

Study regarding management of technological systems in agriculture

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ABSTRACT

Initiation of agricultural activities generates preliminary approaches of multiple aspects that characterize them. The content of such problems and their resolution aim, first, knowledge of the market of agricultural products, determining of the production structure, in accordance with ecological potential and, in particular, for maintaining its, choice of technological systems, being known their variety and the influence, ultimately, on achieving a certain level of performance, preferable economical and ecological. Approach is not at all simple, so requires substantial managerial knowledge connected to reality, especially as it is known propagated impact of management in achieving desired goals. Based on the foregoing, this paper aimed the practical elements of organizing a multifunctional farms, focusing on technology, which will lead to different results to the level of farm and environment

Keywords: *agricultural farm, environment, technological system, management*

INTRODUCTION

Decisions on the establishment of farms are complex, given that agriculture itself is subject to numerous restrictions. Perhaps most important, recognized, moreover, in the literature today are the ecological, which can influence decisions in different directions at senior management level. It is evident that nature has become a determinant for any entrepreneur who seeks a certain longevity of its business, and that is understandable, cannot ignore. In any activity to be launched, the aim is to achieve economic results performance, allowing operation or, more development. It therefore requires recognition of the importance of the economic factor, it diverting, in many cases, decisions at managerial organizational structure. Market analysis is a starting point for the correct evaluation of potential farms that decisions are based on the structure of production. Whether recourse to diversification or specialization, which will take is the sum of the results of the analyzed factors.

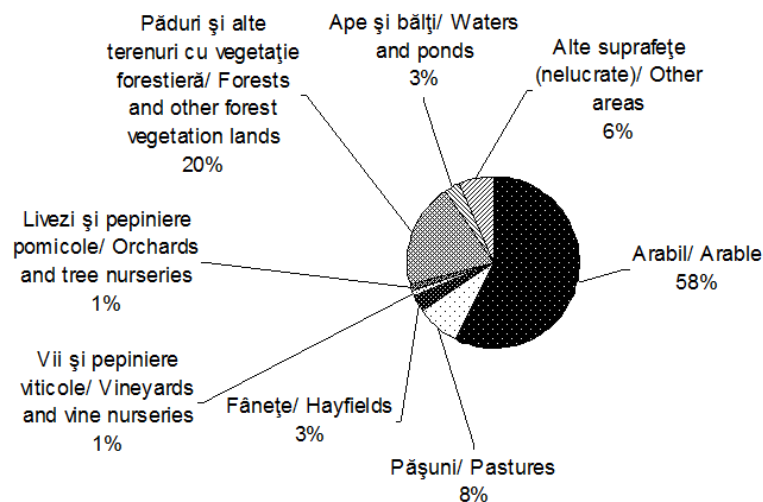
With certain intensity, there is technology practiced. If we consider the modern farms, as in this case, there is a need of applying ecological superior technological structures that highlight the existing natural resources and ensure the quality of certain openness to the market, which will become the holding functional and secure premises for sustainable development. Moreover, there are measures to support and implement the modern technologies in agriculture in the NRDP that

can help boost its performance, thus farm. The eligibility conditions, farms can benefit from a series of investments to adapt to organic farming, purchase of machinery and new equipment, the establishment of plantations etc. The structure of beneficiaries is diverse and has different categories, it comprises: authorized person (established by law 300/2004, with subsequent amendments or established in the law 44/16/2008) individual enterprises (established under the Emergency Ordinance no. 44/16 2008) family business (law no. 44/16 April 2008), family associations and agricultural companies (Law 36/1991), agricultural company stock (Law 31/1990), company companies (Law 31/1990), privately owned company (Law no.15/1990), producer groups (recognized under Law 338/2005), agricultural cooperatives (Law 566/2004). Application of advanced technology systems make sustainable farm, of course under the "protection" for appropriate management.

Materials and methods

There are entrepreneurs who tend to initiate and develop new activities in line not only with getting immediate profit, but also with efficient use of resources in the ecological sense. In South Muntenia region exist optimal conditions for vegetal farms, thus allowing the practice of various crops (cereal crops, pulses, fodder), whose combination results in the possibility of a production structure for the market.

Eco - economic space. The South - Muntenia Region is situated in the south of Romania. In this region are predominant landforms with low altitude (plains and meadows 70.7 % respectively in the central and eastern Romanian Plain), which are occupied by agricultural plant species, forest and ruderal. The landscape is varied and includes 36 types and soil associations. Young soils are prevalent in the chernozem class (molisoils → ten types and associations) and the advanced, well-developed Luvisols class (clay-alluvial → eight types and associations), both shows great fertility and latitudinal distribution in the plain, succeeding from south to north in the form of strips. Soil types found in South Muntenia region as natural factors, offer vegetable agriculture development.



Sursa: Anuarul Atatic al Romaniei

Fig. 1 – Structure of agricultural and nonagricultural land

As a result of the foregoing, the land of the South Muntenia Region (fig. 1, 2011) is an important component with economic value - arable land, which is the main and most trusted wealth. In the Figures 2 and 3 (Statistical Yearbook of Romania) we can notice that the vegetal production is preponderant, South Muntenia Region being supplier for grain and other categories of own livestock feed, and surrounding regions with the most developed animal. These products are beyond the average production per person / country.

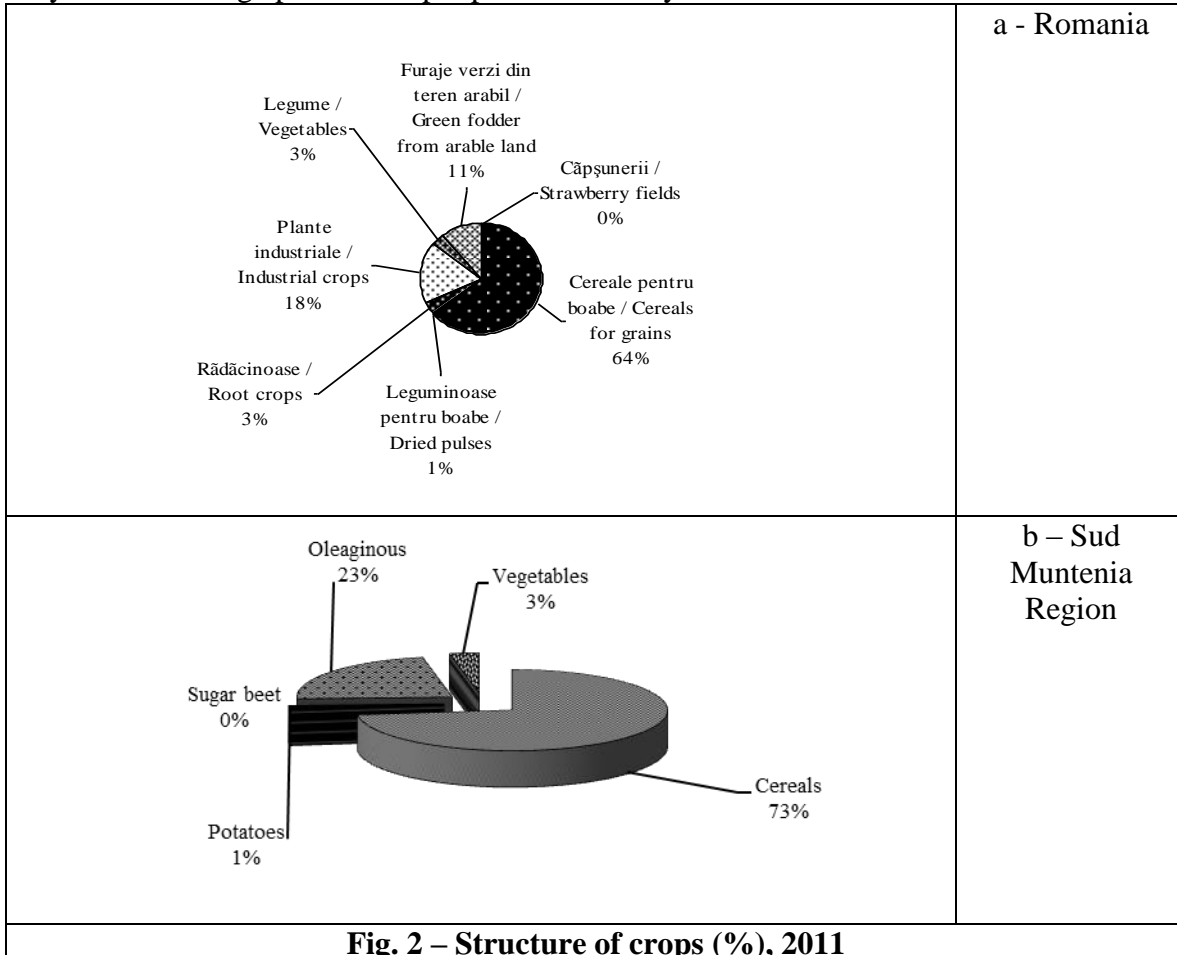


Fig. 2 – Structure of crops (%), 2011

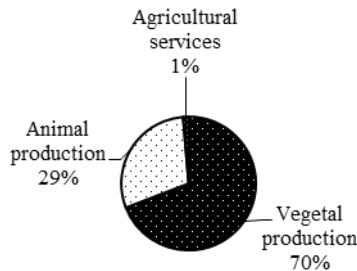


Fig. 3 – Production of agricultural branch in Sud Muntenia Region (%), 2011

Among cereal grains, wheat and maize hold the highest share, which confirm the grain character of the counties bordering the Danube. In fact, grains occupy the largest area in the world. Cofas Elena and Soare Elena (2013) noted that according to data from FAO, the world's arable land, estimated at 1.4 to 1.6 billion hectares, over half is occupied by cereals. But there are products that are not productive in this area due to natural conditions and lack of irrigation systems. In Figure 4 are presented the farms that use irrigation water (27 565 farms in the South Region), most of which hold up to 5 ha areas, leading to vegetable structures.

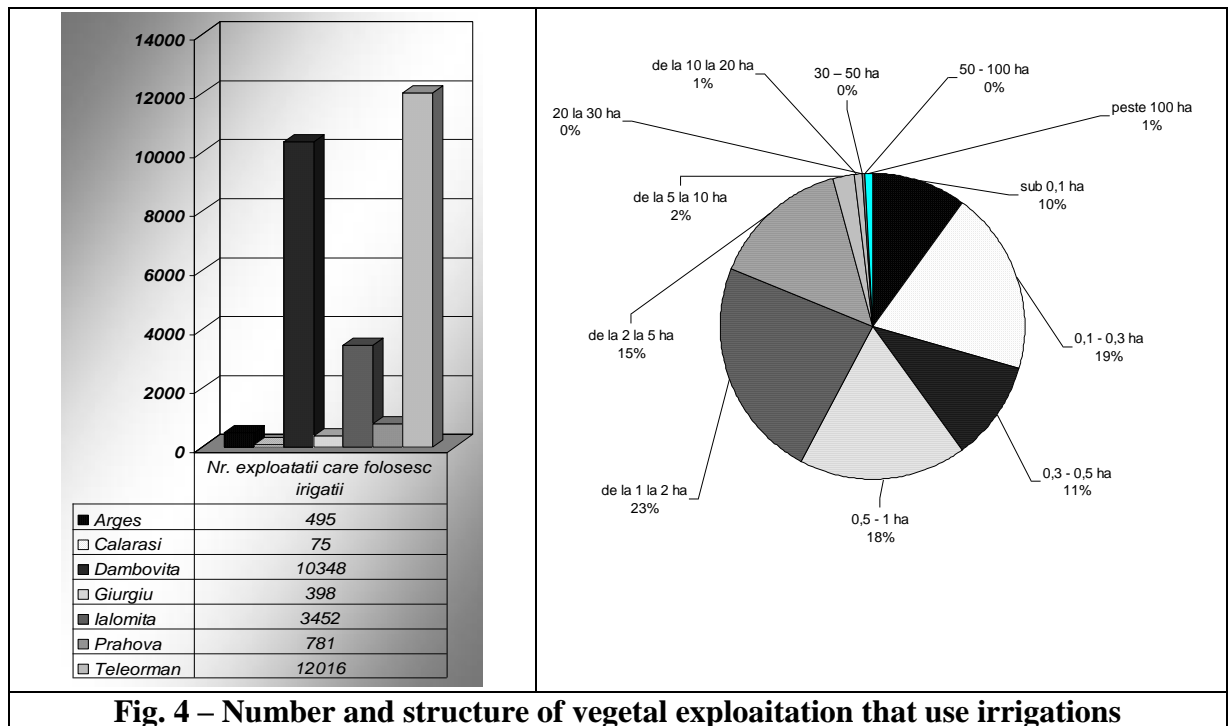


Fig. 4 – Number and structure of vegetal exploitation that use irrigations

The paper is based on representative studies in research literature with reference to the zone, vegetable technological systems, farm management in agriculture, agricultural market. It has been recourse to information from sources in research institutes and agricultural stations. Also, we used the information necessary for the economic and technological forecasting.

Results and Discussion

This paper aims to design production and economic activity of a farm in the south region. The holding is based on the Law 36/1991, the law of agricultural companies and other forms of association in agriculture, which allows manifestation of entrepreneurship and investment. The farm has an area of 240 ha, with a production structure specific to the zone (cereal crops), but due to the low level of investment, weak market oriented. Crops, irrigated formerly practiced in present conditions are undersized in terms of production. Moreover, events and escalation of climate change disfavored most productive plant species.

What is aimed at farm level is to create the necessary technological and managerial framework for sustainable operation. Also, the effort to obtain good results in ecological joins practicing structure of production including branches with high adaptability to the "state " of the

environment and responding to changes in the consumption pattern of the population (R. Voicu, Bran M., Dobre I., Stephen M., 2008).

The functioning of the agricultural exploitation requires the holders thereof to significant changes in level of technology and production structure, aiming not only high economic results, but also to create the ecological framework and enable its sustainability. Changes occur with the purchase of a plant watering, fully automated, generating new projections on farm land redevelopment, and practicing a new structure of production.

FUNDS for farms. In order to modernize the farm, the farmer can access Measure 121 "Modernization of agricultural holdings". The maximum eligible project shall not exceed 2,000,000 Euro, share of non-refundable support will be 50 % and will not exceed 1,000,000 Euro. For these sectors, grant support may be increased by:

- 5% for investments made by young farmers under 40 years old at the time of submission of the application, based on the provisions of the Accession Treaty (Annex VIII: Rural Development, Section II: Special provisions for investment support);
- 10% for investments made by farmers in the areas referred to in art. 36 (a) (i), (ii), (iii) of Regulation (EC) No 1698/2005;

All through measure 121 is encouraged and organic production, allocation of funds and by getting a higher score on selection for this type of activity.

For protection curtains (forestation), farmer can access measure 221 "First forestation of agricultural land" Public support (Community and national) provided under this measure shall not exceed 70% of eligible costs for plantation establishment.

Farm organization. Organizational activity at land holding aimed, first, decisions on the structure of production, the crop to be charged, taking into account the possibility of intercalation vegetable branches afforestation and beekeeping activities, from environmental compliance and economic criteria. When choosing crops were added on the availability holding financial, labor or related to the training manager. Approach and joined activity location use categories (the arable being predominant) and organization of crop rotation (Fig. 5).

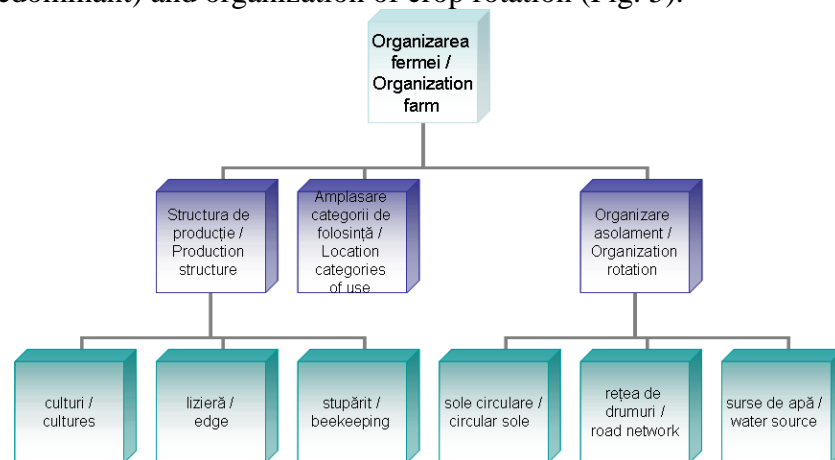


Fig. 5 - Synthetic scheme of the main organizational and technological activities of farm

Organizing crop rotation area includes various elements, such as dividing the territory into sole crop rotation and coordinated placement of fields , mapping the road network

operational (field , secondary) location of water sources (Voicu R. , Dobre I., 2003). Moreover , crop rotation promotes efficient use of environmental resources , application of appropriate technologies , reduce the effects of pests and diseases , which will be sent on the level of total production costs .

Structure of production. Cultures, namely corn, sunflower, soybean and alfalfa, the jumping field, are practiced in the open and under two types of production systems, conventional and organic. Structure, meaning the total area of farm crops and proportions of them settled by resorting to specific methods of optimization processes of branches. Using the method variants, and attempts have been made to combine successive cultures in order to obtain the most advantageous embodiment. We took into account indicators and economic production of each crop (production per hectare, the average expenditure per hectare, revenue and profit per hectare), any modification of the surface resulting culture obviously different results. Technological reasons, environmental and economic, crop them back after our calculations, 77.10 % of the total area of the farm, 185.04 hectares, respectively, and 22.9% left the area for afforestation and access roads (22.40 % and 0.5 %).

Organizing crop rotation. Once chosen in the structure arable crops are necessary to divide the distribution of cultures on soles. In terms of the number of soles, we opted for the formation of six sole equal sizes (surface of the sole of 30.84 hectares). Given the importance of crop sequence on sole, annually 3 soles will be occupied by maize (tolerant monoculture), sunflower, soybean and alfalfa being distributed on one field (Scheme 1).

| Year | Sola | | | | | |
|-------|-----------|-----------|-----------|-----------|-----------|-----------|
| | I | II | III | IV | V | VI |
| I | maize | | | soy | sunflower | alfalfa |
| II | soy | sunflower | maize | | | |
| III | sunflower | soy | porumb | | | |
| IV | maize | | soy | sunflower | maize | |
| V | soy | maize | | | alfalfa | sunflower |
| VI | maize | sunflower | maize | | | soy |
| VII | maize | | sunflower | soy | | maize |
| VIII | sunflower | maize | | | | soy |
| | | | | alfalfa | | |
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Scheme 1 – Crop sequence on sole¹ (field grubbing at 4 years)

Water source. Providing the necessary water for irrigation can be achieved by surface network channels or resorting to groundwater reserves. Irrigation is make with pivot installation, the changes of the position of wetting is performed through towing of installation from a sole to another.

¹ Observations. For nine years ... crop rotation will be the same criteria (suitable monoculture corn, sunflower returns after five years; soy, being legumes in rotation with sunflower and corn).

Organic farming is the most restrictive in terms of environmental impact. Responsibilities for maintaining the ecological balance responsibilities, primarily farms. They must address specific ecological system, which, relate to:

- Respecting the “conversion period ”.
- Appropriate crop rotations for efficient use of farm resources (cycle 6 or 12 years because the soil is not damaged - monocultures are prohibited).
- In areas with moisture deficit, practice coverings and mechanical work (in small numbers) runs vertically (without turning the furrow).
- Limiting the use of synthetic chemicals (pesticides, fertilizers, animal antibiotics, food additives, etc.).
- Prohibit the use of GMOs.
- Local resources (manure for fertilization).
- Identification and use of plant resistance to pests and diseases and adapted to local conditions.
- Establishment of hedgerows (skirts) to improve landscape value along with the overall improvement of environmental conditions, etc.

SCENARIOS USED FOR FARM. Spatial land farm field – Holding seed or green?!

Scenario 1A Seed production

Criteria: conventional technology, irrigation system

Area: 1 hectar

| Indicators | UM | Maize | Sunflower | Soybean |
|--------------------|--------|----------|-----------|---------|
| Average production | kg/ha | 4000 | 1000 | 2000 |
| Total expenditures | lei/ha | 120000.0 | 66000.0 | 23000.0 |
| | E/ha | 26666.7 | 14666.7 | 5111.1 |
| Cost of production | lei/kg | 30.0 | 66.0 | 11.5 |
| | E/kg | 6.66 | 14.66 | 2.55 |
| Total incomes | lei/ha | 128000.0 | 69000.0 | 26000.0 |
| | E/ha | 28444.4 | 15333.3 | 5777.8 |
| Price | lei/kg | 32.0 | 69.0 | 13.0 |
| | E/kg | 7.11 | 15.33 | 2.88 |
| Profit/kg | lei/kg | 2.0 | 3.0 | 1.5 |
| | E/kg | 0.45 | 0.66 | 0.33 |
| Total profit | lei/ha | 8000.0 | 3000.0 | 3000.0 |
| | E/ha | 1777.8 | 13500.0 | 13500.0 |
| Rate of profit | % | 6.66 | 4.54 | 13.04 |

In this variant, we noted that efficiency is low. The main issue is prices on the unit of product that are smaller than, for example, some from ecological system.

Scenario 1B Seed production

Criteria: ecological technology, irrigation system

Area: 1 hectar

| Indicators | UM | Maize | Sunflower | Soybean |
|--------------------|--------|----------|-----------|---------|
| Average production | kg/ha | 2500 | 600 | 1500 |
| Total expenditures | lei/ha | 112500.0 | 54000.0 | 27000.0 |

| | | | | |
|--------------------|--------|----------|---------|---------|
| | E/ha | 25000.0 | 12000.0 | 6000.0 |
| Cost of production | lei/kg | 45.0 | 90.0 | 18.0 |
| | E/kg | 10.0 | 20.0 | 4.0 |
| Total incomes | lei/ha | 120000.0 | 57000.0 | 33000.0 |
| | E/ha | 26666.7 | 12666.7 | 7333.4 |
| Price | lei/kg | 48.0 | 95.0 | 22.0 |
| | E/kg | 10.66 | 21.11 | 4.88 |
| Profit/kg | lei/kg | 3.0 | 5.0 | 4.0 |
| | E/kg | 0.66 | 1.11 | 0.88 |
| Total profit | lei/ha | 7500.0 | 3000.0 | 6000.0 |
| | E/ha | 1666.7 | 13500.0 | 1333.3 |
| Rate of profit | % | 7.55 | 5.55 | 22.22 |

There are more considerations which can be into account, because implies many economics elements. We consider that every economic indicator and its change contribute to efficiency of farm. Anyway, soybean is a good choice, its not implies too much expenditures, but offers best results. All the crops are in respect of crops rotation, what means, overall, maintain of sustainability of farm. From economic point of view, the best efficiency is 1B.

Scenario 2A Production for consumption

Criteria:Conventional technology, irrigation system

Area: 1 hectar

| Indicators | UM | Maize | Sunflower | Soybean |
|--------------------|-----------|--------------|------------------|----------------|
| Average production | kg/ha | 11000 | 2200 | 3200 |
| Total expenditures | lei/ha | 3500.0 | 3960.0 | 4480.0 |
| | E/ha | 777.8 | 880.0 | 995.5 |
| Cost of production | lei/kg | 0.32 | 1.8 | 1.4 |
| | E/kg | 0.07 | 0.4 | 0.31 |
| Price | lei/kg | 0.51 | 2.1 | 1.9 |
| | E/kg | 0.11 | 0.47 | 0.42 |
| Total incomes | lei/ha | 5610.0 | 4620.0 | 6080.0 |
| | E/ha | 1246.7 | 1026.7 | 1351.11 |
| Total profit | lei/ha | 2110.0 | 660.0 | 1600.0 |
| | E/ha | 468.88 | 146.7 | 355.6 |
| Rate of profit | % | 60.28 | 16.66 | 35.71 |

As we observed the most efficient is maize, on the one hand because of the high production in comparison with the other crops, and one the other hand for lowest cost of production. The rate of profit is, also, highest. Therefore, this variant can provides a certain economic stability of the farm level.

Scenario 2B Production for consumption

Criteria:Ecological technology, irrigation system

Area: 1 hectar

| Indicators | UM | Maize | Sunflower | Soybean |
|-------------------|-----------|--------------|------------------|----------------|
| Average | kg/ha | 5000 | 1200 | 2000 |

| | | | | |
|----------------|--------|--------|--------|--------|
| production | | | | |
| Total | lei/ha | 4200.0 | 3000.0 | 6000.0 |
| expenditures | E/ha | 933.3 | 660.0 | 1333.3 |
| Cost of | lei/kg | 0.84 | 2.5 | 3.0 |
| production | E/kg | 0.18 | 0.55 | 0.66 |
| Price | lei/kg | 1.1 | 2.9 | 3.3 |
| | E/kg | 0.24 | 0.64 | 0.73 |
| Total incomes | lei/ha | 5500.0 | 3480.0 | 6600.0 |
| | E/ha | 1222.2 | 773.3 | 1466.7 |
| Total profit | lei/ha | 1300.0 | 480.0 | 600.0 |
| | E/ha | 288.8 | 106.7 | 133.3 |
| Rate of profit | % | 30.95 | 16.00 | 10.0 |

Indeed, the ecological system secures not only production and area, but also foods safety. Even if the level of profit is not very high, the prominent of this kind of system leads to sustainability. .

CONCLUSIONS

- The South Muntenia Region has an remarkable potential for development of agriculture.
- There are many categories of use (arable, vineyard, pastures, orchards, forests) that can lead to development of significant activities.
- Agricultural society presented follow to be extend, due the its potential.
- Therefor, our proposition is to increase the area from 240 hectares to 480 hectares. In this way, ensure complete using of installation for irrigation.

REFERENCES

1. Biolan, I., Șerbu, I., Șovăială, Gh., Florica, Mardare, 2010, *Tehnici și tehnologii de fertirigare a culturilor agricole*, Ed. AGIR, București, pg. 99 – 100 și 157 – 159
2. Bran, Mariana, 2012, *Cercetări privind Dimensiunea eco-economică a biodiversității vegetale din Regiunea de dezvoltare Sud Muntenia, în condițiile schimbărilor climatice și de ecotehnică, în concordanță cu dezvoltarea durabilă*, Lucrare de cercetare științifică pentru finalizarea programului postdoctoral, Academia Română - I.N.C.E.
3. Cofas, Elena, Soare, Elena, 2013, *Study on grain market*, In the Scientific Papers Series „Management , Economic Engineering in Agriculture and Rural Development" Vol. 13, Issue 2
4. Ion, Raluca, Andreea, 2011, *Monitoring Sustainable Agricultural Development in Romania*, In Review of International Comparative Management, Volume 12, Issue 3, pg. 940 – 947.
5. Voicu, R., Mariana, Bran, Iuliana, Dobre, Marcela Stefan, 2008, *The agriculture development in accordance with the environment*, Conferinta internationala Performanta ecologica intr-o economie competitiva, ASE, Bucuresti.
6. <http://www.icpa.ro/proiecte/TACME/Raport%20etapa%20I.pdf>