

RESEARCH ON THE EFFECT OF WHEAT YIELD FERTILIZATION IN THE LONG TERM EXPERIENCE AT ARDS SECUIENI

Cornelia LUPU¹, Margareta NAIE¹

E-mail: scdasec@scda.ro

Abstract

The rational application of fertilizers ensure along with other means of increasing production, the raising of soil fertility and the practice of a large productivity agriculture and economic efficiency. The fertilizer dose schedule is a technological activity, based on the agrochemical data from the field and from planned harvest.

This paper presents experimental results for 2006-2009 period obtained in a long experience on the influence of phosphorus and nitrogen fertilizer on winter wheat production at ARDS Secuieni.

The experience had in study: A – P₂O₅ dose: 0, 40, 80, 120, 160 kg/ha; B – N dose: 0, 40, 80, 120, 160 kg/ha.

The cultivated variety: Crina.

The productions were influenced by the dosage of fertilizer applied but also by the climatic conditions during the research. The productions in the unfertilized variant were 3269-6590 kg wheat/ha (period average was 4910 kg wheat/ha). By applying the P₂O₅ and N fertilizers the production increases were 5-33% representing 228-1617 kg wheat/ha. By applying phosphorus fertilizers the production increases were 358-614 kg wheat/ha representing 6-11% and by applying nitrogen fertilizers increases ranging from 543-1150 kg wheat/ha representing 10-22%.

The marginal increases in phosphorus fertilizer application were 3,83-8,95 kg wheat/kg P₂O₅ and 7,18-13,57 kg wheat/kg N in nitrogen fertilizer application, in both cases were inversely proportional with the doses of fertilizers applied.

Key words: wheat, phosphorus, nitrogen, productions

The agricultural research and practice have revealed that to obtain high yields per unit area is conditioned by a complex of factors, starting from the edaphic and climatic factors to the biological material and technology used. Choosing cultivars adapted to high productivity climatic area in which it is cultivated will not be achieved the entire productive potential unless it will be applied the appropriate technology.

Into the technology culture, the importance of fertilization is undeniable the results obtained worldwide demonstrate that the fertilization contributes about 40% to increase yields per unit area.

Research in long-term experiences with chemical fertilizers, highlight the complex interaction of plant / soil / climate and their productive and economic effect on the obtained yields.

Into optimization of rational use of fertilizers should be considered the principle that a resource is used rationally if using the latest production quantity is obtained value production at least equal to the unit costs of the resource applied.

MATERIAL AND METHOD

The paper aims to analyze the influence of nitrogen and phosphorus fertilizers application on wheat crop during the period 2007-2009 under the conditions of the SCDA Secuieni.

Experience is the bifactorial type has been placed on a mold bill typically by the method of subdivided plots into five repetitions and it is bifactorial type.

Factors studied:

A - P₂O₅ doses: 0-40-80-120-160

B - N doses: 0-40-80-120-160

Variety grown: Crina

Climatic conditions during the research are presented in figure 1.

RESULTS AND DISCUSSIONS

The production of grain

Yields obtained from culture wheat during the period 2007-2009 were recorded variations by the application of fertilizers dosage but also under the influence of climatic conditions.

¹ Agricultural Research and Development Station Secuieni, Secuieni - Neamț

The productions achieved at fertilized version (N0P0) had values of 3269-6590 kg / ha (average of the period being 4910 kg / ha).

Compared with fertilized version (N0P0) by applying experimented fertilizers dosage were obtained productions of 5137-6493 kg wheat per hectare.

Average production increases by the application of fertilizers (NP) were from 5 to 33%, representing 228-1617 kg ha wheat (table 1, fig. 2).

The productions obtained were directly proportional to the doses of fertilizer applied. By applying fertilizers with phosphorus (after the average of five nitrogen fertilizer graduation) the productions obtained during the period 2007-2009 had values of 3880-8242 kg / ha and the average of the period was 5827-6083 kg / ha.

The productions of wheat achieved in the version fertilized with phosphorus (P0), after the average of five nitrogen fertilizer graduations, were 3683-7319 kg / ha (average of the period being 5469 kg / ha).

Between the doses of fertilizer applied (NP) and the productions obtained were established highly significant direct correlations (fig. 3, 4).

Average gain brought by fertilizers with phosphorus (average values 2007-2009) was 358-614 kg / h and represents 6-11%.

Between the production gains achieved and doses of phosphorus applied was establish a highly significant correlation (fig. 5)

Marginal production growth achieved by the application of phosphorus fertilizers was 8.95 kg grain / kg P₂O₅ doses P40, 6.45 kg wheat / kg P₂O₅ dose P80, 4.9 kg wheat / kg P₂O₅ dose P120, 3, 83 kg wheat / kg P₂O₅ P160 dose (table 2).

Marginal increase production at application of phosphorus fertilizers had values of 3.83 to 8.95 kg wheat / ka P₂O₅ and was inversely proportional to the dose of phosphorus applied.

Application of nitrogen fertilizers (after the average of 5 fertilizers graduations with phosphorus) has led to productions during the period 2007-2009 of 3764-8550 kg wheat / ha, while the average by the period of 5718-6325 kg / ha.

Compared to the version not fertilized with nitrogen (N0) that recorded values of the production of 3414-6915 kg / ha (period average 5175 kg / ha) increases production by applying the nitrogen fertilizers were 543-1150 kg / ha, representing 10 -22% (table 3).

Between the production gains achieved and nitrogen doses were established significant correlations (fig. 6).

Marginal increase production through the application of nitrogen fertilizers was 13.57 kg wheat / kg N dose N40; 10.41 kg wheat / kg N dose N80; 8.57 kg wheat / kg N dose N120, 7, 18 kg wheat / kg N N160 dose (table 3).

The limits of variation of the production growth during the period 2007-2009 through the application phosphorus fertilizers were 195-923 kg wheat / ha and was directly proportional to the applied dose of P₂O₅ and the marginal growth of production was 3.75 - 15.02 kg wheat / kg P₂O₅, being inversely proportional to the applied dose.

To the application of nitrogen fertilizers, the limits of variation of production growth was 475-1711 kg / ha and was directly proportional to the applied dose and increase marginal production wheat was 5.66 to 15.05 kg / kg N is inversely proportional to the applied dose (table 4).

At the application of nitrogen fertilizers, the limits of variation of the growth production has been of 475-1711 kg / ha and it was directly proportional to the applied dose and the increase marginal production wheat was 5.66 to 15.05 kg / kg N being inversely proportional to the applied dose (table 4).

Highly significant direct correlations were established between the elements of productivity (no. wheat ears/m² and MMB) and doses fertilizers applied (fig. 7, 8, 9, 10).

The technical and economic indicators at the application of NP fertilizers on wheat crop during the period 2007-2009 were influenced by the applied fertilizer formula.

In reality, the technical and economic indicators are highly more influenced of climatic conditions and by the exploitation price of the wheat. The data from Table 5 give technical and economic indicators obtained in the various formulas of fertilization, showing a increase in production by 32% (from 4910-6493 kg wheat / ha), between 10-40% of the total expenses, the cost of production between 1-35%, a decrease of profit between 5-52% and a rate of profitability from 55.07 to 14.66%.

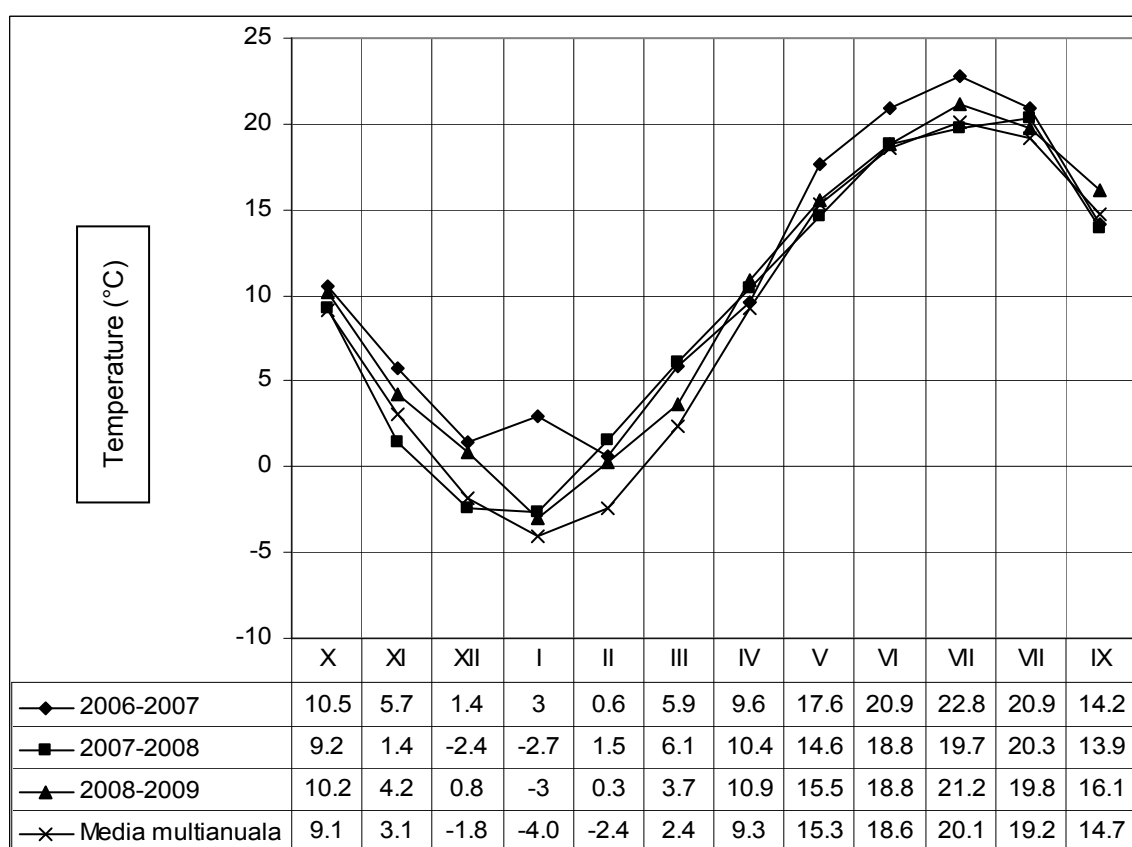
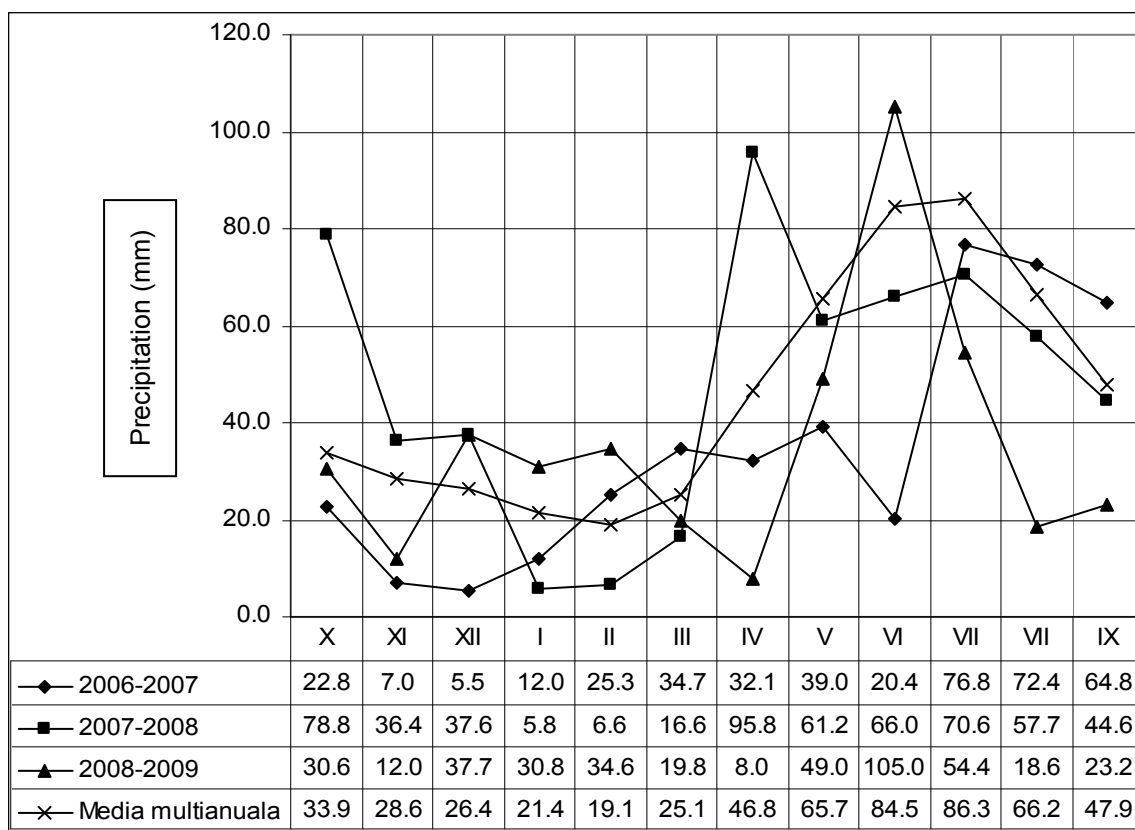


Figure 1 Climatic conditions in ARDS Secueni during 2006 - 2009 and the multiannual average

Table 1

Influence of nitrogen and phosphorus fertilizer on wheat production (2007-2009) ARDS Secuieni

Var.	Dose P ₂ O ₅ kg/ha	Dose N kg/ha	Limits of variation of production kg/ha	Average production kg/ha	Relativ production %	Difference kg	Semnif.
1	P ₀	N ₀	3269-6590	4910	100	Mt	-
2		N ₄₀	3348-6929	5382	110	472	**
3		N ₈₀	3498-6936	5552	113	642	***
4		N ₁₂₀	3483-6992	5694	116	784	***
5		N ₁₆₀	3472-7128	5809	118	899	***
6	P ₄₀	N ₀	3580-7054	5137	105	228	
7		N ₄₀	3639-7755	5641	115	731	***
8		N ₈₀	3833-7779	5942	121	1032	***
9		N ₁₂₀	3944-7922	6103	124	1193	***
10		N ₁₆₀	3826-8092	6313	129	1403	***
11	P ₈₀	N ₀	3735-7473	5229	106	319	-
12		N ₄₀	3999-8039	5769	117	859	***
13		N ₈₀	4055-8235	6111	124	1201	***
14		N ₁₂₀	4122-8403	6333	129	1423	***
15		N ₁₆₀	4048-8433	6485	132	1575	***
16	P ₁₂₀	N ₀	3861-7668	5263	107	353	*
17		N ₄₀	4117-8251	5866	119	956	***
18		N ₈₀	4135-8681	6219	127	1309	***
19		N ₁₂₀	4357-8667	6458	132	1548	***
20		N ₁₆₀	4179-8770	6526	133	1617	***
21	P ₁₆₀	N ₀	3970-7809	5336	109	426	-
22		N ₄₀	4295-8625	5933	121	1023	***
23		N ₈₀	4449-8685	6220	127	1310	***
24		N ₁₂₀	4533-8844	6433	131	1523	***
25		N ₁₆₀	4359-8789	6493	132	1583	***

DL 5% = P N PxN NxPxANI
 1% = 48 kg/ha 53 kg/ha 118 kg/ha 513 kg/ha
 0,1% = 64 kg/ha 70 kg/ha 156 kg/ha 746 kg/ha
 83 kg/ha 90 kg/ha 201 kg/ha 1119 kg/ha

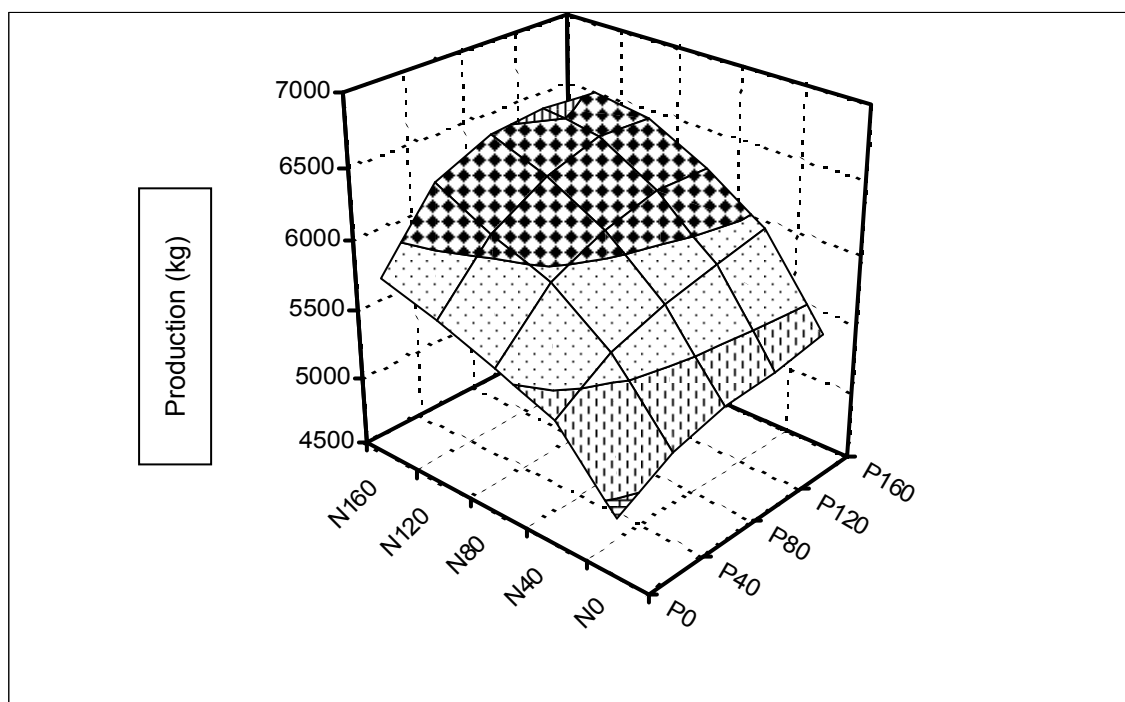


Figure 2 Influence of nitrogen and phosphorus fertilizer on wheat production (2007 – 2009) ARDS Secuieni

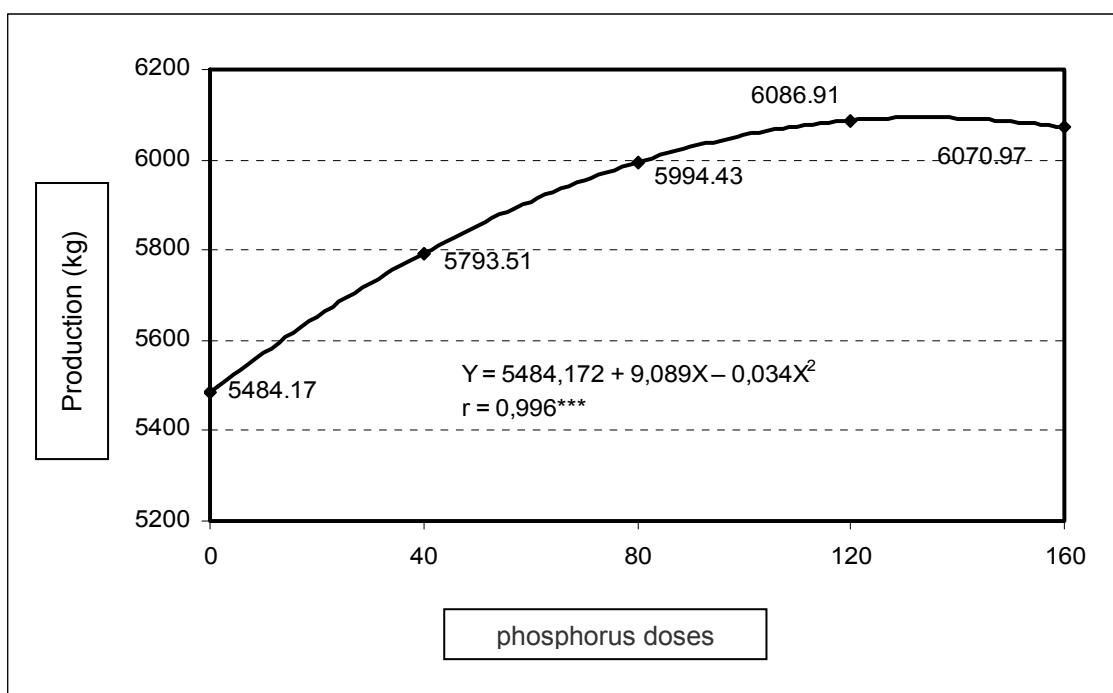


Figure 3 The correlation between doses of phosphorus and production of wheat

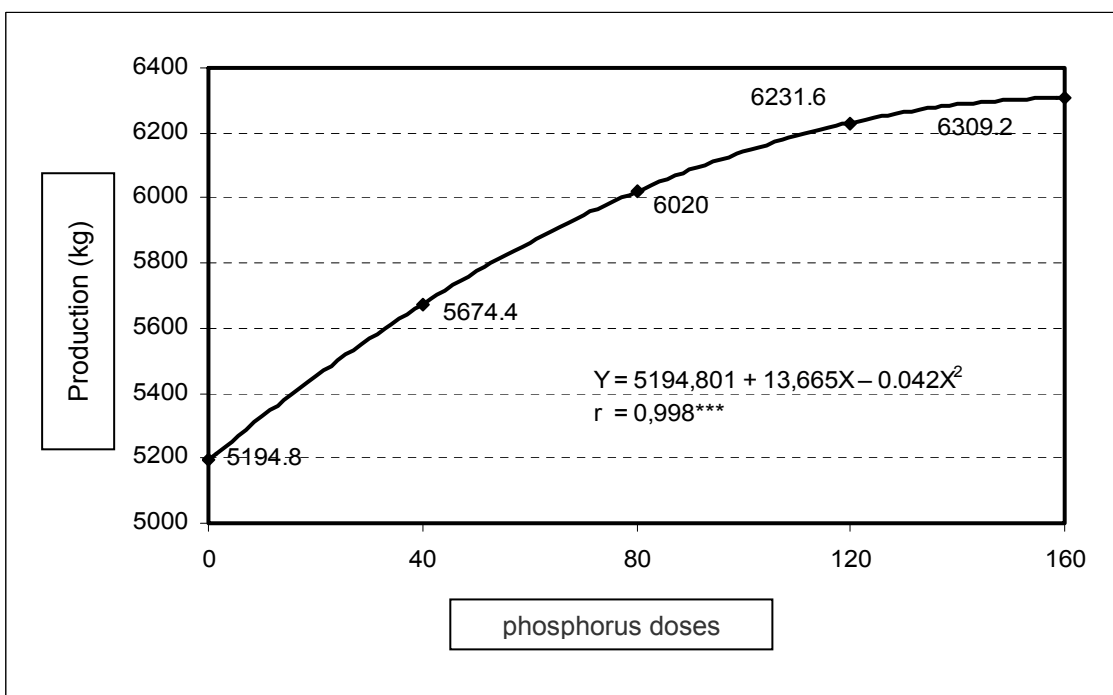


Figure 4 The correlation between doses of nitrogen and production of wheat

Table 2

Influence of phosphorus fertilizer on wheat production under the ARDS Secuieni (2007-2009)

Dose P ₂ O ₅ kg/ha	Limits of variation of production kg/ha	Average production kg/ha	Relative production %	Difference kg/ha	Semnif.	Marginal increase kg wheat/kg P s.a.
P ₀	3683-7319	5469	100	Mt	-	-
P ₄₀	3880-7920	5827	106	358	***	8.95
P ₈₀	3994-8063	5985	109	516	***	6.45
P ₁₂₀	4088-8166	6066	111	597	***	4.97
P ₁₆₀	3971-8242	6083	111	614	***	3.83

DL 5% = 48 kg/ha

DL 1% = 64 kg/ha

DL 0,1% = 83 kg/ha

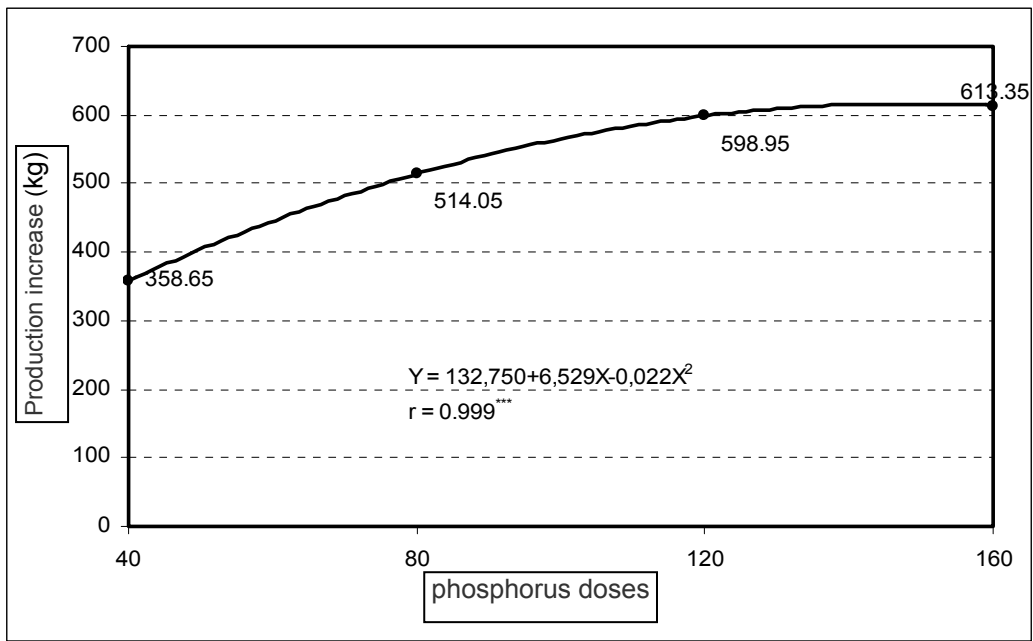


Figure 5 The correlation between doses of phosphorus and increase production of wheat

Table 3

Influence of nitrogen fertilizer on wheat production under the ARDS Secuieni (2007-2009)

Dose N kg/ha	Limits of variation of production kg/ha	Average production kg/ha	Relative production %	Difference kg/ha	Semnif.	Marginal increase kg wheat/kg N s.a.
N ₀	3414-6915	5175	100	Mt	-	-
N ₄₀	3764-7720	5718	110	543	***	13.57
N ₈₀	3992-8117	6008	116	833	***	10.41
N ₁₂₀	4124-8407	6204	120	1029	***	8.57
N ₁₆₀	4321-8550	6325	122	1150	***	7.18

DL 5% = 53 kg/ha

DL 1% = 70 kg/ha

DL 0,1% = 90 kg/ha

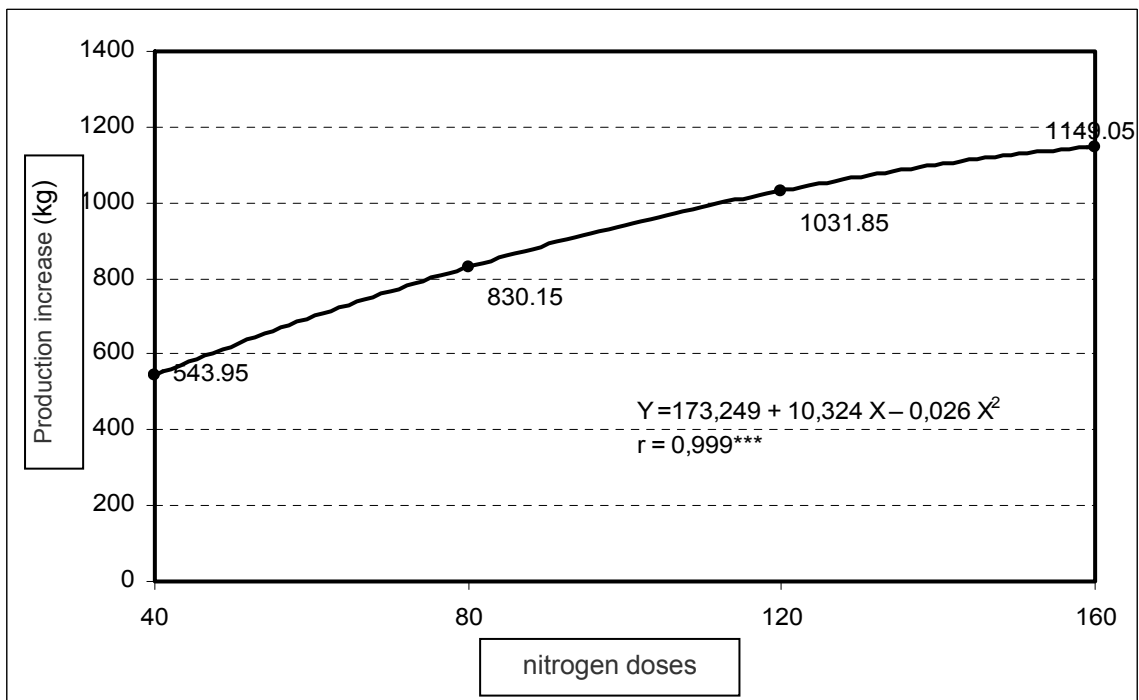


Figure 6 The correlation between doses of nitrogen and increase production of wheat

Table 4

The limits of variation of total production growth and margin growth by applying fertilizers with nitrogen and phosphorus on winter wheat Secuieni (2007-2009)

Specificare	Limite de variatie a sporului de productie la grau kg/ha	Limite de variatie a sporului marginal de productie la grau kg grau/kg ingr. s.a.
N ₄₀	472-1023	11,87-15,05
N ₈₀	642-1018	9,02-12,72
N ₁₂₀	885-1492	7,37-12,43
N ₁₆₀	907-1711	5,66-10,69
P ₄₀	195-601	4,87-15,02
P ₈₀	421-744	5,26-9,31
P ₁₂₀	486-847	4,05-7,06
P ₁₆₀	601-923	3,75-5,77

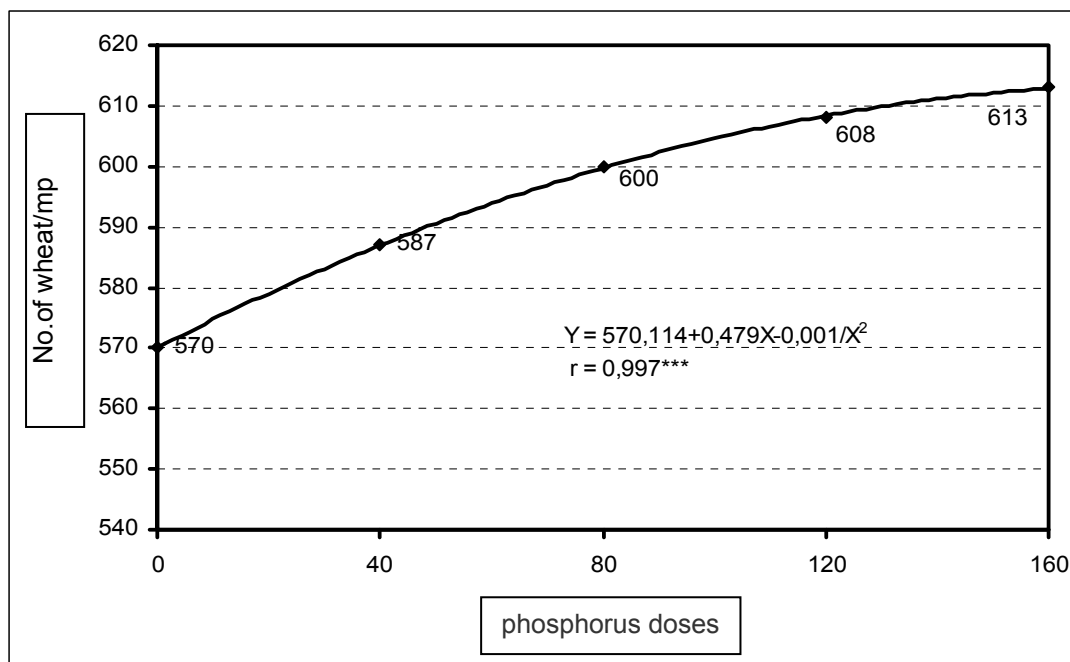


Figure 7 The correlation between doses of phosphorus and nr.spice / m in wheat

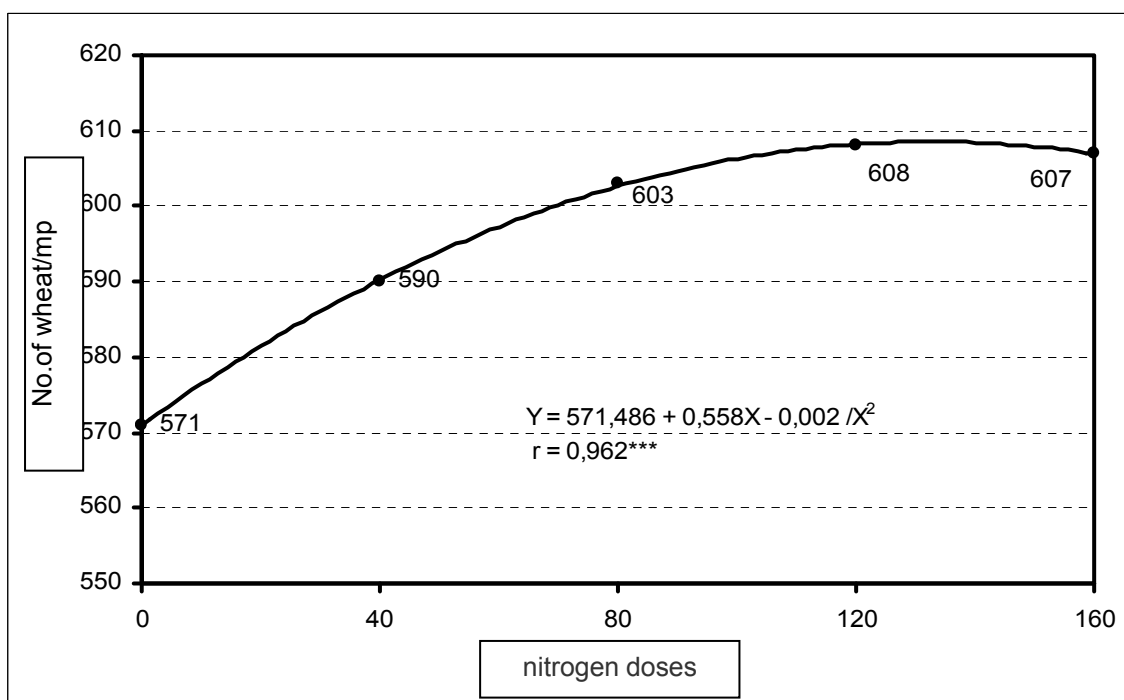


Figure 8 The correlation between doses of nitrogen and nr.spice / m in wheat

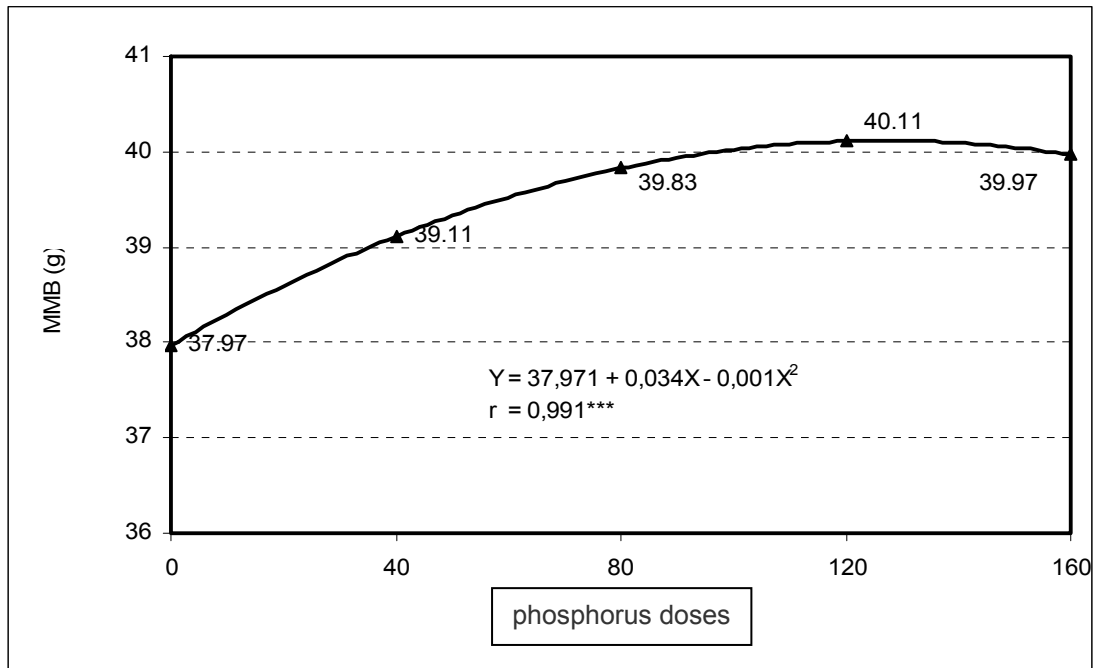


Figure 9 The correlation between the doses of phosphorus and wheat MMB

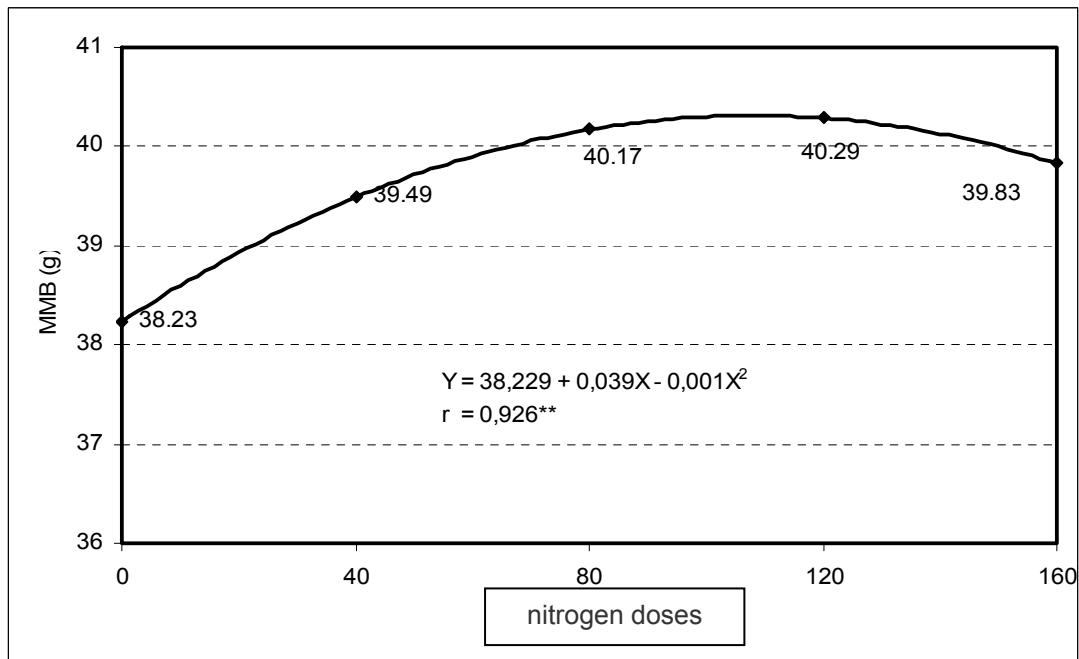


Figure 10 The correlation between doses of nitrogen and in wheat MMB

Table 5
The tehcnical-economic indicators to application of fertilizers with nitrogen and phosphorus to winter wheat
Secuieni 2007 – 2009

Formula de fertilizare kg s.a./ha	Productia		Valoarea productiei		Cheltuieli totale		Profit		Rata rentabilitatii %	Costul de productie	
	kg/ha	%	lei/ha	%	lei/ha	%	lei/ha	%		lei/ha	%
N ₀ P ₀	4910	100	3241	100	2090	100	1151	100	55.07	0.425	100
N ₄₀ P ₄₀	5641	115	3723	115	2559	122	1164	101	45.48	0.453	106
N ₈₀ P ₈₀	6111	124	4033	124	2952	141	1081	94	36.62	0.483	113
N ₁₂₀ P ₁₂₀	6458	131	4262	131	3342	160	920	80	27.53	0.517	121
N ₁₆₀ P ₁₆₀	6493	132	4285	132	3737	179	548	48	14.66	0.575	135
N ₄₀ P ₀	5382	109	3552	109	2308	110	1244	108	49.56	0.429	101
N ₈₀ P ₀	5552	113	3664	113	2485	119	1179	102	47.44	0.447	105
N ₁₂₀ P ₀	5694	116	3758	116	2659	127	1099	95	41.33	0.467	110
N ₁₆₀ P ₀	5809	118	3834	118	2847	136	987	86	34.66	0.490	115
N ₁₂₀ P ₈₀	6333	129	4180	129	3127	149	1053	91	33.67	0.493	116

CONCLUSIONS

The productions obtained on autumn wheat during the period 2007-2009 through the fertilization with NP had average values between 5137-6493 kg / ha.

By applying fertilizers of NP increases of production have been 228-1617 kg / ha representing 5 to 33%.

Phosphorus fertilizers have realized production increases by 6-11% representing 358-614 kg / ha.

Nitrogen fertilizer brought production increases by 10-22%, representing 543-1150 kg / ha.

Between the doses of fertilizer applied and the productions obtained were highly significant direct correlations established.

Marginal of production increases have been influenced by the climatic conditions in the year of experimentation and were inversely proportional to the doses of fertilizer applied. They had higher values (7.18 to 13.57) kg wheat / kg N for nitrogen and lower (3.83 to 8.95 kg wheat / kg P₂O₅) for phosphorus.

Between the doses of NP fertilizer applied and obtained production, the increase of production and the elements of productivity were established highly significant correlations.

On wheat crop the technical and economic indicators were influenced by the fertilization formula applied and climatic conditions during the period of research.

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