STUDY REGARDING CHOOSING THE OPTIMAL TERRITORIAL PLANNING OF AN ARABLE LAND

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Abstract

The main objective pursued in this work was the concentration of agricultural land surfaces in optimally sized units in order to efficiently exploit natural and material resources. Thus, through this work, the organization and development of the territory for the area of 126.47 ha, arable use category, related to the locality of Amărașții de Jos, Dolj county, located in the outskirts and under private administration, was carried out.

Key words*: arable land, territory organization, optimization*

INTRODUCTION

The organization of the territory is, most of the times, defined as a set of measures, actions and works through which one intervenes in a given territory in order to efficiently use the existing potential and to ensure a coordinated development of economic and social activities. Territorial organization plans represent the only way in which the meeting between the coordination of the spatial elements and the solutions adopted, are directed to the improvement of the space, to adapt it to the various goals that can be pursued by society.

MATERIALS AND METHODS

The organization and arrangement of the arable territory was carried out on the basis of the topographic surveys carried out, for the arable land surface of the T61 field in Amărăștii de Jos commune, Dolj county, in order to cultivate the land in accordance with the technological and legislative provisions and the potential of the existing soil type. Cartographic documents (analogue and digital) made available by OCPI Dolj, OSPA Dolj and the Local Council of Amarăștii de Jos for the tarla 61 in question were analyzed (cadastral documentation made, plot table with owners, orthophoto plan, cadastral plans 1/5000 – 1 /10000, UAT limit, urban limit, tarla limit, pedological study).

The topographic measurements were carried out in the coordinate system of the state geodetic network. The measurements were made with 2 GPS receivers, type Leica 900 CS, of the geodetic precision class with double frequency using the STOP AND GO method. The processing of the GPS measurements was done with the help of the specialist program Leica GeoOffice. To calculate the coordinates at the determined points, the observations from the CRAI (CRAIOVA) and CORA (CORABIA) permanent stations were used. With the help of the AutoCAD Map 3D 2008 program, the situation plan was drawn up, on a scale of 1:2000, also with the help of this program, 2 simulations of

variants for the organization of the territory, namely establishing the dimensions and shapes of the soils and establishing the network were carried out of circulation.

RESULTS AND DISCUSSIONS

Soil characterizations and evaluations were carried out for the following US: 4.5; 2.3; 4.1; 4.3; 2.12.

Soil Territorial Unit (U.S.) No. 4.5 (table 1): weakly glazed reddish-brown soil, heavily leached, formed on clays, consisting of medium material, with a texture of medium loamy sand on medium sandy clay; BRgz – G2 – K5 – SMm – UM / SM. The texture is medium loamy sand, the total porosity and bulk density are moderate, the degree of glaciation of the soil is weak. The reaction of the soil is weakly acidic, the humus content in Ap is medium, decreasing to low at a depth of 50 cm, and by point of view, the degree of saturation in bases, the soil is eubasic. The global drain is intense.

Table 1.Bulletin of soil sample analyzes for unit 4.5

Soil profile	Soil horizon	Harvesting depth(cm)	pH in distilled water ratio of 1:2.5	CaCO3 (%)	Humus (%)	Total nitrogen(N %)	Mobile phosphorus (ppm)	Mobile potassium (ppm)	Coarse sand (> 0,2 mm)	Fine sand (0,2-0,02 mm)	Dust I (0,02-0,01 mm)	Dust II (0,01-0,002 mm)	Colloidal clay (< 0,002 mm)	Texture interpretation
13	Ap	0-18	5,96	-	2,48	0,130	10,5	100	36,0	38,3	5,9	8,0	11,8	UM
	Ao	18-34	5,98	-	2,32	0,122	7,0	100	35,7	39,3	3,8	7,0	14,2	SM
	A/B	34-49	6,04	-	1,68	0,090	2,6	90	32,5	35,3	6,4	7,2	18,6	SM
	Bt1	48-84	6,09	-	-	-	-	-	30,8	36,8	4,5	7,5	20,4	SM
	Bt2g	84-125	6,34	-	-	-	-	-	29,2	38,4	5,7	7,0	19,7	SM

Soil Territorial Unit (U.S.) No. 2.3 (table 2): typical wet phreatic cambic chernozem, strongly leached, formed on loessoid deposits consisting of medium material, with a texture of medium loamy sand on medium sandy loam; CCti – G1 – K5 – SLI – SM/SM. The texture is medium sandy loam, the total porosity and density register moderate values. The reaction of the soil is weakly acidic, and therefore of the degree of saturation in bases, the soil belongs to eubasic soils, the humus content in the first 50 cm is low. The global drain is intense.

Soil Territorial Unit (U.S.) No. 4.1 (table 3): typical reddish brown soil, strongly leached, formed on sands, consisting of coarse material, with the

texture of coarse loamy sand on coarse loamy sand; BRtii – K5 – SNg – UG/UG. The texture is coarse loamy sand, total porosity and apparent density have moderate values. The reaction of the soil is weakly acidic, the humus content in Ap is medium, decreasing to low at a depth of 50 cm and as a result of the degree of saturation in bases, the soil is eubasic. The global drain is intense.

Soil Territorial Unit (U.S.) No. 4.3 (table 4): The texture is medium sandy loam, and the total porosity and bulk density are moderate. The reaction of the soil is weakly acidic, the content of humus in Ap is medium and low at the depth of 50 cm. The global drain is intense.

Soil Territorial Unit (U.S.) No. 2.12 (table 5): weakly glazed cambic chernozem, strongly leached, formed on clays, consisting of medium material, with medium clay texture on medium clay; CCgz – G2 – K5 – SMm – LL/LL. The texture is medium clay, the total porosity is high, it shows weak glazing. The reaction of the soil is moderately acidic, and d.p.d.v. of the degree of saturation in the bases, the soil is eubasic, the humus content at the depth of 0-50 cm is low. Overall drainage is good.

Table 2. Bulletin of soil sample analyzes for unit 2.3

Soil profile	Soil horizon	Harvesting depth(cm)	pH in distilled water ratio of 1:2.5	CaCO3 (%)	Humus (%)	Total nitrogen(N %)	Mobile phosphorus (ppm)	Mobile potassium (ppm)	Coarse sand (> 0,2 mm)	Fine sand (0,2-0,02 mm)	Dust I (0,02-0,01 mm)	Soil profile	Soil horizon	Harvesting depth(cm)
160	Ap	0-31	5,92	-	1,78	0,100	70	135	22,0	48,2	5,2	8,4	16,2	SM
	Am	31-47	6,63	-	1,98	0,104	36	90	20,0	45,0	3,8	6,0	19,1	SM
	Bv	47-102	6,94	-	0,86	0,050	21	75	24,0	47,6	5,0	6,0	17,4	SM
	Bc	102-140	7,17	-	-	-	-	-	27,0	48,8	4,4	5,8	14,3	SM

Table 3. Bulletin of soil sample analyzes for unit 4.1

Soil profile	Soil horizon	Harvesting depth(cm)	pH in distilled water ratio of 1:2.5	CaCO3 (%)	Humus (%)	Total nitrogen(N %)	Mobile phosphorus (ppm)	Mobile potassium (ppm)	Coarse sand (> 0,2 mm)	Fine sand (0,2-0,02 mm)	Dust I (0,02-0,01 mm)	Soil profile	Soil horizon	Harvesting depth(cm)
142	Aop	0-20	6,09	-	2,06	0,112	70	60	51,3	31,5	3,2	6,4	7,6	UG
	A/B	20-59	6,43	-	1,86	0,100	21	45	52,5	26,5	4,5	5,8	10,7	UG
	Bt	59-89	6,63	-	-	-	-	-	50,5	28,8	2,8	8,5	9,4	UG
	BC	89-150	6,64	-	-	-	-	-	52,0	28,2	2,8	6,3	10,7	UG

Table 4. Bulletin of soil sample analyzes for unit 4.3

Soil profile	Soil horizon	Harvesting depth(cm)	pH in distilled water ratio of 1:2.5	CaCO3 (%)	Humus (%)	Total nitrogen(N %)	Mobile phosphorus (ppm)	Mobile potassium (ppm)	Coarse sand (> 0,2 mm)	Fine sand (0,2-0,02 mm)	Dust I (0,02-0,01 mm)	Soil profile	Soil horizon	Harvesting depth(cm)
76	Aop	0-25	6,69	-	2,72	0,140	45	95	21,4	45,0	8,2	6,3	19,1	SM
	A/B	25-44	6,51	-	2,48	0,126	9	83	21,0	40,9	5,9	7,6	24,6	LN
	Bt	44-98	6,85	-	-	-	-	-	23,0	39,3	5,4	8,1	24,2	LN
	Bc	98-140	7,06	-	-	-	-	-	21,8	41,8	8,7	8,8	18,9	SM

Table 5.Bulletin of soil sample analyzes for unit 2.12

Soil profile	Soil horizon	Harvesting depth(cm)	pH in distilled water ratio of 1:2.5	CaCO3 (%)	Humus (%)	Total nitrogen(N %)	Mobile phosphorus (ppm)	Mobile potassium (ppm)	Coarse sand (> 0,2 mm)	Fine sand (0,2-0,02 mm)	Dust I (0,02-0,01 mm)	Soil profile	Soil horizon	Harvesting depth(cm)
147	Ap	0-21	5,82	-	2,52	0,138	26	190	6,0	45,8	8,00	10,7	29,5	LL
	Am	21-45	6,74	-	2,04	0,110	8	85	7,0	37,5	10,5	10,3	34,7	TT
	A/B	45-63	7,05	-	1,64	0,088	5	75	7,5	36,7	11,7	10,5	33,6	TT
	Bv1	63-101	7,13	-	-	-	-	-	6,6	42,4	8,8	9,7	32,5	LL
	Bv2g	101-139	7,49	0,2	-	-	-	-	6,4	42,4	10,1	9,3	31,8	LL
	Cg	139-170	8,32	4,5	-	-	-	-	9,4	46,4	8,8	9,5	25,9	LL

For the exploitation of the land, according to the principles of the organization of the arable land, 2 simulations of dividing the entire surface that was topographically raised into roughly equal soils were carried out.

Variant 1 of the land development proposal that can be seen in fig. 1 is described by 4 soles with the surfaces: sole IC1= 31.24 ha; soil IIC1= 31.24 ha; soil IIIC1= 31.24 ha; soil IVC2= 31.24 ha. The area occupied by roads and canal: De 411= 0.6269 ha, De 407= 0.3786 ha.

Variant 2 of the land development proposal (fig. 2), being also the recommended exploitation variant, is characterized by: soil IC1= 31.29 ha; soil IIC1= 31.29 ha; soil IIIC1= 31.29 ha; soil IVC1= 31.29 ha. The surface occupied by roads and canal: De 411= 0.6269 ha; Of 407= 0.3786 ha; Dp 1 = 0.4178 ha/road; Dp 2 = 0.4178 ha/road; Dp 3 = 0.4178 ha/road.

It is proposed:

- the establishment of crop structures for the next 4 years (table 6);
- creation of a field arrangement for the resulting total area of 126.47 ha.

For an efficient operation and to a degree as close as possible to the norms of the organization of the arable territory, the grouping of the entire measured area in a single cropping, respectively the C1 Cropping with 4 soles in equal areas of 31.29 ha, was established. For the area subject to development, the creation of a road network was considered so that the area served by it is as small as possible, at the same time the road network ensures a flow, a circulation as efficient as possible during the exploitation of the agricultural land.

The traffic network necessary for the exploitation of the landscaped territory is made up of the already existing exploitation roads (De394, De407, De411) and three more new temporary roads (Dp1, Dp2, Dp3), the latter of which was decided to be realized keeping taking into account the fact that there is an irrigation channel in the northern part of the tarlala, and to the extent that this

channel will be supplied with water, on the 3 new roads it will be possible to place distribution pipes for the irrigation facilities.

The structure and annual rotation of crops, and their location is presented in table 6. The structure of crops for the next period is dictated mainly by market requirements, thus the largest share is held by cereals (wheat, barley) followed by potatoes and corn (table 7). Crop rotation C1 has a structure of barley, potato, corn and wheat, a crop rotation made only for 4 years and made only according to the requirements of the market, a crop rotation through which both the correlation with the market and the correlation of local factors with the viability of these crops in the area are desired.

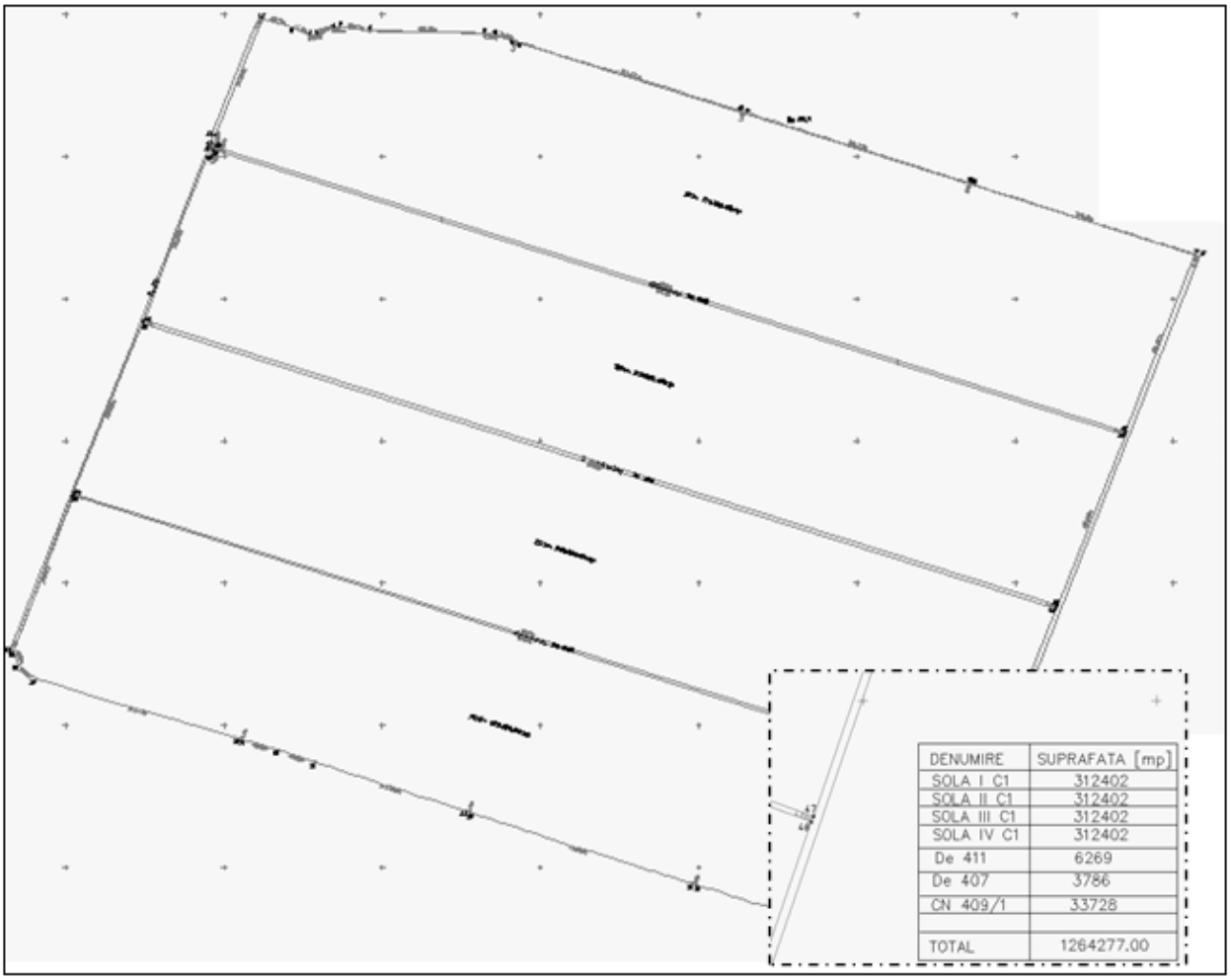

Fig. 1 - Organization proposal in the first version

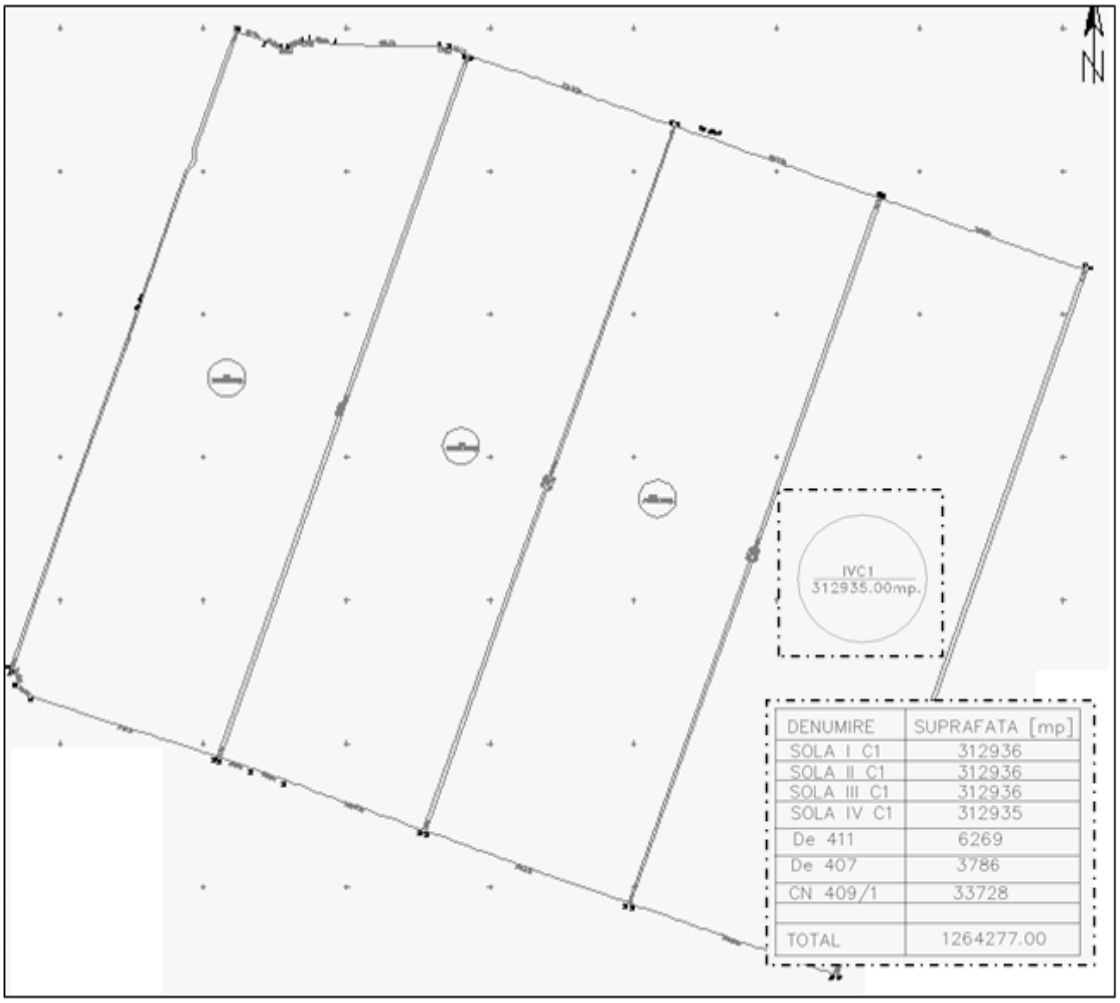

Fig. 2 - Organization proposal in second version

Table 6. Crop rotation C1, organization, structure and crop rotation

Crop rotation	Structure and crop rotation					
	Plot	Plot surface (ha)	Years			
			1	2	3	4
C1	1	31.29	Wheat	Corn	Barley	Potato
	2	31.29	Corn	Barley	Potato	Wheat
	3	31.29	Barley	Potato	Wheat	Corn
	4	31.29	Potato	Wheat	Corn	Barley

Table 7. Structure and share of crops for the first year

Cultivated plant	Plot surface (ha)	Size %
Wheat	31.29	24.83
Barley	31.29	24.83
Potato	31.29	24.83
Corn	31.29	24.83
TOTAL	125,16	100

CONCLUSIONS

Through this work, the organization and development of the territory was carried out for a land area of 126 ha in the locality of Amarăștii de Jos, Dolj county, located in the west-eastern part of the locality, for the category of arable use. The researched territory is located in the south-western climatic region, characterized by a

temperate climate with Mediterranean influence, having moderate winters, hot and generally dry summers, with sufficient but unevenly distributed precipitation during the year, with a lack of humidity and droughts in the months, March, April, August, September and October. The existing soils on the land surface that was subjected to the organization of the territory correspond to the type of weak glazed red preluvosol, typical wet phreatic cambic chernozom, typical red preluvosol and weak typical cambic chernozom.

The climate is favorable for the development of several crops, but the following were included in the rotation: wheat, corn, barley, potatoes. A single 4-year field rotation was established, with equal soil separations. When dimensioning and shaping the floors, it was considered to keep their orientation consistent with the orientation of the old plots. Three new roads were created, but of course the existing roads serving other areas at the commune level were also preserved. By creating the road network, it was aimed to create soles with as regular shapes as possible. A good correlation of the territorial conditions with the production potential of the lands, with their rotation and with the efficient use of tractors, machines and agricultural machinery and hydro-improvement systems as well as by ensuring some products currently demanded on the market, was achieved through the rotation.

Carrying out such work offers several advantages in terms of the private exploitation of agricultural land: - having a clear record of the surfaces and owners inside the field; - the possibility of obtaining the land register for each plot, after which the possibility of concluding sale-purchase contracts without problems; - knowing the type of soil inside the field; - the possibility of using agricultural machinery equipped with guidance equipment or even satellite guidance; - keeping a clear record of the surfaces bought or rented; - the possibility to easily create a business plan for the next period; - records of crops and implicitly costs for a duration corresponding to the employment; - easy declaration of agricultural areas to obtain national and community aid on the area; - the possibility of using software for agriculture..

REFERENCES

Alecu I și colab. - *Management în agricultură*, Ed. Ceres, București, 1997.

Avram C., și colab. – Dicționar istoric al județului Dolj, Ed. Alma, Craiova, 2004.

Bold I. - *Organizarea și amenajarea teritoriului, în volumul Romania* 2020, sub redacția M. Maliță și C. Georgescu , Editura Conspress , București , 1998 , p. 138.