INFLUENCE OF CULTIVATION TECHNOLOGY ON THE MAIN ECONOMIC EFFICIENCY INDICATORS IN GRAIN MAIZE

TURC ALINA¹, TURC BOGDAN VLAD, CÂRCIU GHEORGHE

¹Banat’s University of Agricultural Science and Veterinary Medicine, Faculty of Agricultural Management

* Corresponding author. Email: turc.alina@gmail.com

Abstract: The value of the main economic efficiency indicators is directly influenced by the value of the main production and by production costs. In the maize hybrid PR 35 P 12, the variant N₁₅₅P₁₅₅K₁₅₅ – 2 mechanical weeding + 2 manual weeding has proved the most efficient due to the yield of 93.47 q/ha, i.e. a production of 5,608 RON/ha, production costs of 3,687 RON/ha, with a production cost of only 0.39 RON/ha, supported by a profit rate of 52.10%. The yield in grain maize depends on the genetic material of the hybrid, on the fertiliser rate and on weed control methods. Grain maize cultivated under favourable climate conditions and with proper technology can produce over 100 q/ha standard grains and ensure profitable incomes for the farmers. The total profit in profitable variants range between 37.70% (b₄c₆) and 3.03% (b₁c₆). In the variant b₂c₁ there are losses of 489 RON/ha. The profit rate points out the efficiency of certain experimental variants. The variants with a profit rate of over 30% are recommended for production (b₄c₆, b₄c₅, b₄c₃, b₄c₄, b₃c₆, b₄c₂).

Keywords: grain maize, maize hybrids, economic efficiency, total profit, profit rate, production costs.

INTRODUCTION

To produce with lesser costs, we need to observe cultivation technology. Observing cultivation technology refers to choosing those maize hybrids that best adapt to the climate conditions of the Banat’s Plain, to weed control and to balanced fertilisation.

Special attention should be paid to weed control measures because they consume large amounts of water and fertilisers detrimental to grain maize that sprouts later. We take into account the choice of the best assortment of herbicides that ensure higher weed control – both annual and perennial (2).

A crop with a deep root system, maize needs high quality tillage and a soil germination bed that ensures proper conditions for the growth and development of the plants (1, 3, 4 and 6). Timely mechanical weeding reflects directly on weed control and, therefore, on production level.

Maize consumes large amounts of nutrients both quantitatively and qualitatively. For a ton of main product, it needs 75 kg of nitrogen, 20 kg of P₂O₅ and 15 kg of K₂O (5).

MATERIAL AND METHOD

During research, we monitored the response of three grain maize hybrids: PR 35 P 12, Furio and Fundulea 376 of different precocity groups.

In this paper, we present only the results obtained in the grain maize hybrids PR 35 P 12 and Fundulea 376, hybrids that though cultivated for several years in Western Romania still produce good results.

The experiments were set on the territory of the Commune of Dudeștii Noi.

For this research topic, we set each year an experiment aiming at determining the efficiency of fertilisation and of weed control measures on weeding and production. The experiments were polyfactorial and set after the subdivided plot method of the 3 x 4 x 6 type with four replicates on a total number of 288 experimental plots.
Processing experimental data was done through variance analysis (7). The factors we studied were:

**Factor A** – grain maize hybrid, with the graduations $a_1$ – PR 35 P 12, $a_2$ – Furio, $a_3$ – Fundulea 376.

**Factor B** – fertilisation, with the graduations $b_1$ – N₀P₀K₀, $b_2$ – N₄₅P₄₅K₄₅, $b_3$ – N₉₀P₀K₀₀, $b_4$ – N₁₃₅P₁₃₅K₁₃₅.

**Factor C** – weed control method, with the graduations $c_1$ – no herbicide treatment, no weeding, $c_2$ – Guardian (2.25 l/ha) + Buctril universal (1 l/ha), $c_3$ – Merlin Mix (2 l/ha) + Callisto (0.300 l/ha), $c_4$ – Gardoprim (4 l/ha) + Icedin Super (1 l/ha), $c_5$ – 1 mechanical weeding + 1 manual weeding, $c_6$ – 2 mechanical weeding + 2 manual weeding.

**RESULTS**

To point out the profitability of grain maize, we needed to calculate the main indicators of economic efficiency.

The indicators we analysed were main yield (q/ha), value of main yield (RON/ha), production costs (RON/ha), production cost (RON/kg), total profit (RON/ha) and profit rate (%).

For the indicator “production costs”, we calculated the costs per experimental variant. We used the price levels corresponding to the agricultural year 2013. The mean valorisation price per kg of grain maize was 0.60 RON.

**The grain maize hybrid PR 35 P 12**

The highest yield was in the variant $b_4c_6$, i.e. 93.4 q/ha, while the lowest one was in the variant $b_1c_1$ with only 18.13 q/ha.

The value of the main production is directly proportional with the valorisation price, ranging between 1,852 RON/ha in the variant $b_2c_1$ and 5,608 RON/ha in the variant $b_4c_6$, respectively.

The production costs were influenced the most by the oscillating price of materials (herbicides and fertilisers) between 1,936 RON/ha in the variant $b_1c_2$ and 3,687 RON/ha in the variant $b_4c_6$.

Production costs in all variants with productions over 45.00 q/ha was below valorisation price (0.60 RON/kg). The lowest production cost was 0.39 RON/kg ($b_4c_6$), while the highest one was 0.97 RON/kg ($b_1c_4$, $b_1c_3$ and $b_1c_2$, respectively).

The highest total profit (19,212 RON/ha) was in the variant $b_4c_6$. In the variants $b_2c_1$ and $b_2c_1$, respectively, there was a loss of 134 RON/ha and 272 RON/ha, respectively.

Profit rate oscillates between 2.62% ($b_1c_1$) and 52.10% ($b_4c_6$), with negative values in the variants $b_1c_1$ and $b_2c_1$.

The variant $b_4c_6$ (N₁₃₅P₁₃₅K₁₃₅ – 2 mechanical weeding + 2 manual weeding) proved the most efficient due to the production of 93.47 q/ha, i.e. a production value of 5,608 RON/ha, production costs of 3,687 RON/ha, with a production cost of only 0.39 RON/ha, supported by a profit rate 52.10% (Table 1 and Figure 1).
Table 1. Calculus of the main indicators of economic efficiency in the grain maize hybrid PR 35 P 12 (mean of the years 2005-2007)

<table>
<thead>
<tr>
<th>Variant</th>
<th>Main production q/ha</th>
<th>Value of main production (RON/ha)</th>
<th>Production costs (RON/ha)</th>
<th>Production cost (lei/kg)</th>
<th>Total profit (RON/kg)</th>
<th>Profit rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>b4 c6</td>
<td>93,47</td>
<td>5608</td>
<td>3687</td>
<td>0,39</td>
<td>1921</td>
<td>52,10</td>
</tr>
<tr>
<td>b4 c4</td>
<td>86,93</td>
<td>5216</td>
<td>3620</td>
<td>0,42</td>
<td>1595</td>
<td>44,06</td>
</tr>
<tr>
<td>b4 c3</td>
<td>85,84</td>
<td>5150</td>
<td>3515</td>
<td>0,41</td>
<td>1635</td>
<td>46,51</td>
</tr>
<tr>
<td>b4 c2</td>
<td>85,00</td>
<td>5100</td>
<td>3497</td>
<td>0,41</td>
<td>1603</td>
<td>45,84</td>
</tr>
<tr>
<td>b4 c5</td>
<td>84,57</td>
<td>5074</td>
<td>3558</td>
<td>0,42</td>
<td>1516</td>
<td>42,61</td>
</tr>
<tr>
<td>b3 c6</td>
<td>75,41</td>
<td>4525</td>
<td>3189</td>
<td>0,42</td>
<td>1336</td>
<td>41,89</td>
</tr>
<tr>
<td>b3 c3</td>
<td>71,48</td>
<td>4289</td>
<td>3021</td>
<td>0,42</td>
<td>1268</td>
<td>41,97</td>
</tr>
<tr>
<td>b3 c4</td>
<td>71,24</td>
<td>4274</td>
<td>3125</td>
<td>0,44</td>
<td>1149</td>
<td>36,77</td>
</tr>
<tr>
<td>b3 c5</td>
<td>70,10</td>
<td>4206</td>
<td>3064</td>
<td>0,44</td>
<td>1142</td>
<td>37,27</td>
</tr>
<tr>
<td>b3 c2</td>
<td>68,77</td>
<td>4126</td>
<td>3001</td>
<td>0,44</td>
<td>1125</td>
<td>37,49</td>
</tr>
<tr>
<td>b4 c1</td>
<td>54,14</td>
<td>3248</td>
<td>3108</td>
<td>0,57</td>
<td>140</td>
<td>4,50</td>
</tr>
<tr>
<td>b2 c6</td>
<td>53,39</td>
<td>3203</td>
<td>2687</td>
<td>0,50</td>
<td>516</td>
<td>19,20</td>
</tr>
</tbody>
</table>
Figure 1. Calculus of the main indicators of economic efficiency in the grain maize hybrid PR 35 P 12 (mean of the years 2005-2007)

The grain maize hybrid FUNDULEA 376

The grain maize hybrid FUNDULEA 376 responds well to higher fertiliser rates with absolute production oscillating between 83.51 q/ha ($b_4c_6$) and 26.55 q/ha ($b_2c_1$). The variant $b_1c_1$ ensures a production of 16.34 q/ha.

The value of the main production ranges between 5,011 RON/ha ($b_4c_6$) and 1,593 RON/ha ($b_1c_2$), superior to the production costs in most experimental variants.

Production cost when fertilising with $N_{135}P_{135}K_{135}$ ranges between 0.43 RON/kg ($b_4c_6$) and 0.46 RON/kg ($b_4c_2$). In the variants with no fertiliser no matter the weed control method, production cost was at the production valorisation price level (0.60 RON/kg).

The total profit in profitable variants ranged between 37.70% ($b_4c_6$) and 3.03% ($b_1c_6$). In the variant $b_2c_1$ there was a loss of 489 RON/ha. Profit rate points out the efficiency of certain experimental variants. The variants with a profit rate over 30% are recommended for production ($b_4c_6$, $b_4c_5$, $b_1c_3$, $b_4c_4$, $b_3c_6$, $b_4c_2$) (Table 2 and Figure 2).

The calculus of the main economic efficiency indicators shows that crop efficiency depends on fertiliser rate and weed control method.

Table 2. Calculus of main economic efficiency indicators in the grain maize hybrid Fundulea 376 (mean of the years 2005-2007)
Figure 2. Calculus of main economic efficiency indicators in the grain maize hybrid Fundulea 376 (mean of the years 2005-2007)

CONCLUSIONS
The value of the main indicators of economic efficiency is directly influenced by the value of the main production and by production costs.

In the grain maize hybrid PR 35 P 12 main production oscillates between 18.13 q/ha and 93.40 q/ha, while the value of the main production ranges between 1,852 RON/ha and 5,608 RON/ha.

Production costs varied between 1,936 RON/ha and 3,687 RON/ha, while production cost ranged between 0.39 RON/ha and 0.97 RON/ha.

Maximum profit was 1,921 RON/ha, while profit rate was 52.10%.

The grain maize hybrid Fundulea 376 responded well to fertilisation, with an absolute production oscillating between 26.55 q/ha and 83.51 q/ha. The value of the main production oscillated between 1,593 RON/ha and 5,011 RON/ha.

Production costs ranged between 1,892 RON/ha and 3,639 RON/ha, with a production cost between 0.43 RON/ha and 0.73 RON/ha.

Total profit reached 1,372 RON/ha while profit rate was 37.70%.

The conclusion is that production in grain maize depends on the genetic potential of the grain maize hybrid, on fertiliser rate and on weed control methods. Grain maize cultivated under favourable climate conditions and with the proper cultivation technology can produce over 100 q/ha standard grains and ensure profitable incomes for the farmers.

REFERENCES
1. ALDA S., 2004 – Agrotehnică şi herbologie. Editura Eurobit, Timișoara
2. BOGDAN ILEANA, 2003 – Herbologie. Editura Risoprint, Cluj Napoca
3. CÂRCIU GH., 2004 – Agrotehnică şi herbologie. Editura Eurobit, Timișoara
4. CÂRCIU GH., 2006 – Managementul lucrărilor solului. Editura Eurobit, Timișoara
5. DAVIDESCU D., DAVIDESCU VELICA, 1992 – Agrochimie horticolă, Editura Academiei Române, București
6. LĂZUREANU A. ȘI COLAB., 1994 – Agrotehnică. Editura Helicon, Timișoara