

## ECONOMIC EFFICIENCY ASSESSMENT OF RUNNER BEAN (*Phaseolus coccineus* L.) IN INTERCROPPING SYSTEM

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### Abstract

The paper presents the economic efficiency assesment of runner bean (*Phaseolus coccineus* L.), cultivated in intercropping system. The crop was established by direct sowing in the field, in three variants of plant arrangement, namely: intercropping with common maize, intercropping with sunflower and intercropping with Jerusalem artichoke. The technological estimate elaboration meant the enumeration of technological links for each experimental variant, since the previous crop abolition and ending with harvesting. The results were reported at the unit area (hectare-ha), indicating obvious differences between the studied variants.

**Key words:** bean, cost of production, rate of return.

Economic efficiency is the result of everything related to the scientific organization of production and work, everything that can contribute to saving financial and material means. For this reason, the notion of efficiency is complex and can not be limited only to the concept of return. Moreover, determination and economic efficiency analysis can not be confined to a single indicator, but it must use a system of indicators that can highlight the complexity of the phenomena that occur within a farm (Hobincu M., 2013).

The role of economic analysis is to assess the economic situation of farmers. Based on this analysis, a new strategy in the maintenance and development of specific local economy takes place, providing economic information to those who practice agriculture and to those outside this field who are interested (Mungiu-Pupuzan C., 2010).

The paper presents the evaluation of economic efficiency of runner bean (*Phaseolus coccineus* L.) in intercropping system. Through the intercropping system, a certain economic efficiency is ensured, by the fact that, in the event that a culture is compromised, the other culture can provide an income (Horwith B., 1985; Eskandari H. *et al.*, 2009; Hamburdă S.B. *et al.*, 2014). The need for this study stems from the fact that there were no such economic studies conducted on runner bean grown in intercropping system.

### MATERIAL AND METHOD

To achieve the objective, a technical-economic database carried out following the technological process of runner bean cultivation was used as a working material.

Runner bean cultivation was established by direct sowing in the experimental field of the Vegetable Growing discipline from "Vasile Adamachi" farm of UASVM Iași. The distance between rows was 1 m and between plants, in the row, 0.4 m. Distance between common maize plants, sunflower plants, respectively Jerusalem artichoke plants, was 0.8 m.

The technological estimate elaboration meant the enumeration of technological links for each experimental variant, since the previous crop abolition and ending with harvesting. The results were reported at the unit area (hectares-ha).

The experimental variants were:

- V<sub>1</sub> = intercropping with common maize (*Zea mays* L.), on a single row, with a density of 5.0 runner bean plants/m<sup>2</sup>;
- V<sub>2</sub> = intercropping with sunflower (*Helianthus annuus* L.), on a single row, with a density of 5.0 runner bean plants/m<sup>2</sup>;
- V<sub>3</sub> = intercropping with Jerusalem artichoke (*Helianthus tuberosus* L.), on a single row, with a density of 5.0 runner bean plants/m<sup>2</sup>.

Expenses for technological links were grouped as follows: work in progress, land preparation, crop establishment, maintenance and

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harvesting (Stoleru V. and Munteanu N., 2010). For each of these, the following were calculated: consumption expenditure of manual labor, consumption of mechanics labor and consumption of materials.

Correspondingly, direct costs, indirect costs, cost of production, revenue, gross profit and rate of return have been calculated. Economic efficiency is calculated without considering, for recovery, the yield obtained by common maize, sunflower or Jerusalem artichoke plants, but only by the runner bean plants. Data interpretation was done by appropriate statistical-mathematical

methods, respectively comparative analysis between variants (Jităreanu G., 1994; Săulescu N.A. and Săulescu N.N., 1967).

## RESULTS AND DISCUSSIONS

### Results obtained at variant V<sub>1</sub>

In variant V<sub>1</sub>, commercial yield was 2073 kg/ha (dry beans). Direct expenses were 9821 lei/ha, of which: 5300 lei for manual force expenditure, 1809 lei for mechanical force and 2712 lei for material consumption (*table 1*).

Table 1

Surface = 1 ha Comercial yield = 2073 kg/ha (dry beans)					
Nr. crt.	Work title	Force consumption		Material consumption	
		manual (lei)	mechanical (lei)	material name	val. (lei)
1	work in progress	300	180	-	-
2	land preparation	-	1509	manure	1500
3	crop establishment	300	120	common maize seeds	72
				runner bean seeds	120
4	maintenance	2601.3	-	Boundary, Hunter, Wettable Sulfur, Kocide, Cropmax, Champ, Veramin	1020
5	harvesting	2098.7	-	-	-
6	TOTAL	5300	1809	-	2712
TOTAL					9821

Regarding the economic efficiency of V<sub>1</sub> variant, total operating expenses were 11294.2 lei/ha. Following recovery of runner bean yield, there would be an income of 20730 lei at a delivery price of 10 lei/kg. In this case, gross profit would be 9435.8 lei and the rate of return 83.5 % (*table 2*).

### Results obtained at variant V<sub>2</sub>

In variant V<sub>2</sub>, commercial yield was 3104 kg/ha (dry beans). Direct expenses were 11022.2 lei/ha, of which: 6531.2 lei for manual force expenditure, 1809 lei for mechanical force and 2682 lei for material consumption (*table 3*).

Regarding the economic efficiency of V<sub>2</sub> variant, total operating expenses were 12675.6 lei/ha. Following recovery of runner bean yield, there would be an income of 31040.0 lei at a delivery price of 10 lei/kg. In this case, gross profit would be 18364.4 lei and the rate of return 144.9 % (*table 4*).

### Results obtained at variant V<sub>3</sub>

In variant V<sub>3</sub>, commercial yield was 1221 kg/ha (dry beans). Direct expenses were 9948.9 lei/ha, of which: 4824.9 lei for manual force expenditure, 1884.0 lei for mechanical force and 3240.0 lei for material consumption (*table 5*).

Table 2

No.	Specification	V <sub>1</sub> (lei)
1	direct costs (lei/ha)	9821.0
2	indirect costs (lei/ha)	1473.2
3	total operating expenses (lei/ha)	11294.2
4	cost of production (lei/to)	5448.2
5	delivery price (lei/kg)	10
6	income (lei/ha)	20730
7	gross profit (lei/ha)	9435.8
8	rate of return (%)	83.5

Table 3

**The technological estimate for V<sub>2</sub> variant**

Surface = 1 ha Comercial yield = 3104 kg/ha (dry beans)					
No.	Work title	Force consumption		Material consumption	
		manual (lei)	mechanical (lei)	material name	value (lei)
1	work in progress	300	180	-	-
2	land preparation	-	1509	manure	1500
3	crop establishment	300	120	sunflower seeds	42
				runner bean seeds	120
4	maintenance	2788.8	-	Boundary, Hunter, Wetable Sulfur, Kocide, Cropmax, Champ, Veramin	1020
5	harvesting	3142.4	-	-	-
6	TOTAL	6531.2	1809		2682
TOTAL					11022.2

Table 4

**Economic efficiency of V<sub>2</sub> variant**

No.	Specification	V <sub>2</sub> (lei)
1	direct costs (lei/ha)	11022.3
2	indirect costs (lei/ha)	1653.3
3	total operating expenses (lei/ha)	12675.6
4	cost of production (lei/to)	4083.6
5	delivery price (lei/kg)	10
6	income (lei/ha)	31040.0
7	gross profit (lei/ha)	18364.4
8	rate of return (%)	144.9

Table 5

**The technological estimate for V<sub>3</sub> variant**

Surface = 1 ha Comercial yield = 1221 kg/ha (dry beans)					
No.	Work title	Force consumption		Material consumption	
		manual (lei)	mechanical (lei)	material name	value (lei)
1	work in progress	300	375	-	-
2	land preparation	-	1509	manure	1500
3	crop establishment	475	-	Jerusalem artichoke tubers	600
				runner bean seeds	120
4	maintenance	2813.8	-	Boundary, Hunter, Wetable Sulfur, Kocide, Cropmax, Champ, Veramin	1020
5	harvesting	1236.1	-	-	-
6	TOTAL	4824.9	1884.0		3240.0
TOTAL					9948.9

Regarding the economic efficiency of V<sub>3</sub> variant, total operating expenses were 11441.3 lei/ha. Following recovery of runner bean yield, there would be an income of 12210 lei at a delivery price of 10 lei/kg. In this case, gross profit would be 768.7 lei and the rate of return 6.7 % (table 6).

Table 6

**Economic efficiency of V<sub>3</sub> variant**

No.	Specification	V <sub>3</sub> (lei)
1	direct costs (lei/ha)	9948.9
2	indirect costs (lei/ha)	1492.3
3	total operating expenses (lei/ha)	11441.3
4	cost of production (lei/to)	9370.4
5	delivery price (lei/kg)	10
6	income (lei/ha)	12210.0
7	gross profit (lei/ha)	768.7
8	rate of return (%)	6.7

**Results from the experience**

Comparing the three experimental variants, *direct costs* were highest for variant V<sub>2</sub> (11022.3 lei ha) and lowest for variant V<sub>1</sub> (9821.0 lei/ha). *Indirect costs* ranged from 1653.3 lei/ha (variant V<sub>2</sub>) to 1473.2 lei/ha (variant V<sub>1</sub>).

The highest *total operating expenses* are in variant V<sub>2</sub> (12675.6 lei/ha) and the lowest for variant V<sub>1</sub> (11294.2 lei/ha).

The highest *cost of production* is for variant V<sub>3</sub> (9370.4 lei) and the lowest for variant V<sub>2</sub> (4083.6 lei/to).

Economic efficiency of the experimental variants

No.	Specification	V <sub>1</sub>	V <sub>2</sub>	V <sub>3</sub>	Mean average
1.	direct costs (lei/ha)	9821.0	11022.3	9948.9	10264.1
2.	indirect costs (lei/ha)	1473.2	1653.3	1492.3	1539.6
3.	total operating expenses (lei/ha)	11294.2	12675.6	11441.3	11803.7
4.	cost of production (lei/to)	5448.2	4083.6	9370.4	6300.7
5.	income (lei/ha)	20730	31040	12210	21326.7
6.	gross profit (lei/ha)	9435.8	18364.4	768.7	9522.9
7.	rate of return (%)	83.5	144.9	6.7	78.3

The highest *income* is for variant V<sub>2</sub> (31040 lei/t) and the lowest for variant V<sub>3</sub> (12210 lei/to).

In terms of *gross profit*, the largest is at variant V<sub>2</sub> (18364.4 lei) and the lowest at variant V<sub>3</sub> (768.7 lei).

The highest *rate of return* is at variant V<sub>3</sub> (144.9%) and lowest at variant V<sub>3</sub> (6.7 %) (table 7).

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#### CONCLUSIONS

Economic efficiency is a modern assessment activity and serves to substantiate decisions, so that available resources are consumed in the most favorable way for the company.

The most cost-effective and productive variant is V<sub>2</sub>, respectively intercropping with sunflower, on a single row, with a density of 5.0 runner bean plants/m<sup>2</sup>, followed by V<sub>1</sub>, intercropping with common maize, on a single row, with a density of 5.0 runner bean plants/m<sup>2</sup>.

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