

Original Article

The Economic Efficiency of the Soybean Culture Depending on the Soil Tilling System and the Pre-emerging Plant

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Abstract

The purpose of this paper is determining the specific influences which soil tillage and the pre-emerging plant have on the economic efficiency of the soybean culture in the area of the Somesan Plateau. The economic efficiency of the soybean culture is mainly determined by the crop level and the production costs, so that for the soybean culture a profit between 128 - 153 lei/ha is recorded, which varies depending on the soil tillage. Thus, with the classical alternative, a profit of 135 lei/ha is recorded, and with the unconventional chisel and paraplow soil tilling alternatives values of 140 - 153 lei/ha are recorded. The profit achieved in the (a_4) alternative, tilled with the rotary harrow, is 128 lei/ha, smaller than both the profit recorded in the classical system alternatives and the unconventional systems ones. Regardless of the fact that soybean is cultivated after wheat or corn, the profit rate is maximal 16.25 - 16.32% in the paraplow tilling alternative, respectively 13.57-13.58% in the classical plowing alternative and 13.66 - 13.69% in the rotary harrow soil tilling alternative. Variations of the profit rate depending on the pre-emerging plant were identified only with the chisel alternative, for which cultivating soybean after wheat achieves a rate of profit of 14.89%, comparatively with 13.01%, when soybean was cultivated after corn.

Keywords: economic efficiency, soil tillage, crop rotation.

1. Introduction

Soil tillage and crop rotation are some of the main economic means of lasting agricultural production, which lead to the profitability of the production consistently with the economic requirements. The large weight of soil tillage expenses in the technology of the soybean culture motivates the soil tillage rationalization with the purpose of fuel consumption reduction and also introducing new soil tillage alternatives, with the chisel, paraplow and rotary harrow, which lead to making the cultivation technology more efficient, to profit growth for the surface unit and to lowering the production costs in the area.

The new soil tilling systems recommended for different soil and climate areas and concrete local conditions represent alternatives which can remove risk factors and their negative consequences on the agricultural agro-ecosystems. The increase in fuel prices and the necessity to lower the energetic input with the purpose of increasing the economic efficiency of soil cultivation has been another cause which led to major changes in the soil tillage concept. The suitability of the new soil tilling systems for different soil and climate conditions and their economic and organizational advantages have led to modifying the concept of soil tillage.

The specialized literature from Romania [3, 6, 7, 8, 10, 12], offers enough examples concerning the Romanian researchers' preoccupation for finding out the role that soil tillage has on production and profit with the cultivated plants.

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2. Material and Method

The results presented in this paper were obtained in the experimental fields of the agrotechnics discipline from the Jucu region in Cluj, on argic-stagnic Faeoziom soil, with a humus content of 3.8% and 6.5 pH. From a climatic point of view, the hilly area where the experiments took place is characterised by medium annual precipitations between 550 - 650 mm. The thermal regime of the area is characterised by annual average temperatures between 8.0 - 8.2°C.

The aim of the research was determining the economic efficiency depending on the soil tilling system and the pre-emerging plant for the soybean culture. The experimental factors were as follows: *Factor A – Tillage system*: a₁ – worked with reversible plough; a₂ – worked with chisel; a₃ – worked with paraplow; a₄ – worked with rotary harrow; *Factor B – Cultivated plant*: b₁ – corn; b₂ – soybean; b₃ – wheat.

3. Results and Discussions

The economic efficiency of the soybean culture is mainly determined by the crop level and the production costs. For the soybean cultures a profit between 128 - 153 lei/ha is recorded, varying on the soil tilling systems.

The profit of lei/ha exceeds the classical alternative with the reversible plough. Thus, a profit of 135 lei/ha is recorded with the classical alternative, and with the unconventional chisel and paraplow soil tilling alternatives values between 140 - 153 lei/ha are recorded.

The profit achieved in the (a₄) alternative, with the rotary harrow, is 128 lei/ha, as compared to the profit recorded in the classical system alternatives and the unconventional system alternatives (table 1).

Considering the profit rate, we recommend for the soybean culture the paraplow tilling system, followed by the chisel and plough systems.

Table 1. Economic efficiency in soybean crop related to the soil tillage system, after wheat as a pre-emergent plant

Working variant	Main production (kg/ha)	Main production value (lei/ha)	Production increase value (lei/ha)	Production expenses (lei/ha)	Production cost (lei/kg)	Total profit (lei/ha)	Rate of profit (%)
a ₁	1883	1129	(Mt)	994	0.53	(Mt) 135	13.58
a ₂	1800	1080	-49	940	0.52	+140	14.89
a ₃	1817	1090	-39	937	0.51	+153	16.32
a ₄	1775	1065	-64	937	0.52	-128	13.66

The profit recorded for the soybean culture is determined by both the soil tillage and the pre-emerging plant. In the case of the soybean cultivated after corn also, the maximum value of profit fits in the paraplow alternative.

Concerning the pre-emerging plant, the profit rate differences are small regarding the influence of the pre-emerging plant.

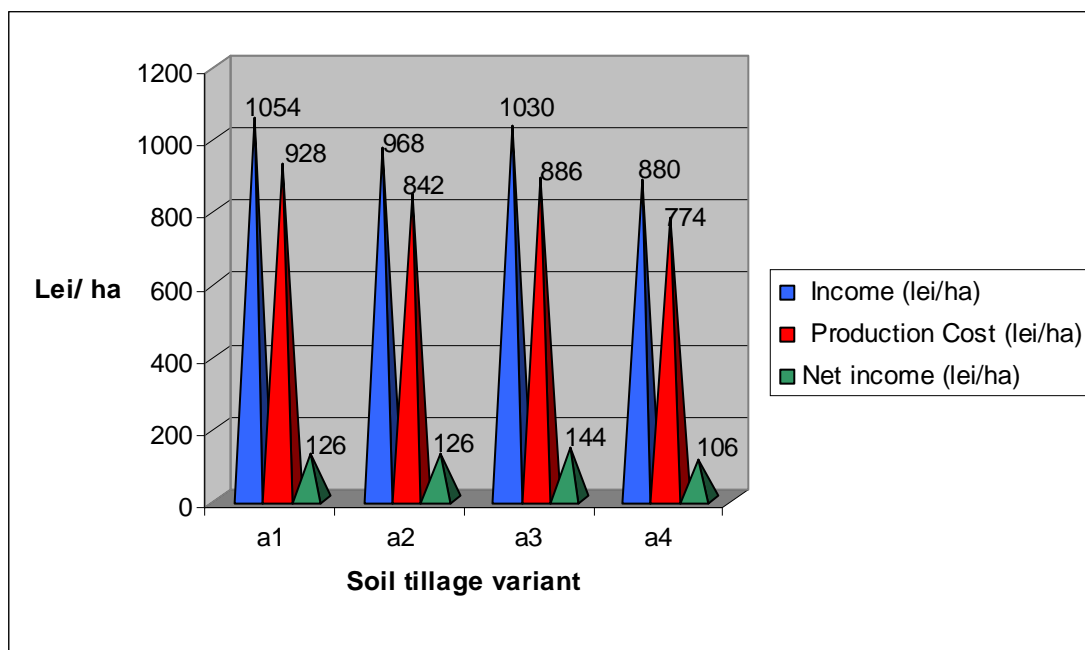
Consequently, no matter if the soybean is cultivated after wheat or corn, the profit rate is

maximal 16.25-16.32%, with the paraplow alternative, respectively 13.57 - 13.58% in the classical plowing alternative, and 13.66 - 13.69% in the rotary harrow alternative (table 2).

Variations of the profit rate depending on the pre-emerging plant have been identified only in the chisel alternative, for which cultivating soybean after wheat recorded a profit rate of 14.89%, comparatively to 13.01%, in the situation when soybean was cultivated after corn.

Table 2. Economic efficiency in soybean crop related to the soil tillage system, after corn as a pre-emergent plant

Working variant	Main production (kg/ha)	Main production value (lei/ha)	Production increase value (lei/ha)	Production expenses (lei/ha)	Production cost (lei/kg)	Total profit (lei/ha)	Rate of profit (%)
a ₁	1757	1054	(Mt)	928	0.53	(Mt)126	13.57
a ₂	1613	968	-86	842	0.52	126	13.01
a ₃	1717	1030	-24	886	0.51	+144	16.25
a ₄	1467	880	-174	774	0.52	-106	13.69

**Figure 1.** Economic efficiency in soybean crop related to the soil tillage system and the pre-emergent plant, corn

4. Conclusions

The economic efficiency of the soybean culture is mainly determined by the crop level and the production costs. For the soybean culture a profit between 128 - 153 lei/ha has been recorded, varying on the soil tillage. The profit in lei/ha with the unconventional systems exceed the reversible plough classical alternative.

Thus in the classical alternative a profit of 135 lei/ha is recorded, and in the unconventional chisel and paraplow alternatives values of 140 - 153 lei/ha are recorded. The profit achieved in the (a₄) rotary harrow alternative is of 128 lei/ha, smaller than both the profit recorded in the classical system

alternative and the unconventional system alternatives.

Considering the profit rate, we recommend for the soybean culture the paraplow tilling system, followed by the chisel and plough systems. Regarding the pre-emerging plant, the profit rate differences are small concerning the pre-emerging plant. Consequently, regardless of whether we cultivate soybean after wheat or corn, the profit rate is maximal 16.25 - 16.32% in the paraplow alternative, respectively 13.57 - 13.58% in the classical plowing alternative, and 13.66 - 13.69% in the rotary harrow alternative.

Differences in the profit rate depending on the pre-emerging plant have been identified only in

the chisel alternative, for which cultivating soybean after wheat achieves a profit rate of 14.89%, comparatively to 13.01%, when soybean was cultivated after corn.

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