CONSIDERATION ON THE HAZEL SPECIES CULTIVATION POTENTIAL IN ORDER TO OBTAIN TRUFFLES IN THE MOLDOVA AREA

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Abstract

Truffle plantation are traditional crops in countries such as France, Italy and Spain, but also have started to be considered as potential sources of revenue in our country, with the specification that there is a limited dendrological assortment for obtaining the truffles, composed of nut trees, oak, hornbeam, lime and beech species. The survey, conducted at the Livezi County Forest from Bacau, has demonstrated the fact that none of the species listed above can provide the two advantages of the setting up of a hazel culture (*Corylus avellana var. Tonda gentile romana*), namely: earlier production entry, in average with 5-6 years, compared to the tree species and the obtaining of the two main productions (truffles and hazelnuts). Mycorrhized hazel plants have proven that they can produce truffles from the age of 6÷7 years, depending on the edaphic and climatic factors. Hazelnuts production starts in the 4th year when the amount is estimated to be 2÷3 kg/ plant, about 1÷2 tons/ha, but after the plants reach maturity, production of hazelnuts can increase to 10÷15 kg/plant, which means a quantity of approximately 7-10 tonnes of nuts/ha. Truffle production begins in the 8th year and is estimated at an average amount of 50 kg/ha. The investment return can be achieved in the seventh year culture and the cumulative net profit from the exploitation of the hazel truffle plantation, over a period of 13 years, exceeds 920.000 lei.

Key words: truffle, the hazel, truffle plantation

The paper presents an experience regarding the technology of cultivation of hazel tree (*Corylus avellana var. Tonda gentile romana*) in order to harvest truffles in the Livezi nursery, from Bacău county, aiming in highlighting the potential of this crop for the Moldova area. Truffle plantations are already a reality in countries with tradition in the cultivation of truffles (France, Italy, Spain, Australia, etc), but have started to become promising in various regions (Dincă, Dincă, 2014). Worldwide, there are approximately 100 species that are part of the *Tuber* family,while in Europe there are about 30 species of truffles, but not all interest gourmet. In our country the only species of truffles that can be successfully cultivated in the present is the *Tuber aestivum/uncinatum* (black truffle or summer truffle), which has an aromatic smell, not too spicy and is harvested from mid May until to late august (Chira *et al*, 2012). For truffle crops there are considered appropriate calcareous, permeable, neutral to weak alkaline, rich in organic substances, permeable and with moderate humidity soils (Cociu, 2006).

MATERIAL AND METHOD

There have been used 3 schemes of planting in the establishment of the plantation of hazel (*Corylus avellana* var. *Tonda gentile romana*), depending on the culture system (organic or conventional), namely: 5/5 m (400 plants/ha) in conventional system; 5/6 m (333 plants/ha) in ecological system and 6/6 m (277 plants/ha) also in ecological system.

The experiment has proposed to benefit from the advantages of the culture of the hazelnut, namely faster entry in production, with an average of 5-6 years compared to the tree species, and to obtain two products for recouping (truffle and hazelnuts).

Thus, it was found that the michorized plants hazel can produce truffles from the age of 6-7 years, depending on climatic factors and the structure of the soil, when it can begin harvesting truffles quantities of the order of kilograms from the surface of a hectare.

The culture was established in the year 2002 on an initial surface of 4.3 ha, being carried out periodic observations regarding the evolution, productivity and profitability of the truffle-hazel culture.

This crop profitability calculations have been carried out on one ha representative control surface, aiming to both the main output of truffles and the production of secondary fruits (hazelnuts).

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RESULTS AND DISCUSSION

The truffle plantation on hazel from the Livezi Forest District required a land in reduced slope, mechanised, deep and well drained. The hazelnut tree is cultivated without problems after himself because it is not influenced by the phenomenon of soil fatigue (Botez *et al* ,1984).

Drainage is one of the very important works for the success of the hazel culture. That is why after the basic fertilization (70÷90 t/ha of manure equivalent in the active substance, 300 kg of potassium sulphate and 550 kg superphosphate per hectare) the land has been scarified with special machines at a depth of 35÷45 cm, through two passes perpendicular to each other, with two-three months before planting, achieving the in-depth loosening, aeration and favoring water movement in the soil. It attended tillage with rotary harrow, aiming to break up and to level the surface of the land, being thus prepared for the planting of michorized seedlings.

Before the seedlings planting, the land was picketed with a geodetic GPS, according to the schemes of planting, as outlined above.

The experiment pursued the modalities of the hazel plants conducting, using for truffle culture the following forms of management:single stem, pot, hedge fruit and shrub.

Single stem presents the following advantages: reduces the vigor of the plant, allows the suckers suppression, the stem growth is more balanced, and fruition is earlier. These plants conducted this way are very well lit and give the production more large and constant, also allowing the mechani-zation of the works. As a rule hazelnut form only the skeletal branches of the order I and II and on which are branches of semischelet and rod. Although the young hazel shoots grow quite vigorously (60÷80 cm or more) they do not exhibit anticipated shoots. Moreover, the polarity is poorly expressed, as is the hazel it's not a question of freeing the peaks (Grădinariu, 2002).

The conducting of hazel, in the form of the pot involves the formation of a trunk of approx. 60 cm and a number of 4÷6 trusses, and on each framing 1-2 undertrusses. Due to the large number of roof trusses in the composition of the crown, it is found a reduction of the vigour of the shrub (Sandu, 2008).

The conducting of the hazel in the hedgerow fruit was made quite easy due to the following features: the 2 rows buds placing, thickening and slow lengthening of the skeleton elements, good trusses garnish with branches of semischelet and rod on their entire length, weak polarity, the flexibility of the branches (Grădinariu, 2002).

Leadership in the form of shrub has assumed the maintenance of 6÷8 stems on each plant whose annual extension will be shortened to 70÷80 cm for branching. In the end, the height of the plant reaches 3-3. 5 m. The shape of the shrub at the hazel is not recommended for intensive plantations because it prints a force much greater than the single stem conducting (Sandu, 2008).

The length of the seedlings rows has been oriented on the N-S direction in order to capture a greater amount of light during the day and avoid as much as possible the phenomenon of shading. Planting was carried out in the period March-April, with additions in year 1 in the interval November-December, in the intervals climate devoid of winds.

In the case of spring plantings there were carried out watering periodic as the young plants of the michorized hazel are adversely affected by drought (Cociu, 2006). Maintenance of culture trufiere hazel mainly involved the maintenance of a fair balance of coexistence shrub-fungus, so as to ensure inter-conditionality thereof, on the understanding in the achievement of normal growth of the shrubs and the formation of mycorrhizae well developed, resulting in a rich and constant production of truffles. In the moment in which the truffles start to develop they emit a substance that, when the truffles are mature, produces a destruction of actual vegetation around them, like a halo, like a circle of vegetation around the hazel plant.

Among the maintenance work carried out during the 13 years of the culture it may be mentioned as being important: the mechanized mobilisation of surface soil around the plants, starting at a depth of 12-15 cm, decreasing annually up to 5-6 cm (Delmas, J. 1978); the destruction of weeds around the plant of hazel, mechanized in the first 5 years with tillers, then with trimmers to avoid areas of development of the truffle; deep loosening of the soil between the rows, periodically, for the creation of a good aeration of the soil; irrigation, depending on the culture year rainfall, using water with pH-neutral or slightly alkaline, the most common irrigations being in the first 2÷4 years; starting with the fifth year crop irrigation was aimed at mainly for the hydration of the truffle, which was adapted to the precipitation regime and soil type and in periods of drought stress watering has been carried out from 3 in 3 weeks (Fodor, 2013); maintenance pruning of hazel shrub have consisted in trimming the branches dried and the cuts to create the shape of the canopy desired (pot, shrub or hedge);

conducting in the form of single stem allowed, by trimming the trunk up to the height of 1-1,5 m, a much better insolation, when the managements in the form of a pot, shrub or hedge, with the advantage of better retention of moisture in the soil by shading, the also pose the disadvantage of favoring the installation of pests and diseases; harvesting was performed by collecting manual or by shaking on tilt tarps placed under the plants of the hazel (Dincă, Dincă, 2014).

Calculations on the profitability (cost-benefit ratio) have been carried out to of a representative 1 ha control surface, planted with seedlings of *Corylus avellana var. Tonda Gentile Romana* michorized with the *Tuber aestivum /uncinatum* fungus in a scheme of planting 5/5 m (400 plants/ha) in the conventional system.

In terms of the main truffle production harvesting began in the 6 year of the culture, with a modest value of approx. 50 kg/ha, taking into account the fact that a truffle hazel plantation at maturity can produce 150 kg/ha of truffle.

In subsequent years the production of truffles has increased reaching the amount of 135 kg/ha in the year 13 of the culture.

The price of truffles to the stock market for truffles is rated at 100÷150 euro/kg, depending on their sizes and quality.

In relation to the secondary production of hazelnuts, it could be harvested in the year 4 of culture, with an average amount of 2-3 kg/plant, meaning about 1-2 tonnes/ha, characterized by a exponential growth of the production of hazels during the years of culture, reaching in the year 9 of the culture up to 10÷15 kg/plant, i.e. about 7÷10 tons of hazelnuts per hectare.

The centralization of incomes and expenses for the 13 years of culture (*table 1*) has highlighted the fact that the expenses for the establishment and maintenance of the truffle hazel plantation until reaching maturity are estimated at approx. 115,000 lei, and the revenues accumulated from the exploitation of the plantation over a period of 13 years (first 2 years being unproductive) have been calculated as being approx. 1.117.000 lei for 1 ha.

So, the gross profit cumulated from the exploitation of the plantation over a period of 13 years was approx. 1,002,000 lei and the cumulative net profit from the exploitation of the truffle hazel plantation, over a period of 15 years, exceeds 920,000 lei.

Table 1

Summary with the expenses and income for the plantation of hazel trufier of 1 ha

Name of indicator/year production	*Expenses (lei)*	*Incomes (lei)*	*Net Profit (lei)*	*Gross Profit (lei)*
Establisment+Year 1	93,578	-	-	-
Years 2-3	3,485	-	-	-
Year 4	1,745	15,707	13,967	11,733.11
Year 5	1,745	31,415	29,675	24,927.85
Year 6	1,745	47,123	45,383	38,122.57
Year 7	1,745	62,831	61,091	51,317.12
Year 8	1,745	106,590	104,850	88,077
Year 9	1,745	127,907	126,167	105,961.23
Year 10	1,745	149,225	147,485	123,868.2
Year 11	1,745	170,543	168,803	141,735.4
Year 12	1,745	191,861	190,121	159,772.3
Year 13	1,745	213,180	211,440	177,649.9
TOTAL	114,513	1,116,883	1,098,982	923,121.6

The results of the financial analysis are presented in *figure 1*, where it is noted that the percentage of 29% net profit for a truffle hazel plantation can justify the opinion that this is a potential success culture for the Moldova area.

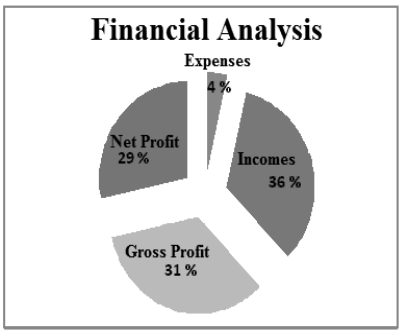

Figure 1 **The results of the financial analysis for the truffle hazel plantation**

CONCLUSIONS

Profitability of the investment was estimated as being approx. 8 %, so a positive value which indicate that a truffle hazel culture in the hilly area of Moldova can be a cost-effective and deserves to be implemented .

The legal provisions in the countries of the E. U. on crops truffle mention the fact that, if after the preparation of the business plan, the profitability of the culture exceeds 2%, the project is considered potentially profitable culture and may receive funding from the grant.

The culture of the truffle hazelnut production taken in the study required in 15 years of culture 115.000 lei expenses for the establishment and maintenance for one hectare of culture.

Revenues accumulated over the 13 years of production (first two years being totally unproductive, from the 3-4 years production being only hazelnuts and from year 8 after truffle can also been harvested) were 1.117.000 lei per ha.

The cumulative net profit of more than 920.000 lei/ha and the fact that the investment can be recoup in the seventh year of culture can lead us to conclusion that the truffle hazel plantation in the hilly area in the center of Moldova can be potentially profitable culture.

We note that the profitability of the truffle hazel culture contributes in a large extent the incomes from the secondary production side of hazelnuts.

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