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MANAGEMENT ISSUES OF THE CORN CROP ON THE EUTRICAMBOILS FROM BREBU AREA (PRAHOVA COUNTY)

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Abstract

Regardless of its geographical position in Romania, corn is a plant of great importance for both human alimentation and animal nutrition, mostly in rural areas. Experiments conducted on the eutricambosoils from Brebu village have found that locals are using local varieties, with a 2-3 times lower productivity than that of specific hybrids in the area, but also that they are using monoculture, sometimes unlimited in time. Our experiences aim was that of changing some technological system links even on small surfaces of 1-5 ha. For this purpose, the varieties were replaced with hybrids, which leaded to yield increases of 1.5 times. It was also introduced the fertilization with compost obtained in the household, while potato, peas, alfalfa (jumping field) and corn were used as previous crops. The experience conducted for 10 years only confirms the negative effect of the local variety and of the monoculture (annually yields of about 5-10 q/ha). The ameliorative previous plants, such as peas and alfalfa, increased by only 4.6 q/ha the corn yield of the variety, which had no significant reactions not even to the compost fertilization. Introducing a hybrid from FAO 300 group, crop rotation and compost manure led to an increased corn production of up to 55 q/ha, opening a new economic vision for those who have chosen to try this system.

Key words**:** *compost, corn, crop rotation, hybrid, local variety*

INTRODUCTION

National Institute for Soil and Agrochemical Research (NISAR) claims that eutricambosoils occupy, in Romania, about 1.4 million hectares and that those are frequently located at heights of 500-1000 meters, in the peripheral area of the Carpathian Mountains [3].
The soil from the Brebu village, on which the experiences were placed, lies at an altitude of 800 m, it has a medium fertility (about 2.8% hummus), but it is rich in calcium (Ca), being formed on calcareous sediments [5].
The large surfaces cultivated with corn in the villages' area maintain the average production of Romania, for over 50 years, less than 3000 kg/ha [4]. This is because of the low crop productivity in these areas, generated by low natural fertility of some soils, but especially by the low use of inputs and by their quality.
For rural areas, corn is a crop of high economic and spiritual tradition, sufficient grounds for us to become so much concerned about this crop, but also about the area in question.

MATERIALS AND METHODS

Work has been done directly in the field, following the mechanistic research conception, by installing an experience on a surface of approximately 4000 m^2.
The experimental model was a trifactorial one, of 4 x 2 x 2 type, in which the three factors are:
1.Previous plant (crop):
- corn (monoculture);
- potato;
- peas;
- alfalfa (jumping field)

2.Biological material:
- local variety;
- hybrid.

3.Fertilization:

- ➔ without compost and chemical fertilizers;
- ➔ with compost made inside the household.

The used variety came from a local white population, historical and anthropic selected directly from the field, while the hybrid was part of the 300 group, not being every year the same. However, it was each time matured until the beginning of October.

As regards the compost it was produced in a special pit of cement, built near the stables and cages of animals and birds.

Compostable material was a mixture of manure from the local animals (cows, pigs, poultry, turkeys, sheep), to which were added organic wastes of vegetable and animal origin, carefully collected from the farm, crushed and put in the pit fermentation, being well mixed with the manure.

Into the pit were also introduced mowed and chopped herbs, weeds and even small quantities of alfalfa, in order to improve the nitrogen concentration of the compost.

The fermentation pit has had a special role in the household greening process, absolutely all the organic waste being gathered there. Compost fermentation lasted over one year, in the experimental plots being applied a dose equivalent to 25 t/ha.

The chemical composition of the resulting compost was presented in a previous scientific paper [1].

Basic and maintenance works were the ordinary ones made for the corn crop, using small mechanical machines specific to the region [2] – 40 HP tractor + disc + harrow.

No pesticides were applied, weed control being made with a motocrop machine and a hoe, system used by householders in the area.

For all crops, the harvest was done by hand. Corn production was brought to a moisture of 14% (in seeds).

Results interpretation was performed by variance analysis calculation, by the "t" test on the student distribution, calculating the correlations and functions. All this work was made with special programs, designed by our research team.

RESULTS AND DISCUSSIONS

It was found that the monoculture and the biological material (variety – the local population) blocks most the production level (Fig. 1). Under the monoculture, the local variety yield (average 10 years) is only 6.45 q/ha.

Any other previous plant, starting with potato, increases production, this increase being statistically assured for peas and alfalfa, but without exceeding 30 q/ha.

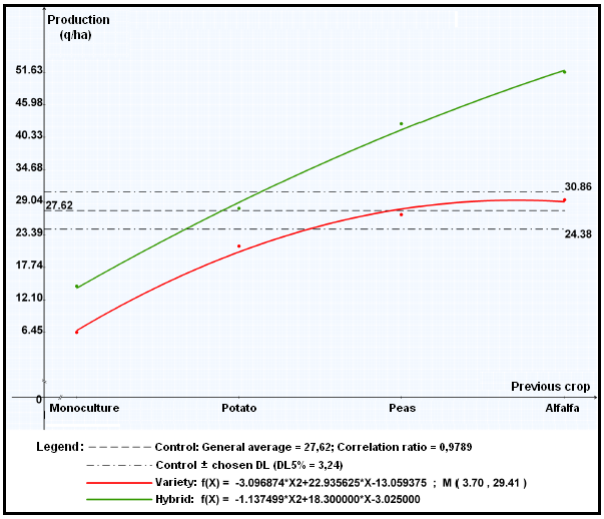

Fig. 1. Crop rotation and biological material influence on the corn yield – 10-year average (2001-2011) (original)

For hybrid, the yield in monoculture is not significantly detached, demonstrating that the long-term monoculture doesn't allow the superior valorization of a good biological material. Nevertheless, it is noticed that crop rotation, the previous crop, is much better used by the hybrid. Potato becomes, at its turn, a significant pre-plant, while peas and especially alfalfa raise the production to 40, respectively 51 q/ha.

On average, the compost is better exploited in peas and alfalfa, with residual effect on corn: +10.76 – very significant after peas and +15.06 – also very significant after alfalfa (Table 1).

Without compost, alfalfa provides to the corn crop the highest yield increase (+10.78 – very significant). It improves by 34 q/ha the negative effect of the monoculture in corn.

Table 1. Effect of fertilization and previous plant on corn production, using the average of the 10 years (original)

Fertili-zation	Previous plant	Prod. (q/ha)	Ratio (%)	Difference (q/ha)	Semnifi-cation
General average = 27.62 q/ha (Control)					
No compost	Monoculture	8.95	32.40	-18.67	o o o
	Potato	22.16	80.23	-5.46	o
	Peas	31.19	112.90	3.56	
	Alfalfa	38.40	139.01	10.78	* * *
25 t/ha compost	Monoculture	11.99	43.40	-15.63	o o o
	Potato	27.22	98.56	-0.39	
	Peas	38.39	138.97	10.76	* * *
	Alfalfa	42.69	154.53	15.06	* * *
				DL5% = 4.81	
				DL1% = 6.41	
				DL0.1% = 8.37	

Most important is to see how corn yield fluctuates depending on those three factors – biological material, treatment with fertilizers and previous crops (Table 2). Yield variation in this context is of 55.68 – 5.65 = 50.03 q/ha, namely the level of a good production in the normal years, including in Southern Romania.

Table 2. Biological material, fertilization and previous plant effect on the corn production, using the average of the 10 years researched (original)

Variety	Fertili-zation	Previous plant	Prod. (q/ha)	Ratio (%)	Dif. (q/ha)	Semnifi-cation
General average = 27.62 q/ha (Control)						
Local variety	**No compost**	Monoc.	5.65	20.45	-21.97	o o o
		Potato	19.45	70.41	-8.17	o o o
		Peas	27.27	98.74	-0.34	
		Alfalfa	29.23	105.80	1.60	
	25 t/ha compost	Monoc.	7.25	26.25	-20.37	o o o
		Potato	23.38	84.62	-4.24	o o
		Peas	26.50	95.93	-1.12	
		Alfalfa	29.70	107.52	2.08	
Hybrid	**No compost**	Monoc.	12.25	44.35	-15.37	o o o
		Potato	24.88	90.05	-2.74	
		Peas	35.10	127.07	7.48	* * *
		Alfalfa	47.58	172.23	19.95	* * *
	25 t/ha compost	Monoc.	16.72	60.55	-10.89	o o o
		Potato	31.07	112.50	3.45	*
		Peas	50.28	182.00	22.65	* * *
		Alfalfa	55.68	201.55	28.05	* * *
					DL5% = 2.76	
					DL1% = 3.69	
					DL0.1% = 4.83	

Compared to the local conventional version (variety x monoculture), with 6.45 q/ha, the modern alternative proposed (hybrid x alfalfa) reaches 55.68 q/ha. Ratio, in this case, is:

$$\frac{55.68}{6.45} = 8.60$$

With the same work volume, but using a wise thinking and efficient technical and biological instruments, the yield can be 8 times increased, leading it in the field of economical satisfaction.

Compost is less valued (paradoxically) in monoculture, both by the variety (7.25 q/ha) and by the hybrid (16.72 q/ha). The difference between them is, however, significant.

Neglecting the crop rotation system and judging the difference between varieties (Table 3), we find that for both of them (local variety and hybrid) the 25 t/ha of compost doesn't increase in a significant way the production. So, we conclude that a combination formed between the previous plant and the compost application determines the production growth in proportion of over 87%.

Table 3. The effect of biological material and of fertilization with compost on the corn production, using the average of the 10 years (original)

Variety	Fertili-zation	Prod. (q/ha)	Ratio (%)	Difference (q/ha)	Semnifi-cation
General average = 27.62 q/ha (Control)					
Local variety	**No compost**	20.40	73.85	-7.22	o o
	25 t/ha compost	21.71	78.58	-5.91	o
Hibrid	**No compost**	29.95	108.42	2.33	
	25 t/ha compost	38.44	139.15	10.81	* * *
				DL5% = 3.21	
				DL1% = 4.29	
				DL0.1% = 5.61	

From Fig. 2 it follows that the use of compost is ineffective in monoculture and after potato, but it is effective after peas and relatively efficient after alfalfa.

Further it was carried out a calculation in order to separate the influence of each factor on the production increases, using a method elaborated by Berca Mihai and Draghici Manea (1972).

The factors influence distribution on the yield is presented below.

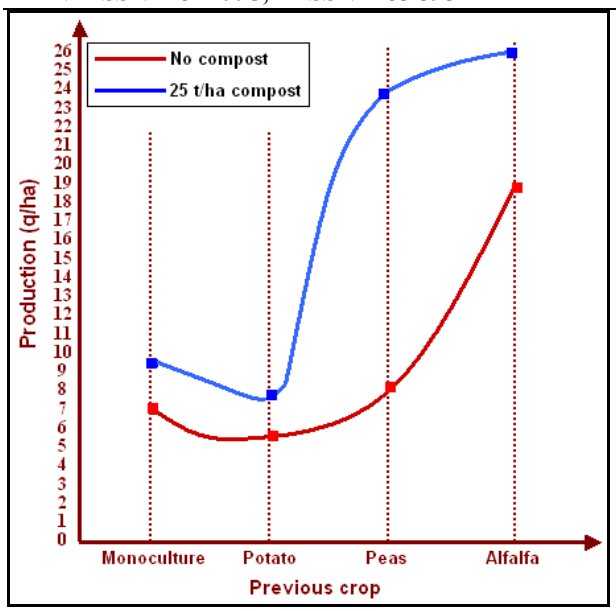

Fig. 2. Parallels between fertilized and unfertilized, depending on the difference between the biological materials used (hybrid – local variety), under the conditions of cultivation after different previous plants (original)

It resulted that the factors influence distribution on the yield is as follows:

Total growth 50.03 q/ha

- **8.5 q/ha (16.4%)** from hybrid
- **15.3 q/ha (29.6%)** from the compost (25 t/ha)
- **22.47 q/ha (43.52%)** from ameliorative previous plants
- **4.36 q/ha (10.48%)** from other interactions and errors

CONCLUSIONS

On the eutricambosoil from the rural area a subsistence agriculture is practiced, these leading to a yield of 6-8 q corn/ha using local populations, monoculture and with no fertilization.

By applying modern hybrids, a crop rotation system and using 25 t compost/ha as fertilizer, the production can reach over 55 q/ha, with a difference of about 50 q/ha compared to what it was produced before.

The used parameters (factors) participate with over 87% to the yield increase. What remains are interactions or errors.

Obtaining a production 8 times higher than the current one doesn't leave any question mark over the economical efficiency of this and not even over the householder satisfaction.

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