RESULTS OBTAINED IN SOME AGRO SYSTEMS ESTABLISHED ON DAMAGED SOIL FROM ROVINARI MINING ZONE

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ABSTRACT

This study presents the production result obtained in some agro systems established on degraded soil from Rovinari mining zone in a period of 25 years. From obtained results we can take the conclusions that on degraded soil from waste dump we can create diversified cultivations which normal productions with condition to assure a agronomic background in concordance with cultivation species, in special fertilizer manure and increased dose of N, P, K. the best results are obtained on trees, vine, pea, oat, maize and forage cultivations.

1. THE RESEARCH PURPOSE

An important aspect of ecological balance deterioration is soil pollution. One of the most aggressive forms of soil destruction is the damage made by the surface mining activity.

As a result of coal exploitation the ecological balance is highly affected by the ground water layer modification, the mix of different geological layers, natural migration of chemical elements into the depth, the acceleration of soil erosion, destruction of micro flora and organic matter (Humus) from soil, in fact the destruction of the most important property of the soil: natural fertility.

Soils recovered after surface coal exploitation and biological recultivation, are called by some authors "Technologically created soils".

The purpose of the researches made by SCPP TG-JIU, started in 1969 on technological created soil from Rovinari Mining Zone, is to reinsert the area into agricultural use – ecological and economical speaking.

2. LOCATION AND CONDITIONS OF THE RESEARCH

The experiments were carried on technologically created soil from Rovinari Mining Zone, more precise at Cicani waste dump. The area reserved for the experiment, consist of a heterogeneous mixture of sand, clay, gravel, coal, with poor physical, chemical and biological properties, as a result of dumped earth found between layers of coal.

3. STUDIED FACTORS

Studied factors are the ones mentioned in the lower tables and they represent a collection of results on a period of 25 years, starting with 1971-1972, with biological and production data obtained in studied agro systems – vine, apple trees, plum trees, cherry trees, nut trees, hazel nut trees and cereals, established on technologically created soil.

RESULTS OBTAINED

4.1. Fruit trees

4.1.1. Tests on tree species. Along the years a great number of species had been tested: apples, plums, cherries, hazels and nuts.

Trees were planted in 1970-1971. They had been treated in normal conditions. We have gathered the results on a period of 25 years in table No.1.

From that data we can see that the apple trees with a production of 24,9 t/he and the plum trees with a production of 8,2 t/he are most fitted for this kind of soil.

An interesting plant revealed to be the hazel tree, which was planted on the edges of the embankments which stopped soil erosion.

The trees should be planted on dumps, 10 to 15 years after their soil had been physical and chemical improved, followed by biological cultivation with annual plants species for a minimal period of 5 years.

4.1.2. Establishing fertilizing systems. The experiment was mented to improve the hydro physical, chemical and biological properties of the dumps, by using green fertilizer (simple or mixed with chemical fertilizers based on N, P, K manure) on a plum tree culture, the Stanley variety.

As a "green" fertilizer we used different weed crops with 8.5 to/he of biomass without fertilizer and 30.0 to/he of biomass with $N_{16}P_{160}K_{120}$ fertilizer. These crops were left to decompose on the ground, increasing the humus level.

Tomescu I. RESULTS OBTAINED IN SOME AGRO ...

The determinations were made between 1987-1993 on dump site Gârla-Rovinari and the alternatives are the ones mentioned in table No.2.

The data obtained between 1987-1993 reveal the soil need of chemical and organic fertilizers.

So, the main biometric data determened shows a proportional growth with the chemical fertilizer dosage, but also with the organic fertilizer used.

It all came up in the first important production, 6 years after the trees were planted, when the researches revealed significant increases in the alternative ways of fertilization.

The highest level of production was revealed with the V9 variant, when were used 40 t/he of manure + $N_{160}P_{160}K_{120}$ Kilo/he, about 6.04 t/he plums, which means an increased percentage of 59% compared with the unfertilized soil.

Table No.1. Average multiannual	production and main biometrical data	a recorded on fruit trees on recovere	ed dumping sites (25 year	rs)
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Studied Species	Roaling percentage	Trunk thickness after 25 years		Average offshoot growth	Multiannual average production	
		Total	Annually		Kilo/tree	T/he
Apple	99	13.7	1.1	54	39.8	24.9
Plum	97	13.2	1.2	37	24.8	8.2
Sweet Cherry	69	16.5	1.5	18	17.0	4.1
Cherry	65	12.1	1.1	13	11.5	3.8
Nut	68	9.5	0.9	14	6.2	0.6
Hazel nut	89	4.0	0.3	7	0.5	0.3

Table No.2. The fertilization influence on main biometric data on the plum culture

	Trunk's dia	meter-cm	Annual growth of offshoots –cm			Productions t/he	
Variant	1987-1993	Annual growth	Average 1987- 1993	% Compared to the unfertilized soil	Importance	At 6 year old	%
V1-unfertilized soil	2.9	2.0	66	100	Х	3.8	100
V2-green fertilizer	3.0	2.0	74	112	XX	4.2	123
V3-green fertilizer+ N ₈₀ P ₁₈₀ K ₄₀	4.4	3.5	102	155	XXX	4.20	135
V4- green fertilizer+ N ₁₂₀ P ₁₂₀ K ₈₀	4.5	3.6	109	165	XXX	4.35	135
V5- green fertilizer+ N160P160K120	5.5	4.1	112	170	XXX	3.90	140
V6-manure 40 t/he	5.0	3.0	107	162	XXX	4.20	125
V7-manure 40 t/he + N ₈₀ P ₈₀ K ₄₀	5.2	3.9	115	174	XXX	4.70	135
V8- manure 40 t/he + N ₁₂₀ P ₁₂₀ K ₈₀	5.2	4.5	121	183	XXX	4.92	152
V9 manure 40 t/he + N160P160K120	5.6	4.6	127	192	XXX	6.04	159

4.2. Vine culture

In the same experiment we also researched the vine culture. For proving this we present the most representative data from 1988-1992.

During the period of study, were analyzed and determined a series of factors (soil moisturing/humidity, green fertilizers biomass, green fertilizers content in N, P, K, wood mass), which linked together have contributed to the difference of production related to the applied treatment. The studied variety was Pinot Noir, guided as a two-way, medium height stemp (70 cm).

From the shown data can be seen that increased production was obtained with green and chemical fertilizers ($N_{160}P_{160}K_{160}$ Kilo/he) with a production of about 7.27 t/he, comparing with 4.59 t/he without fertilization, followed by the V3 way with 40 t/he of manure + $N_{40}P_{40}K_{40}$ kilo/he.

Variant	Obtained production		Sugars	Acidity
	Kilo/vine To/he		g/l	g/l
				H_2SO_4
V1 – US + NPK 160 kilo/he	1,50	6,82	210,8	4,99
V2 – US + NPK 40 kilo/he	1,27	5,77	216,2	4,98
V3 – US + manure 40 to/he + NPK 40 kilo/he	1,58	7,18	207,7	4,75
V4 – GF + NPK 100 kilo/he	1,54	7,00	206,7	4,92
V5 - GF + NPK 40 kilo/he	1,42	6,50	202,5	4,87
V6 - GF + manure 40 to/he + NPK 160 kilo/he	1,60	7,27	206,4	5,19
V7 - US	1,01	4,59	223,7	4,42

US - unfertilized soil

4.3. Cereal crops

Other plants studied during the experiment were cereals (maize, oat, barley) and other plants (potatoes, pea).

The soil was found to be less suited for potato and spring barley crops, but also for unfertilized or little fertilized maize crop.

In table No.4 is shown the energetical level of main studied species.

Table No.4. Energetical level of severa	crops - annual average	1990 – 1998 MJ/he phy	vsical, chemical and biolo	gical properties.
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Culture	Fertilizing level				Average	%	
	N₀P₀	N44P44	N ₁₀₀ P ₁₀₀	N ₁₃₂ P ₁₃₂	N176P176		
Potato	19794	24517	32677	36044	53637	3334	51
Maize	22021	40868	68363	80902	104475	63326	97
Oat	30346	57920	77870	83774	98853	71753	110
Pa	30197	58118	92152	107066	123368	82180	126
Barley	20294	46329	57783	76758	80611	56355	86
Wheat	25100	43755	75800	101507	117560	72744	111
	22715	49538	102782	114429	135614	85016	130
Average per variant	24228	46215	71938	84829	99426	65327	100
Percentage %	37	71	110	130	152	100	

5. Conclusions

Soil that was technologically created on mining dumps can be used for agricultural purpose just like normal ones, with the condition to insure proper organic and chemical fertilization, in order to enhance the soil's physical, chemical and biological properties.

We can creat ecological agro systems consisting of annual cultures, fruit trees and vine by respecting their growth needs

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