POSSIBILITIES TO INCREASE THE TECHNICAL-ECONOMIC RESULTS IN VEGETABLE GROWING OF PRAHOVA DISTRICT, THROUGH THE OPTIMIZATION OF THE STRUCTURE OF CULTURES, ON SPECIES (CASE STUDY IN THE VEGETABLE AREA OF BERCENI-BĂRCĂNEŞTI- BALTA DOAMNEI, PRAHOVA DISTRICT)

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Most of speciality studies accept the idea that the promoter of food security consists in securing of the access to normal nourishment for each person, at any moment.

The vegetables bring important quantities of vitamins, provitamins and various mineral salts to food, being from this point of view, beside fruits, through the most important nutriment for the human consumption.

Most of vegetables have a pleasant taste, which is specific to each variety. Some vegetables are rich in ethereal oils and carbohydrates, which stimulate the appetite.

The vegetable growing represents a branch very important in the structure of the Romanian agricultural production and has major implications in national economy, and particularly in human nourishment.

After the year 1989, the Romanian vegetable production has had a descending tendency concerning both the cultivated surface and the total production.

***The revitalization of the Romanian vegetable growing**, the increase of economic efficiency and the correlation with the national interests can be realised through the reconsideration of positive elements and the introduction of new elements of management and performance marketing, in accordance with the principles and the Directives elaborated by the European Commission i+n Brussels.*

***The optimization of the structure of vegetable crops** appears because of the necessity of planning in territorial profile of the vegetable production, respectively a judicious division into zones and a rational joint of cultures.*

The optimization of the structure of vegetable crops must ensure the increase of the agricultural production, the amelioration of its quality and the increase of the profitability in all zones and productive units.

The optimal variant of the structure of vegetable crops is the one that ensures the maximum profit, where the land was organized on alternation of crops, in accordance with its economic estimation, regardless the zone.

***In the studied area,** the authors have observed a pronounced instability of the vegetable production. This phenomenon relates to the lack of performance of the vegetable growing farms, which is generated by the insufficient correlation between the main resources of production, such as the land, the labour force and the operational capital.*

This fact explains also the insufficient efficiency of the vegetable production, which is mainly determined by the inadequate use of the arable land, the lack of technical and economic background of the new landowners, as compared to the requests of a modern, profitable vegetable growing, which is oriented to the market economy.

Afterwards, the complex process of the Romanian integration into the unique European market imposes a different approach of the optimization process and the use of agricultural resources, as well as of the technical, economic and organizational indicators from the vegetable growing sector.

The process of Romanian integration into European market must correspond to the new requests of the market and to the correlation between the demand and the offer, which are particular to a competitive market.

***Key words:** vegetable growing, optimization, results.*

The evolution of the Romanian total production of vegetables was inconstant, that is why in 2007 Romania produced only 78, 4 % comparing to the production of the year 2002. Although the average production per hectare doubled comparing to the production of the year 1938, its level was low.

The evolution of the average production of vegetables per hectare increased in the period 2002-2007, in Prahova district, but its level registered 10,3 – 12,5 t/ha.

All these aspects justify that it is necessary to adopt a system of production, which lead to the increase of production, the reducing of its cost and the maximization of the profit.

In this context, the optimization of the technologies of culture of main vegetable species is necessary. There are also necessary the implementation of an optimal programme of organic and mineral fertilization, an integrate fight against diseases and pest, the alignment to the European standards concerning production and use of biological materials, through the use of handbooks of good practices, both in producing and in industrial processing of vegetables.

The vegetable area of Berceni-Bărcăneşti-Balta Doamnei brings an important contribution to the realization of the total production of vegetables, due to its favourable conditions for producing, industrial processing and selling them.

Relating to the economic aspect, we observe that in the last four years, in the studied area, the main cultivated vegetable species were profitable, with obvious differentiations depending on species.

The size of economic indicators was higher than the average of Prahova district, so finding a certain economic ranking of cultures. In the studied area, the cultures with the best results registered have been the garlic, the cucumbers, the tomatoes and the eggplants. In Prahova district, the ranking of vegetable cultures is different, but the culture of garlic remains on the first position.

The authors observed that the costs and the sale prices have presented an ascendant evolution, but the differences were insignificant between the values obtained in the studied vegetable area and the average of Prahova district, under the absolute size.

However, the average productions per hectare are still small, because of the influence of some internal and external factors, which are related to the inadequate use of certain technologies. This imposes the initiation of some measures concerning the improvement of technologies and the optimization of the structure of cultures on species and destinations of products.

The durable vegetable growing represents the future of the Romanian vegetable growing. Therefore, it must adopt some strategies relating to the environment and soil preservation, through promoting of some objectives, with the aim to obtain some well-proportioned vegetable products, with a minimum of toxic substances or potential pests, to be able to ensure the health protection of consumers.

MATERIAL AND METHOD

The case study was performed in the vegetable area of Berceni-Bărcăneşti-Balta Doamnei, which is located in the south part of Prahova district and includes the following eight localities: Berceni, Bărcăneşti, Rafov, Gherghiţa, Balta Doamnei, Gorgota, Puchenii Mari, and Dumbrava *(fig. 1).*

There are favourable conditions for most of vegetable species in the vegetable area of Berceni-Bărcăneşti- Balta Doamnei, but the most widespread species are *the tomatoes, the peppers, the eggplants, the carrots, the onion and the vegetables related to cabbage.*

In Prahova district, the most favourable zones for the culture of vegetables are the following: *Mizil, Ciorani, Drăgăneşti and Poienarii Burchii.*

Taking into account the particularities of each zone, we observe that the main concern of specialists is directed to the focussing of cultivated surfaces with the main vegetable species, in the zone, which has the best environment conditions. For establishing the rapport between different vegetable species, the specialists take also into account the economic aspect, preferring those vegetable species, which ensure the best exploitation of environment conditions. This fact will lead to a higher economic efficiency.

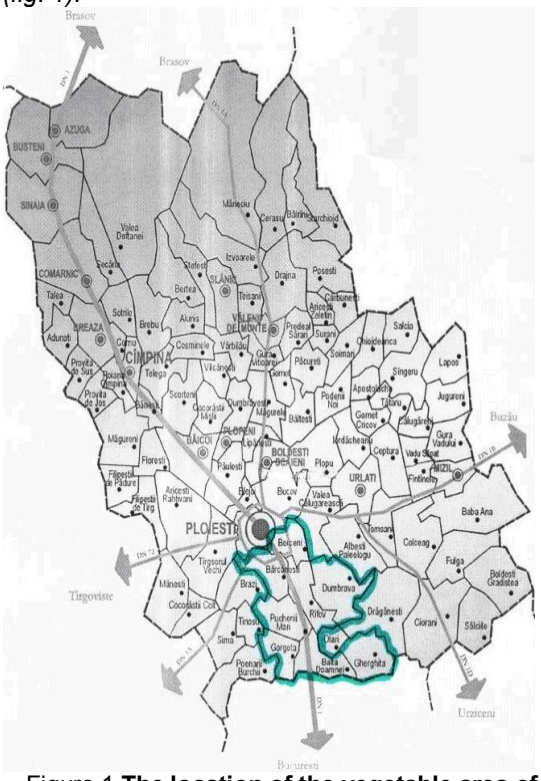

Figure 1 **The location of the vegetable area of Berceni-Bărcăneşti-Balta Doamnei, Prahova district**

RESULTS AND DISCUSSION

The necessity to optimize the structure of vegetable cultures derives from the complex and dynamic character of the production process in vegetable growing.

Knowing the land favourableness based on the grade of fertility and the economic evaluation, which are established for the plants that can be included in the structure of cultures, the specialists allow the quantification of productions per hectare in a different way depending on the types of soil.

The optimization of the structure of vegetable cultures ensures many possibilities for a rational organisation of the production, especially for an intensive exploitation of internal resources, out of which the arable land occupies the first place.

During the analysed period**,** the vegetable production has had a pronounced instability in the studied area. This phenomenon relates to the lack of performance of the vegetable growing farms, which is generated by the insufficient correlation between the main resources of production, such as *the land, the labour force and the operational capital*.

This fact explains also the insufficient efficiency of the vegetable production, which is mainly determined by the inadequate use of the arable land, the lack of technical and economic background of the new landowners, as compared to the requests of a modern, profitable vegetable growing, which is oriented to the market economy, the use of traditional technologies in the culture of plants with a higher consumption of manual work, a poor efficiency, an inefficient valuation of the vegetable production due to the numerous intermediary agents, the impossibility to get into local and regional markets because of the intermediary agents etc.

For the optimization of the structure of the cultivated surface with the main vegetable species **in the area of Berceni-Bărcăneşti-Balta Doamnei, Prahova district**, the authors have taken into account the economic estimation of the arable land for the main vegetable species, as well as the results of production and the economic-financial results.

The studied area (*the average of the period 2005-2008*), cultivated with vegetables, is lend itself of the category of arable use, which is classified in four quality classes: *very good, good, middle and poor* (*tab. 1*).

As we observe from the presented data, the land of middle quality holds the biggest value (50,1 %), followed by those of good quality (34,9 %), those of very good quality (8,8 %) and those of poor productivity (6,1 %).

Under the ecological aspect, the studied area corresponds to the main vegetable species. This also results from the average values of the grade of fertility, which present a small amplitude of variation *(65,6 - 70,1 AETA points)*.

The determination of the list of variables that will join in the economic-mathematic model, must take into account the necessity to ensure a correlation between the cultures, which are destined to consumption, and those for industrial processing.

Table 1

The average values of the grade of fertility by classes of favourableness of the arable land for vegetable cultures in the area of Berceni-Bărcăneşti-Balta Doamnei

Class of quality	Sur-face	Average values of the grade of fertility					
		Toma-toes	Cucum-bers	Onion	Peppers and eggplants	Cabba-ge	Other vege-tables
Very good (1)	61	91	91	90	91	90	90
Good (2)	241	79	79	79	79	78	78
Middle(3)	346	64	64	62	64	58	56
Poor (4)	42	40	39	39	40	39	39
Total	690	70	70	68,9	70,1	66,6	65,6

Source: Data processing after the Office of Pedological and Agrochemical Studies, Ploieşti

In addition, the techno-economic coefficients must differentiate based on the technologies of culture of the vegetable species, which are introduced in the optimization model (*tab. 2*)**.**

Table 2

List of unknown quantities and the size of techno-economic coefficients, used in the model of optimization

Vegetable species	Code of vria-bles	Techno-economic coefficients			
		Average production -kg/ha-	Costs of production per hectare - lei-	Total revenues per hectare - lei-	Gross profit per hectare - lei-
Early tomatoes	X_1	20000	12937	25600	12663
Summer-autumn tomatoes	X_2	23000	10828	21160	10332
Peppers	X_3	19000	13656	31540	17884
Eggplants	X_4	22000	10779	17600	6821
Early cabbage	X_5	23000	11941	22770	10829
Autumn cabbage	X_6	25000	10288	16250	5962
Dry onion	X_7	9500	7342	13395	6053
Garlic	X_8	8000	9098	22000	12902
Cucumbers	X_9	25000	8796	16250	7454
Carrots	X_{10}	9500	3978	6650	2672
Other vegetables	X_{11}	6000	12350	19800	7450

The main restrictions of the economic-mathematic model refer to the integral and intensive use of the arable land *(based on classes of quality),* the ensuring of a minimum alternation in crop rotation (so the species from the same botanical family must be cultivated once at four year, in the same field), the realization of a minimum quantity of production, which must be adequate to the minimum needs of consumption etc.

The authors have chosen two objective functions (the maximalization of gross profit and the minimization of costs of production) in view of the economic-mathematic model of optimization of the structure of vegetables on the main species, with the possibility to obtain two variants of the solution.

Because of the big number of restrictions and variables, the authors have chosen to apply **the linear programming method**, solved on computer by a specific informatics programme.

The economic-mathematic model comprises a single block and has in its structure the following elements: ***the variables with their techno-economic coefficients; the restrictions; the free terms; the objective functions.***

As a result of the resolution of the economic-mathematic model of optimization, the following solutions have been achieved (*tab. 3*):

Table 3

Structure of cultivated surfaces with vegetables, on species, by variants, in the vegetable area of Berceni-Bărcăneşti-Balta Doamnei, Prahova district

Code of variables	Vegetable species	V_0 Actual situation		V_1 Minimum costs		V_2 Maximum profit	
		ha	%	ha	%	ha	%
x_1	Early tomatoes	95	13,8	80	11,6	91	13,2
x_2	Summer-autumn tomatoes	155	22,5	130	18,8	160	23,2
x_3	Peppers	54	7,8	30	4,3	50	7,2
x_4	Eggplants	76	11,0	40	5,8	40	5,8
x_5	Early cabbage	19	2,8	16	3,3	28	4,1
x_6	Autumn cabbage	39	5,6	61	8,8	50	7,2
x_7	Dry onion	71	10,3	85	12,3	70	10,1
x_8	Garlic	23	3,3	22	3,2	22	3,2
x_9	Cucumbers	71	10,3	95	13,8	75	10,9
x_{10}	Carrots	40	5,8	42	6,1	15	2,2
x_{11}	Other vegetables	47	6,8	89	12,9	89	12,9
Total		690	100,0	690	100,0	690	100,0

Source: Solutions of the economic-mathematical model

The authors present comparatively the size of five synthetic indicators in view of certifying the choice of the second variant V_2 (*tab. 4, fig. 2 – 5*).

Table 5

The main techno-economic indicators of the vegetable crops per unit of surface, by variants of structure

Varia-bles	Average production per hectare – t/ha -	Costs of exploitation per hectare – mill. lei -	Total revenues per hectare - mill. lei -	Gross profit per hectare – mill. lei	Rate of gross profit - % -
V_0	16,10	16,31	20,27	3,96	24,28
V_1	17,72	10,26	19,06	8,80	85,77
V_2	18,29	10,73	20,22	9,49	88,44

Source: Personal calculations

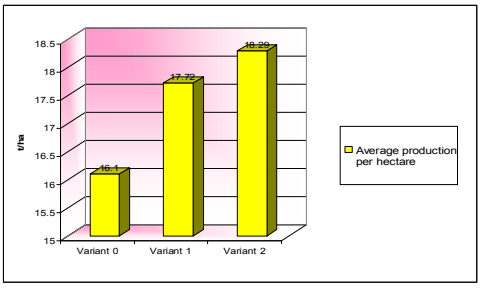

Figure 2 **Average production per hectare, by variants – vegetables total – t/ha**

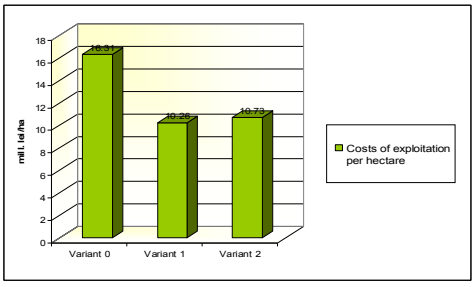

Figure 3 **Costs of exploitation per hectare, by variants–vegetables total–mill. lei/ha**

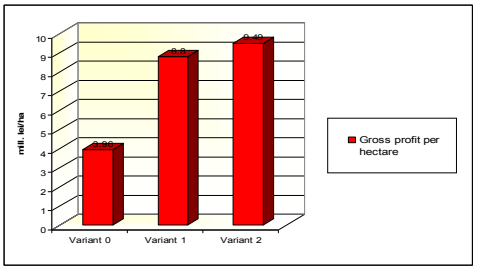

Figure 4 **Gross profit per hectare, by variants- vegetables total – mill. lei/ha**

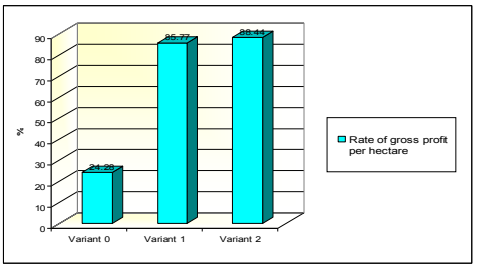

Figure 5 **Rate of gross profit, by variants - vegetables total - %**

CONCLUSIONS

1. In the process of optimization, the specialists can apply both classic and modern methods, based on informatics programmes, which are solved on computer. In practice, the linear programming is used especially.

2. The elaboration of the economic-mathematic model of optimization of the vegetable production has taken into account a series of logical stages, which have carried on as following:

- the grade of fertility of the arable land and its distribution on classes of quality;
- the properly elaboration of the economic-mathematic model (the determination of variables, restrictions, objective functions and the size of free terms);
- the resolution of the economic-mathematic model;
- the solutions analyse and the choice of optimal variant.

3. The two elaborated variants differentiate obviously as compared to the variant V0, by the following elements:

- the increase of the surfaces with summer-autumn tomatoes, early cabbage, autumn cabbage, cucumbers and other vegetable cultures in the case of the variant V_2, while in case of the variant V_1, the surfaces have increased for cucumbers, dry onion, autumn cabbage, carrots and other vegetable cultures. Concerning the other species, the surface has remained the same (in the case of garlic) or it has reduced significantly (in the case of early tomatoes, peppers, eggplants, early cabbage);
- concerning the elaborated variants, under the aspect of the average production per hectare, the surplus will be of 13,2 % in case of the variant V_1 and 16,2 % in case of the variant V_2;
- the costs of exploitation per hectare will decrease very much as compared to V_0 , respectively with 59 % (V_1) and with 52 % (V_2);
- the revenues per hectares will be fairly close as compared to the existent situation (V_0): they will represent 93,7 % in case of V_1, respectively 99,8 % in V_2;

- the gross profit per hectare, which represents the economic effect, will be obviously significant as compared to V_0 , so that it can register a surplus of 2,22 times in case of the variant V_1, while the surplus will register 2,4 times in V_2;
- under the aspect of relative profitableness, the biggest rate of profitableness will be registered in V_2 (88,44 %), respectively in V_1 (85,77 %), as compared to the existent situation (24,88 %).

4. Taking into account the results of the optimization, the authors recommend the variant V_2, which differentiate through the superiority of the analysed indicators, excepting the costs of exploitation per hectares, where it appears a difference of 4,58 %, as compared to V_1.

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