THE ANALYSIS OF CROP STRUCTURE ACCORDING TO SOCIAL-ECONOMICAL REQUIREMENTS IN VRANCEA DISTRICT

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Abstract

A well established structure of cultures at a level of area, county or farm, is an important factor for obtaining more stable average yields and closer to natural potential. Choosing the structure of culture must take account of the purpose (of the products meet nutrition for human and animal) and a number of restrictions imposed by the specific cultures. There have been developed several variants corresponding to different situations of resource allocation. The technical and economical indicators from the optimization model were based on the estimates of expenditure, the consumption norms of materials and labor, cost recovery and pricing of products analyzed. In respect of livestock by species and categories, they may correlate with the potential represents the county, depending on material, social and economic existence at a time. It requires increasing the areas cultivated with forage plants to meet the necessary volume of feed for cattle and sheep, at the level of expected livestock production.

Key words: crops optimum structure, safe-food, productivity potential, average yield, food and feed

INTRODUCTION

The district Vrancea is located in the South-east of Romania, Eastern limit of Euroregion Siret – Prut – Nistru. From area viewpoint, the district has 4,863 km^2 , and from rural area viewpoint is on seven place among all districts of Romania. As relief, one can mention the Mountains Vrancea (with heights between 960 – 1,783 m), hilly regions (with heights between 350 – 1,001 m) and plain (spreading till rivers Siret, Trotus and Ramnic). The continental climate is influenced by air streams from North and South of Europe. The forests cover about 38% of district area (191,792 ha), representing one of the most important richness of this area. The agriculture is well developed; the agricultural area consists of 255,284 ha, of which 146,792 arable land, 35,000 ha wineyard (main yield of district), 4,654 ha fruit trees.

The overall objectives to determine the optimum crop structure for the district Vrancea are:

• achievement of food safety for district habitants (population);

• yield levels which should cover the consumption requirements related to EU and WHO (World Healthy Organization) recommendations;

• diminution of decreasing degree of livestock and poultry at the limit to stop the decline, observation of parameters in gradual increasing at the level of expected yield ensuring;

• increasing of average and total yield level, as a consequence of improving biological level of livestock, technologies and feeding techniques, reproduction and breeding;

• ensuring of nutritive resources adequate to proposed aims, by optimization of forage crop structure, realization of grasslands improvement program;

• livestock productive potential expressing, by application of scientific nutrition.

The process of optimization ensures the most advanced balance between production factors, due to its achieving depending on some current restrictions and for an established target. At the same time, the economical activity optimization allows the establishment of real, concrete level of economical efficiency, to reach its external size, through the maximization of effects with existing tools, or by minimization of total expenses regarding the proposed aim.

MATERIAL AND METHODS

Generally, by choosing of crop structure, one can understand the optimum level of food and feed to cover the human and animal need as well as the optimum utilization of existing climate and soil resources.

Besides, one can calculate the endowment to perform mechanical tillage, optimum level to ensure crop inputs, refering especially to seeds, chemical and organical fertilizers, pesticides, other raw matters and materials.

At the same time, one can take into account the available labour force, due to the fact that some crops (row crops, for example) require higher consumption of labour force that others (cereals).

Under other situations, one can follow to achieve, on whole crop structure, a low fuel consumption for mechanical tillage, this element becoming a restrictive one in choosing crop component as part of structure.

Also, the agro-productive features of soils are restrictive. Thus, one can mention acid or basic soils, salty ones, with moinsture in excess, which could be optimum utilized only by certain species cultivation. In the case in which the water reserve into soil during autumn – winter is insufficient and the prognosis show reduced rainfall during vegetation, it is necessary to increase the weight of less pretention crops vs. water.

It is necessary to take into consideration the level of ensuring financial tools for crop's establishment as well as their maintenance, harvesting and yield transportation. In this respect, one can know the fact that, the own financial resources of the farmers are insufficient and using of bank credits is a hard decision, due to current high interest.

If, by an established crop structure one can achieve a high net benefit, it means that the weight of crops which require reduced expenses must be increased; globally, the crop structure will be economically more profitable simultaneously with the technological restrictions for each crop.

The cereals (wheat, barley, two-rowed barley, oats, maize for kernels) were considered as models; together with industrial crops (sunflower, soybean, rape for oil, peas, beans, sugar beet, potatoe) and forage ones (vetch-oats mixture, barley for green mass, maize for silo, forage beet, alfalfa for hay) constitute the arable land of the district Vrancea (141,808 ha), after the substraction from total district area (148,028 ha) of 50 ha maize, 50 ha sunflower, 14 ha tobacco, 88 other industrial crops, 5,615 field legumes, 337 ha melon, 66 ha other crops, all of them cultivated for seed multiplication.

As an example, the table presents the cereals for grains quantities necessary for district requirements during an year:

Cereal	Destination	Calculation	Annual need, t
Wheat	*For human consumption*	160 kg/habitants/year x 400.000 habitants = 64.000t	*70.300*
	For seed	21.000 ha x 300 kg/ha (norm, including the reserve) = 6.300t	
Barley	*For feeding (swine)*	55.490 individuals x 0,2 kg/individual/day x 365 days = 4.051t	*4.211*
	For seed	800 ha x 200 kg/ha = 160 t	
Oat	*For feeding*	- *horses:* 2000 individuals for breeding x 3 kg/individual/day x 365 days = 2.190t - *swine:* 2400 individuals for breeding x 2 kg/individual/day x 365 days = 1.752t	*4.246*
	For seed	1900 ha x 160 kg/ha = 304t	
Maize	*For feeding*	- *cattle*: 52.609 individuals x 1,8 kg/individual/day x 365 days = 34.565t - *sheep and goats*: 174.746 individuals x 0,5 kg/individual/day x 365 days = 31.891t - *swine*: 55.490 individuals x 1,6 kg/individual/day x 365 days = 28.356t - *poultry:* 1.966.400 individuals x 0,25 kg/individual/day x 365 days = 179.434t	*280.946*
	For human consumption	40 kg/habitant/year x 120.000 habitants (in towns) = 4.800 tons	
	For seed	76.000 ha x 25 kg/ha = 1.900t	

The technical-economical indicators (table 1) introduced into optimization model were calculated based on expenses, norms of material and labour force consumption, costs and prices of utilization of tested products, while the restrictions refer to:

− *integrated utilization of arable land;*
− *minimum rotation into crop rotation;*
− *achievement of minimum and maximum quantity of tested products;*
− *non-negation restrictions.*

Table 1
Economical indicators of tested crops*

Nr. crt.	Technical-economical indicators	Wheat	Barley	Spring two-rowed barley	Oats	Maize for kernels
1	Labour force consumption, thousand hours-worker/ha	0.00145	0.00204	0.00184	0.00099	0.01563
2	Fuel consumption, thousand l/ha	0.06764	0.07112	0.06463	0.04997	0.07351
3	Nitrogen fertilizer consumption, t active ingredient./ha	0.135	0.100	0.093	0.050	0.100
4	Phosphorus fertilizer consumption, t a.i./ha	0.060	0.080	0.067	0.048	0.070
5	Yield expenses, thousand RON/ha	1.803	1.796	1.599	1.190	1.854
6	Yield value, thousand RON/ha	1.973	2.000	1.713	1.332	1.980

* at the level og agricultural year 2006/2007

RESULTS AND DISCUSSIONS

Many variants, adequate to various situations of resources allocation were performed. The final solution, in which the *objective-function took into consideration was net benefit*, show that this variant is optimum one under imposed conditions and restrictions, ensuring a crop structure viable in the district Vrancea.

The criteria previously exposed are accomplished:

⇨ the population consumption is entirely ensured;

⇨ the concentrate fodder necessary for livestock is entirely ensured;

⇨ the seed supply is ensured.

The results obtained in optimum variant were synthetized in the following tables:

• table 2 presents the crop optimum structure (V2) compared to current one (V1) established in district. The data emphasize the fact that the area cultivated with cereals for grains decreases with 5.1% in optimum structure vs. initial one, at the level of district in 2007;

• table 3 presents the labour force and fuel consumptions. To emphasize the superiority of crop optimum structure, the level of utilized technology inputs vs. initial crop structure was comparatively analyzed. The data underline the fact that, under optimized variant (V2), the labour force and fuel consumption is less vs. initial structure variant (V1);

• in table 4, the comparative analysis of chemical fertilizer consumptions emphasizes the fact that under optimum variant (V2), the chemical fertilizer consumption is higher than consumptions under initial one (V1) for 2007.

The market requirements and the system of measures implemented by State or economical agents, which utilize the products to stimulate certain crops will have an important impact on cultivated area structure.

Table 2
Comparative analysis between current structure – 2007 – and optimum one

Specification	Area under current structure, V_1		Area under optimum structure, V_2		V_2 vs. V_1 %
	ha	% of arable	ha	% of arable	
Cereals for grains, of which:	102802	69,4	95198	64,3	- 5,1
Wheat	21543	14,5	20286	13,7	- 0,8
Barley	786	0,5	1053	0,7	+ 0,2
Two-rowed barley	2486	1,7	1500	1,0	- 0,7
Oats	1894	1,3	2123	1,4	+ 0,1
Maize for kernels	76093	51,3	70236	47,5	- 3,8

Table 3
Comparative analysis between current structure – 2007 – and optimum one after consumption hours/human and fuel

Specification	Human labor consumption, thousand hours-human			Fuel consumption, thousand liters		
	V_1	V_2	V_2 vs. V_1	V_1	V_2	V_2 vs. V_1
Cereals for grains, of which:	1228,484	1134,213	- 94,271	7361,961	6813,113	- 548,848
Wheat	31,108	29,415	- 1,693	1457,147	13721,145	- 85,002
Barley	1,603	2,148	+ 0,545	55,903	74,889	+ 18,986
Two-rowed barley	4,567	2,760	- 1,807	160,678	96,945	- 63,733
Oats	1,873	2,102	+ 0,229	94,637	106,086	+ 11,449
Maize for kernels	1189,333	1097,788	- 91,545	5593,596	5163,048	- 430,548

Table 4
Comparative analysis between current structure – 2007 – and optimum one after chemical fertilizer consumption

Specification	Nitrogen fertilizer consumption, t active ingredient			Phosphorus fertilizer consumption, t active ingredient		
	V_1	V_2	V_2 vs. V_1	V_1	V_2	V_2 vs. V_1
Cereals for grains, of which:	10922,103	10113,16	- 808,943	6933,444	6420,360	- 513,084
Wheat	2908,305	2738,61	- 169,695	1295,580	1217,160	- 75,420
Barley	78,600	105,300	+ 26,700	62,880	84,240	+ 21,360
Two-rowed barley	231,198	139,500	- 91,698	166,562	100,500	- 66,062
Oats	94,700	106,150	+ 11,450	90,912	101,904	+ 10,992
Maize for kernels	7609,300	7023,600	- 585,700	5326,510	4916,520	- 409,990

CONCLUSIONS

• The choosing of crop structure must take into considerations both expected task and each crop requirements.

• In order to optimize crop structure, an economical-mathematical model was performed.

• The establishment of adequate crop structure ensures the achievement of cereal yield, which entirely cover the internal need for human consumption, fodder one as well as raw matter resources for food and adjacent industries.

• By increasing average yield/ha, the weight of area cultivated with cereals for grains could annually decrease with 2%, in favour of areas cultivated with industrial crops and legumes for grains.

• The livestock, on species and categories, could be correlated with the district potential, depending on material, social and economical conditions, at a given time.

• It is necessary to cultivate areas with forage crops which entirely ensure the fodder supply for cattle and sheep, at the level of expected productions.

• After joining Romania to EU, it is necessary to find solutions for European market competition. From our viewpoint, we consider that an important niche is the utilization of slight energy and pollutant technologies. Under this circumstances, one can achieve products with no residues or with residues below the established limits, meaning acceptable positions of Romanian products on European market.

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