UNIVERSITY OF AGRICULTURAL SCIENCES AND VETERINARY MEDICINE „ION IONESCU DE LA BRAD" FROM IASI
FACULTY OF AGRICULTURE
DOMAIN: AGRONOMY
SPECIALIZATION: MANAGEMENT AND MARKETING IN AGRICULTURE

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DOCTORAL THESIS

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STUDIES CONCERNING PRODUCTION OPTIMIZATION TO THE MAIN FRUIT SPECIES FOR THE SOUTH COMPARTMENT OF SUCEAVA PLATEAU

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ABSTRACT

Culture trees in Romania is multi secular, testimony time are documents certifying the existence of vast lands with trees and beautiful Romanian grapes. Limited in the beginning just inside the royal gardens, monasteries and hermitages, following the First World War the culture extends occupying large areas, encouraging trade with fruit.

Unlike other agricultural products, fruit can be consumed without previous training in both human nutrition and other activities, but are suitable in processed form also.

The presence of nutritious substances in fruit, sugar and acid balance are beneficial considerations of food and organoleptic qualities that can not be seen in other agricultural products.

Studies undertaken so far show that the fruit can be considered as an important means of improvement of nutrition, essential in the composition of rations balanced by positive role in the normal vital functions of the body and ensure a state of permanent health.

Daily allowance of fruit body is different depending on the following factors: age, gender, the body's energy consumption given the nature of a person. Specialized statistical calculations show that the annual consumption of fruit falls within limits of 50 - 150 kg with an average of 100 kg fruits per capita.

This work addresses issues of optimizing fruit production in South section of the Suceava Plateau aiming knowledge requirements raised by fruit tree to identify ways of production factors best use of and the rationalization of Fruit culture techniques in this microzone of Moldova.

Literature indicates research in this area, but they have a general character to the whole country, they are not being adopted at geo-economic conditions existing in the counties of Iasi and Suceava, conditions that have special features for the South Section of the Suceava Plateau, which require detailed studies to solve them. Such complex studies on optimizing fruit production in the counties of Iasi and Suceava have been initiated so far.

Theoretical and practical work is aiming the application of the economic and technical solutions - obtained from the optimization process of fruit considered for the study of the Southern Section of the Suceava Plateau.

The South section of Suceava Plateau legally belongs to two administrative districts: the South of Suceava Plateau covering 23 communes with an area of 2029 hectares planted with trees, and western county of Iasi with a number of joint 19 having surface 1700 ha.

The zoning work undertaken during the past year 1976 has treated tangentially zoning fruit production, the last of its kind.

After 1990 new forms of ownership and production relations have changed the balance between production and natural conditions, which resulted in the change area of spread of fruit products. This requires the need to review regional distributions of fruit production in line with existing resources aimed at ensuring economic efficiency of this branch.

Research in work led to the identification of two basin orchards in the area studied. First, in Suceava county, concentrated in the city Fălticeni and the second in the western county of Iasi with the concentration point city Harlau.

Within this two basin were established eight micro fruit orchards: Falticeni, Liteni Depression, Valley of Suceava, Culoarul Siret the first basin, and Motca, Pascani, Lespezi, Harlau in the second basin.

Optimization of fruit production in the volume of work which has sought to share the following:

- Optimization of fruit plantations by species separately for the two areals Fălticeni fruit and Harlau;

- Optimizing the varieties of apple fruit plantations;

- Optimization of two Technology links: The system of planting trees on slopes and dosage of chemical fertilizers;

- Optimize recovery for fruit production.

To optimize the structure of species and varieties of fruit plantations have used economic and mathematical modeling that the linear programming method.

Objective functions of optimization mathematical model of fruit plantations species followed to maximize profit and minimize total production costs. After solving the mathematical model based on the criterion of maximizing the gross profit resulted in a new structure that differs from currently existing structure. The apple has a weight of 75% lower, by 9.4% compared to the baseline ($V_{0)}$. The increased share of cherry is insignificant, and plum remained in the intervals.

Starting from the same data as in previous version, but with a different optimization criterion, namely minimization of total production costs, has led to a new structure of production, different from previous version.

For comparison of the three variants that where the total surface current areas under orchards (160 ha) optimized structure percentages apply the criterion "maximum profit" resulting in intermediate variant V_0^1 , an increase of gross profit 34,600 Lei who provided operating costs are lower to 271.500 lei.

If the percentages were applied to optimized structure based on "minimum operating expenses" are resulting total values of other economic indicators. Compared with the original version, the term variant V_0^2 expenditure less total operating with 348,600 lei and gross profit is higher with 28,900 lei.

Comparing the three structure variants for the year 2020 designed so that if variant V_1, which was pursued profit maximization, and if V_2 version which had the criterion of optimization rationalizing expenditure, total value indices have higher values of variant which were used to structure the current percentage.

In the case of total gross profit margin, the highest level recorded in variant V_1 respectively 1.719,5 thousand lei, above the 376.6 thousand lei. This version is the total gross profit for variant V_2 with 318.1 thousand lei.

The second criterion optimization - minimizing total production costs, shows the lowest level of this indicator variant V_2 , total expenditures for this variant is 6.583,6 mii lei, inferior with 875,7 mii lei than the varianta V_0 and with 115,5 mii lei than the varianta V_1 .

We appreciate that the optimization process can create structures of the area planted with trees whose efficiency is superior to existing structures.

To optimize the structure of fruit plantations in the catchments Fruit Hîrlău use the same methodology as in the previous case.

The new optimized structure based on "maximum gross profit" the apple share reduced from 67,4% to currently 56%. It grew up in exchange the nuts share in that cherry has 16% to 11.8% in variant V_0, and cherries by 12% compared to 9.4%.

Note that in variant 1 occurred in the structure Walnut with a significant percentage of 6%, equal to that of the plum that fell by two percent. Apricots and peaches have reduced areas (as a share) first with 2,5% and the latter by 0,5%. Other fruit species have insignificant share.

If the criterion "Low operating costs' share of Apple is 53% to 3% lower that the previous optimized version and 14,4% lower than the original version.

Other differences relate to areas filled with apricot and peach, which, compared to the previous version showed slight increase. Other species share the rest remained unchanged.

Analyzing the variations in structure covering the year 2020 to Hîrlău fruit basin area 500 ha, is clear that if variant V_1, in which it was intended for profit maximization and the variant V_2 was intended optimization criteria streamlining operating costs, total value indicators were higher values on which version they used the percentages of structures at this time.

To achieve economic and mathematical model of optimization of the production of apple varieties were undertaken studies for apple varieties most representative of the fruit basin Fălticeni - Rădăşeni, to be planted in an orchard-type intensive. In their actual choice were taken into account the biological characteristics of varieties adapted to the soil and climate in Fălticeni, etc. to ensure pollination factor. Assortment of apple varieties is represented by: Golden spur, Jonathan, Falticeni, Rădăşeni, Kalterer B and Wagener plus some local varieties neameliorate.

Following the optimization process has resulted in a new structure different from that. Between the two structures are important differences. The current structure stands in first place with a variety Jonathan 40% followed by variety Goden Spurwith 30. Other varieties Falticeni Rădăşeni, Kalterer B, Wagener and other varieties have each 5% of the total.

If optimized structure is taken into account it stood in first place with a variety Idared 40%, variety with the highest level of productivity and generating higher economic indicators.

Ranked second fall variety Golden Spur a rate of 30%, third place was occupied by Jonathan variety with only 16%. Percentage difference of this sort, to the current version is 24%.

Optimized variant present to all indicators higher levels in comparison with current version of the structure. Thus, the total production structure for optimized version, is 256 tones more than in the current version. All high turnovers is that the optimized version is increased by 156,7 thousand lei compared to the current and total profit is also higher by 64,8 thousand lei.

Research objectives are aimed to establish the best methods of planning and planting of trees, specifically the apple species, allowing high recovery of land slope and soil conservation. Golden spur, Idared and Jonathan varieties were used. The trees were planted at a distance of 4x2 m (1250pomi/ha). Research has pursued technology three variants namely:

- Version - A - easy leveling and planting trees along the line of greatest slope;
- Variant - B - easy leveling and planting trees on contours;
- Variant - C - land in terraces with three rows of trees.

Analyzing the effect of different methods of planning and planting of trees in terms of fruit production can be seen that it is different in the three species taken in the study. Thus the variety Golden Spuroption B gives the best results (28.3 t / ha), followed by varieties Idared and Jonathan, who found the largest production of the same variant (B), with 27,4 t / ha respectively 25,3 t / ha.

Additional work to prepare the ground ca be justified economically at the variety Golden spur. Production results give first variant B (easy leveling and planting trees on contours), followed

by variations of C and A. It is clear that the economic efficiency of three methods of land use land for planting trees on the first situiază variety Golden spur, followed by Idared and Jonathan.

To determine rational dosage of fertilizers, the SCDP Fălticeni to conduct a study under way at an apple orchard with variety Golden spur.

They used data from experiments of the experience that the results were presented only in the technical. Our research question and the calculation of economic efficiency and energy.

Variations experiment were:

- V_1 - unfertilized (mt);
- V_2 – N_{70} P_{50} K_{60} kg/ha = 2.329 kwh/ha; -;
- V_3 – N_{70} P_{100} K_0 kg/ha = 2.364 kwh/ha; - ;
- V_4 – N_{70} P_{50} K_{120} kg/ha = 2.576 kwh/ha; - ;
- V_5 – N_{70} P_{100} K_{50} kg/ha = 2.611 kwh/ha; -;
- V_6 – N_{140} P_{50} K_0 kg/ha = 3.880 kwh/ha; - ;
- V_7 – N_{140} P_{50} K_{60} kg/ha = 4.127 kwh/ha; - ;
- V_8 – N_{140} P_{100} K_{120} kg/ha = 4.658 kwh/ha; -;

Influence of chemical fertilizers on fruit production obtained show that the surplus energy produced the highest compared to the V_1 (control), was recorded at V_5 (N_{70} P_{100} K_{50}) by 3359 kwh / ha and the V_7 (N_{140} P_{50} K_{60}), has the highest energy loss, of - 2354 kwh / ha.

Energy balance increased energy produced at higher than control (V_1) was recorded at V_5 (N_{70} P_{100} K_{50}) is 747 kWh / ha, which supply chemical fertilizers was achieved at a cost of 767 million Euro / ha and the V_8 (N_{140} P_{100} K_{120}) recorded a negative energy balance - 3233 kwh / ha at a cost of chemical fertilizer supply 1.005 million lei / ha. It also proved to be effective options 3 and 4 in which there was a positive energy balance respectively 249 and 116 kWh / ha.

The investigations conducted show that the fruit produced per unit area and use of chemical fertilizers (NPK) both expressed as energy kwh / ha, a close correlation between the dose of chemical fertilizers and increase the production obtained by variant V_5 .

To optimize recovery of apple production were designed five different fruit recovery, as follows:

V_0 - turning all of the apples to different recipients immediately after harvesting the fruit (version control).

V_1 - recovery in two stages:

- Half the production will capitalize immediately after harvest;
- Half the production will exploit during 20.VIII - 31.XII;

V_2 - turning in two stages:

- Half of production immediately after harvest;

. - Half of production, from 01.I - 31.III the following year.

V_3 - recovery in three stages:

- Half of production immediately after harvest;
- Produtos quarter of the period 01.I - 31.III next year;

. - Quarter production during 01.IV. - 31.V next year.

V_4 - turning in two stages:

- Half the time 01.I - 31.III;
- Half the time 01.IV - 31.V;

The highest economic efficiency is achieved in version V_4. The version on which derives the bulk of total gross profit, of 2910.3 thousand lei, up from 199 thousand lei in variant V_0 - version control, representing an increase of more than 2711.3 thousand lei. In this variation and the profit rate is higher than all other variants with 264,8%, other variants having values between 24,4% for variant V_0 and 128,6% in variant V_3. Due to prolonged storage, V_4 is the option that has the highest losses from collection to recovery (339 tonnes). These losses are offset by higher recovery prices to those charged in the case of recovery immediately after harvest. These prices differ from the period of recovery (01.I - 31.III and 01.IV - 31.V) are on average 3-4 times higher than those of the harvest.

In conclusion we can state that a combination of forms of recovery (immediately after harvest or after a period of storage) have clear economic benefits, both in terms of providing an additional income and in improving the supply of fresh fruit in the state of internal market and an export target.