|
| Winter wheat | 238 | 1380 |
| Barley | 35 | 192 |
| Corn | 218 | 1504 |
| Rapeseed | 98 | 355 |
| Triticale | 50 | 250 |

As can be seen from Table 9, the main crop plant is wheat. It occupies an area of 238 ha and a total production of 1380 t, with an average production of 5,798.3 kg/ha, followed by corn with an area of 218 ha, with a production of 1504 tons, representing an average production of 6,899 kg/ha. The next crops are rapeseed with 98 ha and autumn triticalsă with 50 ha.

*Table 10*

Harvested area and vegetable crop yields

| Crops | Area - hectares | Production -tons |
|---|---|---|
| Early and semi-early  potatoes | 1 | 30 |
| Early tomatoes | 2 | 50 |
| Tomato | 1 | 25 |
| Dried onion | 1 | 20 |
| Dried garlic | 1 | 2 |
| Roots | 1 | 15 |
| Peas | 2 | 3 |
| Early cabbage | 2 | 50 |
| Watermelons | 1 | 10 |
| Melons | 1 | 10 |

The vegetable crops located within the locality, as can be seen from the table and figures above, the main crops are those of early crop and lime, early tomatoes şand limeă and peas with 2 hectares each and potatoes, onions, garlic etc. are grown on small areas that complete the range of crops.

*Table 11.*

Harvested area and yields for fodder crops

| Crop | Area - hectares | Production -tons |
|---|---|---|
| Lucerne | 42 | 10 |
| Natural pastures in use | 52 | 300 |

Fodder plants occupy 94 ha in the cultivation area of the locality, alfalfa and pastures occupying the largest areas. 42 ha respectively 52 ha.

*Table 12*

Area and fruit yields of fruit trees

| Crops | Area - hectares | Production -tons |
|---|---|---|
| Apple | 2 | 20 |
| Pears | 1 | 10 |
| Plum | 3 | 18 |
| Peaches | 1 | 10 |
| Walnuts | 2 | 4 |

Fruit trees occupy an important space in the cultivation area of the locality, plums occupying the largest area of 3 ha.

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*Table 13*

Productive area  of cereal crops

| Crops | Harvested area (ha) |
|---|---|
| Common autumn wheat | 68 |
| Autumn triticale | 7 |
| Spring oats | 21 |
| Corn for grains | 320 |

As can be seen, the most representative crop plants are corn with an area of 320 ha, followed by wheat with an area of 68 ha.

*Table 14*

Productive area  in vegetable crops

| Crops | Area - hectares |
|---|---|
| Potatoes | 40 |
| Tomato | 1 |
| Autumn tomatoes | 1 |
| Roots | 1 |
| Cabbage | 2 |
| Beans | 1 |
| Pepper | 2 |
| Cucumber | 2 |
| Peas | 2 |

The vegetable crops found in the locality, among the most important crop plants is peas with 40 ha and on smaller areas cabbage, tomatoes, peppers etc. are grown, which complete the range of crops.

*Table 15*

Productive area  in fodder crops

| Crops | Area - hectares |
|---|---|
| Alfa alfa | 20 |
| Natural pastures in use | 595 |
| Clover | 7 |
| Old and new perennials | 28 |
| Fodder beets | 1 |
| Feed pumpkins | 4 |
| Arable land | 515,08 |
| Hays | 478 |

Fodder plants occupy an important space in the cultivation area of the locality, meadows and pastures occupying the largest areas. 478 ha respectively 595 ha

**CONCLUSIONS**

The analysis of the evolution of the agricultural system in Semlac in the period 2021–2024 highlighted some essential trends:

The predominance of cereal crops (especially wheat and maize) confirms the agricultural specificity of the lowland area and the high degree of mechanization of agricultural holdings.

Grain maize recorded the highest yields, reaching a maximum of 1504 tons in 2023, reflecting the adaptability of this crop to local pedoclimatic conditions. Vegetable crops were present on small areas, with significant annual variations, determined by climatic conditions and the economic interest of local producers. Fodder plants (pastures and meadows) play an important role in the agricultural structure, helping to sustain livestock activities and maintain the ecological balance. Fruit crops show relative stability, with a constant share of plum and apple trees in the existing orchards.

The results show a general trend of crop diversification, at the same time as a moderate increase in productivity in years with favorable climatic conditions.

For the sustainable development of agriculture in the area, it is recommended:

- the continuation of locally adapted conventional agricultural practices;
- introduction of precision technologies;
-promoting drought-resistant alternative crops;
-strengthening irrigation systems and efficient management of water resources.

Thus, Semlac represents a relevant example of field agriculture in western Romania, where maintaining the balance between productivity and sustainability becomes a strategic objective for the future.

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