# EXPERIMENTAL RESULTS ON ECONOMIC EFFICIENCY OF RUNNER BEAN (*Phaseolus coccineus* L.) IN PURE CROP SYSTEM

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**Abstract**

The paper presents the economic efficiency assesment of runner bean (*Phaseolus coccineus* L.) cultivated in pure crop system. The crop was established by direct sowing in the field, in three variants of plant arrangement, namely: palis on trellis, with individual string, with double rows, having a density of 7.14 plants/m$^2$; palis on trellis, with individual string, with a single row, having a density of 5.0 plants/m$^2$; palis on trellis, with synthetic net with a single row, having a density of 5.0 plants/m$^2$. 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), indicating obvious differences between the studied variants.

**Key words**: bean, costs, technological estimate.

In the Romanian agricultural landscape, runner bean (*Phaseolus coccineus* L.) is lesser known, the cultivated areas relatively low, being found, in particular, in small farms, private collections and research units (Hamburdă S.B. *et al.,* 2013). The importance of this species lies not in the cultivated area, but in the food and economic value, as well as from the perspective of cultivation (Munteanu N., 1985; Hamburdă S.B. *et al.,* 2014).

In the economic efficiency matter, the complex relationship between effects and efforts is revealed, namely the results of economic activities, respectively expenses incurred for obtaining them. Economic efficiency is all the higher as, with the same amount of inputs used, a higher output is obtained, or when a given quantity of product is obtained with minimal use of inputs (Bărbulescu Tudorache A.C. and Bărbulescu Tudorache T.M., 2013).

The paper presents the evaluation of economic efficiency of a runner bean crop, established in three plant designs, namely schemes and densities. The need for this study stems from the fact that such economic studies on the runner bean crop, grown in different plant disposals, have not been achieved. Thus, these calculations will highlight which cultivation scheme, out of the three studied variants, is economically efficient.

## 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 Ia□i. The distance between rows was 1 m and between plants, in the row, 0.4 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 the three runner bean support systems, namely:

- $V_1$ = pure culture, palis on trellis, with individual string, with double rows, having a density of 7.14 plants/m$^2$
- $V_2$ = pure culture, palis on trellis, with individual string, with a single row, having a density of 5.0 plants/m$^2$;
- $V_3$ = pure culture, palis on trellis, with synthetic net with a single row, having a density of 5.0 plants/m$^2$.

Expenses for technological links were grouped as follows: work in progress, land preparation, crop establishment, maintenance and harvesting (Stoleru V. and Munteanu N., 2010). For each of these, the following were calculated: consumption expenditure of manual labor,

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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. 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 DISCUSSION

In variant $V_1$, commercial yield was 2732 kg/ha (dry beans). Direct expenses were 20457.6 lei/ha, of which: 12228.6 lei for manual force expenditure, 1599 lei for mechanical force and 6630 lei for material consumption *(table 1)*.

Table 1

**The technological estimate for $V_1$ variant**

| Surface = 1 ha<br>Comercial yield = 2732 kg/ha (dry beans) | | | | | |
|---|---|---|---|---|---|
| No. | Work title | Force consumption | | Material consumption | |
| | | manual (lei) | mechanical (lei) | material name | value (lei) |
| 1 | work in progress | 2850 | 90 | - | - |
| 2 | land preparation | - | 1509 | manure | 1500 |
| 3 | crop establishment | 3011.60 | - | trellis | 3025 |
| | | | | wire | 455 |
| | | | | runner bean seeds | 150 |
| 4 | maintenance | 3601.15 | - | string | 585 |
| | | | | Boundary, Hunter, Wettable Sulfur, Kocide, Cropmax, Champ, Veramin | 915 |
| 5 | harvesting | 2765.88 | - | - | - |
| 6 | TOTAL | 12228.6 | 1599 | - | 6630 |
| TOTAL | | | | | 20457.6 |

Regarding the economic efficiency of the $V_1$ variant, total operating expenses were 23526.3 lei/ha. Following recovery of runner bean yield, there would be an income of 27320 lei at a delivery price of 10 lei/kg. In this case, gross profit would be 3793.7 lei and the rate of return 16.1% *(table 2)*.

Table 2

**Economic efficiency of $V_1$ variant**

| No. | Specification | $V_1$ (lei) |
|---|---|---|
| 1 | direct costs (lei/ha) | 20457.6 |
| 2 | indirect costs (lei/ha) | 3068.6 |
| 3 | total operating expenses (lei/ha) | 23526.3 |
| 4 | cost of production (lei/to) | 8611.4 |
| 5 | delivery price (lei/kg) | 10 |
| 6 | income (lei/ha) | 27320 |
| 7 | gross profit (lei/ha) | 3793.7 |
| 8 | rate of return (%) | 16.1 |

**Results obtained at variant $V_2$**

In variant $V_2$, commercial yield was 3321 kg/ha (dry beans). Direct expenses were 23957.4 lei/ha, of which: 14623.4 lei for manual force expenditure, 1599 lei for mechanical force and 7735 lei for material consumption *(table 3)*.

Regarding the economic efficiency of the $V_2$ variant, total operating expenses were 27551.0 lei/ha. Following recovery of runner bean yield, there would be an income of 33210 lei at a delivery price of 10 lei/kg. In this case, gross profit would be 5659.0 lei and the rate of return 20.5 % *(table 4)*.

**Results obtained at variant $V_3$**

In variant $V_3$, commercial yield was 3199 kg/ha (dry beans). Direct expenses were 23744.7 lei/ha, of which: 14465.7 lei for manual force expenditure, 1599 lei for mechanical force and 7680 lei for material consumption *(table 5)*.

Regarding the economic efficiency of the $V_3$ variant, total operating expenses were 27306.5 lei/ha. Following recovery of runner bean yield, there would be an income of 31990 lei at a delivery price of 10 lei/kg. In this case, gross profit would be 4683.5 lei and the rate of return 17.2 % *(table 6)*.

Table 3

**The technological estimate for $V_2$ variant**

| Surface = 1 ha<br>Comercial yield = 3321 kg/ha (dry beans) | | | | | |
|---|---|---|---|---|---|
| No. | Work title | Force consumption | | Material consumption | |
| | | manual (lei) | mechanical (lei) | material name | value (lei) |
| 1 | work in progress | 3950 | 90 | - | - |
| 2 | land preparation | - | 1509 | manure | 1500 |
| 3 | crop establishment | 4025.8 | - | trellis | 4400 |
| | | | | wire | 525 |
| | | | | runner bean seeds | 120 |
| 4 | maintenance | 3285.42 | - | string | 455 |
| | | | | Boundary, Hunter, Wettable Sulfur, Kocide, Cropmax, Champ, Veramin | 735 |
| 5 | harvesting | 3362.18 | - | - | - |
| 6 | TOTAL | 14623.4 | 1599 | | 7735 |
| TOTAL | | | | | 23957.4 |

Table 4

**Economic efficiency of $V_2$ variant**

| No. | Specification | $V_2$ (lei) |
|---|---|---|
| 1 | direct costs (lei/ha) | 23957.4 |
| 2 | indirect costs (lei/ha) | 3593.6 |
| 3 | total operating expenses (lei/ha) | 27551.0 |
| 4 | cost of production (lei/to) | 8296.0 |
| 5 | delivery price (lei/kg) | 10 |
| 6 | income (lei/ha) | 33210 |
| 7 | gross profit (lei/ha) | 5659.0 |
| 8 | rate of return (%) | 20.5 |

Table 5

**The technological estimate for $V_3$ variant**

| Surface = 1 ha<br>Comercial yield = 3199 kg/ha (dry beans) | | | | | |
|---|---|---|---|---|---|
| No. | Work title | Force consumption | | Material consumption | |
| | | manual (lei) | mechanical (lei) | material name | value (lei) |
| 1 | work in progress | 4050 | 90 | - | - |
| 2 | land preparation | - | 1509 | manure | 1500 |
| 3 | crop establishment | 4575.8 | - | trellis | 4400 |
| | | | | wire | 400 |
| | | | | runner bean seeds | 525 |
| | | | | string | 120 |
| 4 | maintenance | 2601.3 | - | Boundary, Hunter, Wettable Sulfur, Kocide, Cropmax, Champ, Veramin | 735 |
| 5 | harvesting | 3238.6 | - | - | - |
| 6 | TOTAL | 14465.7 | 1599 | - | 7680 |
| TOTAL | | | | | 23744.7 |

Table 6

**Economic efficiency of $V_3$ variant**

| No. | Specification | $V_3$ (lei) |
|---|---|---|
| 1 | direct costs (lei/ha) | 23744.8 |
| 2 | indirect costs (lei/ha) | 3561.7 |
| 3 | total operating expenses (lei/ha) | 27306.5 |
| 4 | cost of production (lei/to) | 8535.9 |
| 5 | delivery price (lei/kg) | 10 |
| 6 | income (lei/ha) | 31990 |
| 7 | gross profit (lei/ha) | 4683.5 |
| 8 | rate of return (%) | 17.2 |

**Results from the experience**

Comparing the three experimental variants, *direct costs* were highest for variant $V_2$ (23957.4 lei ha) and lowest for variant $V_1$ (20457.6 lei/ha). *Indirect costs* ranged from 3593.6 lei/ha (variant $V_2$) to 3068.6 lei/ha (variant $V_1$).

The highest *total operating expenses* are in variant $V_2$ (27551.0 lei/ha) and the lowest for variant $V_1$ (23526.3 lei/ha).

The highest *cost of production* is for variant $V_1$ (8611.4 lei) and the lowest for variant $V_2$ (8296,0 lei/to).

The highest *income* is for variant $V_2$ (33210.0 lei/t) and the lowest for variant $V_1$ (27320.0 lei/to).

In terms of *gross profit*, the largest is at variant $V_2$ (5659.0 lei) and the lowest at variant $V_1$ (3793.7 lei).

Profitability of production is a key aspect for determining the economic efficiency. Given the above, the highest *rate of return* is at variant $V_2$ (20.5%) and lowest at variant $V_1$ (16.1%) *(table 7)*.

**Table 7**

**Economic efficiency of the experimental variants**

| No. | Specification | $V_1$ | $V_2$ | $V_3$ | Mean average |
|---|---|---|---|---|---|
| 1. | direct costs (lei/ha) | 20457.6 | 23957.4 | 23744.8 | 22719.9 |
| 2. | indirect costs (lei/ha) | 3068.6 | 3593.6 | 3561.7 | 3407.9 |
| 3. | total operating expenses (lei/ha) | 23526.3 | 27551.0 | 27306.5 | 26127.9 |
| 4. | cost of production (lei/to) | 8611.4 | 8296.0 | 8535.9 | 8481.1 |
| 5. | income (lei/ha) | 27320.0 | 33210.0 | 31990.0 | 30840.0 |
| 6. | gross profit (lei/ha) | 3793.7 | 5659.0 | 4683.5 | 4712.0 |
| 7. | rate of return (%) | 16.1 | 20.5 | 17.2 | 17.9 |

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## CONCLUSIONS

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.

Economic efficiency can play a decisive role in the decision for choosing between systems. The most cost-effective and productive variant is the variant $V_2$, respectively runner bean pure culture, palis on trellis, with individual string, with a single row, having a density of 5.0 plants/$m^2$.

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