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

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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 b_4c_6 ($N_{135}P_{135}K_{135}$ – 2 mechanical weeding + 2 manual weeding) has proven 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% (b_4c_6) and 3.03% (b_1c_6). In the variant b_2c_1 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 (b_4c_6, b_4c_5, b_4c_3, b_4c_4, b_3c_6, b_4c_2).*

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 P_2O_5 and 15 kg of K_2O (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 Dudeştii 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 – $N_0P_0K_0$, b_2 – $N_{45}P_{45}K_{45}$, b_3 – $N_{90}P_{90}K_{90}$, b_4 – $N_{135}P_{135}K_{135}$.

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_3c_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_3c_1 and b_2c_1.

The variant b_4c_6 ($N_{135}P_{135}K_{135}$ – 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

Variant	Main production q/ha	Value of main production (RON/ha)	Production costs (RON/ha)	Production cost (lei/kg)	Total profit (RON/kg)	Profit rate (%)
b_4 c_6	93,47	5608	3687	0,39	1921	52,10
b_4 c_4	86,93	5216	3620	0,42	1595	44,06
b_4 c_3	85,84	5150	3515	0,41	1635	46,51
b_4 c_2	85,00	5100	3497	0,41	1603	45,84
b_4 c_5	84,57	5074	3558	0,42	1516	42,61
b_3 c_6	75,41	4525	3189	0,42	1336	41,89
b_3 c_3	71,48	4289	3021	0,42	1268	41,97
b_3 c_4	71,24	4274	3125	0,44	1149	36,77
b_3 c_5	70,10	4206	3064	0,44	1142	37,27
b_3 c_2	68,77	4126	3001	0,44	1125	37,49
b_4 c_1	54,14	3248	3108	0,57	140	4,50
b_2 c_6	53,39	3203	2687	0,50	516	19,20

b_2 c_4	50,06	3004	2640	0,53	364	13,79
b_2 c_3	49,60	2976	2519	0,51	457	18,14
b_2 c_5	48,87	2932	2562	0,52	370	14,44
b_2 c_2	46,83	2810	2499	0,53	311	12,44
b_3 c_1	41,35	2481	2615	0,63	-134	-5,12
b_1 c_6	38,99	2339	2122	0,54	217	10,23
b_1 c_4	35,22	2113	2059	0,97	54	2,62
b_1 c_5	35,11	2107	1999	0,95	108	5,40
b_1 c_3	33,66	2020	1953	0,97	67	3,43
b_1 c_2	33,24	1994	1936	0,97	58	3,00
b_2 c_1	30,86	1852	2124	1,15	-272	-12,81
b_1 c_1	18,13	1088	1562	1,44	-474	-30,35

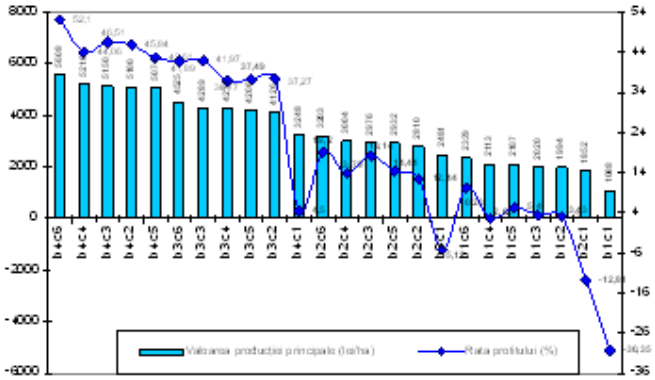

Figure 1. Calculus of the main indicators of economic efficiency in the grain maize hybrid PR 35 P 12 (mean of the years 2005-2007)

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_4c_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)

Variant	Main production q/ha	Value of main production (RON/ha	Production costs (RON/ha)	Production cost (lei/kg)	Total profit (RON/kg	Profit rate (%)
b_4 c_6	83,51	5011	3639	0,43	1372	37,70
b_4 c_4	79,75	4785	3575	0,45	1210	33,85
b_4 c_5	79,47	4768	3515	0,44	1253	35,65
b_4 c_3	77,92	4675	3469	0,45	1206	34,76
b_4 c_2	75,20	4512	3450	0,46	1062	30,78
b_3 c_6	68,73	4124	3144	0,46	980	31,17
b_3 c_4	65,79	3947	3081	0,47	866	28,11
b_3 c_3	65,33	3920	2977	0,45	943	31,68
b_3 c_5	64,73	3884	3020	0,47	864	28,61
b_3 c_2	62,66	3760	2957	0,47	803	27,16
b_2 c_6	50,08	3005	2646	0,53	359	13,57
b_2 c_5	45,46	2728	2521	0,55	207	8,21
b_4 c_1	45,14	2708	3061	0,68	-353	-11,53
b_2 c_4	43,86	2632	2595	0,59	37	1,43
b_2 c_3	43,50	2610	2475	0,57	135	5,45
b_2 c_2	41,28	2477	2456	0,59	21	0,85
b_3 c_1	35,87	2152	2571	0,72	-419	-16,30
b_1 c_6	35,73	2144	2081	0,58	63	3,03
b_1 c_4	33,17	1990	2013	0,61	-23	-1,14
b_1 c_5	31,16	1870	1957	0,63	-87	-4,45
b_1 c_3	30,01	1807	1912	0,64	-105	-5,49
b_1 c_2	27,77	1666	1892	0,68	-226	-11,95
b_2 c_1	26,55	1593	2082	0,73	-489	-23,49
b_1 c_1	16,34	980	1522	0,93	-542	-35,61

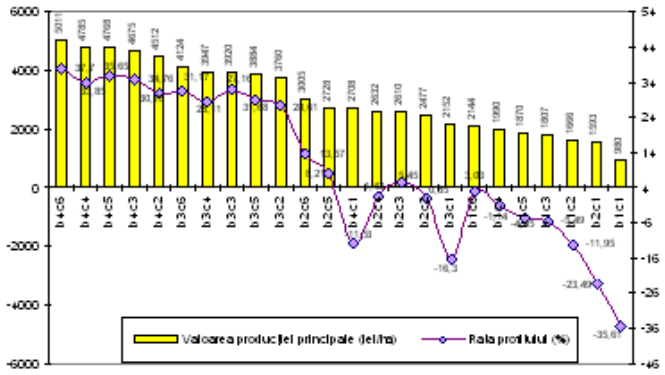

Figure 2. Calculus of main economic efficiency indicators in the grain maize hybrid Fundulea 376 (mean of the years 2005-2007)

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.

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