CAN HORTICULTURE BECOME A SUCCESS STORY IN INCREASING THE COMPETITIVENESS OF THE AGRICULTURAL ENTERPRISES FROM THE REPUBLIC OF MOLDOVA?

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Abstract

The horticultural sector of the Republic of Moldova represents a third from the total agricultural production and has a high importance in the economic development of the country. Horticultural products are high value added products, being very rich in vitamins and very beneficial for human health. Increasing the competitiveness of the agricultural enterprises through the development of the horticultural production will contribute to the modernization of the agricultural sector of the Republic of Moldova. Achieving high level of competitiveness of agricultural enterprises can be realized by improving the technological process of production, production quality assurance, investments in the infrastructure and searching of new sales markets. The purpose of the scientific research consists of revealing the role of the horticultural sector in increasing the competitiveness of the agricultural enterprises, the determination of the competitiveness level of the agricultural enterprises, reaviling the factors which influence at increasing the competitiveness of the agricultural enterprises and proposal of measures to increase the competitiveness of the agricultural enterprises by development of the horticultural production.

Key words: Competitiveness, horticultural sector, agricultural enterprises, Total Factor Productivity, Data Envelopment Analysis

The agricultural sector of the Republic of Moldova has a high importance for the political and economical stabilty of the country, because it ensures the food security of the country, and also it represents the principal source of income for the majority population from the rural areas, determining the level of welfare of families from the rural areas.

The competitiveness of the agricultural sector depends on the competitiveness of the agricultural enterprises from this sector, which is determined by the cleverness of managers to combine more efficiently the factors of production in order to satisfy the consumers demands and to achieve high level of profitability.

Republic of Moldova has favourable conditions to develop high value added competitive agriculture, represented by horticultural products - fruits and vegetables, which are very beneficial for health and very rich in vitamins.

In this scientific research is analized the competitiveness of the agricultural enterprises from the Republic of Moldova, the factors which influence at increasing the competitiveness of the agricultural enterprises and it is revealed the role of the horticultural sector in increasing the competitiveness of the agricultural enterprises.

MATERIAL AND METHOD

In the modern economic literature for evaluation of enterprises competitiveness are used more than 100 methods and approximately 300 economic indicators. The basic role of enterprise competitiveness evaluation is to appreciate the economical situation of the company at a certain moment of time, on a certain analyzed market (Zhuran L.A., Abaza I.O. , 2011).

The analyze of enterprises competitiveness presumes selection of criteria of analyze and calculation of indicators which determines the competitiveness of enterprises.

The selected criteria for analyze must characterize the quantitative and qualitative sides of enterprise's activity, being concretized in the set of economic indicators which represent numerical characteristics of the enterprise's activity.

In the process of the indicators analyze, are studied their dynamics at the level of enterprise compared to analogical indicators of other enterprise, competitiveness being a notion which can be appreciated only by comparing the situation of an economic object with the situation of other economic object at certain moment of time.

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Competitiveness of enterprise cannot be separated by the competitiveness of the products, services created by the enterprise. Thus in opinion of Michael Porter and Paul Krugman „determination of competitiveness is based on the notion of productivity" (Krugman P., 1994; Krugman P., 1996; Porter M., 1982).

Therefore the main idea in measuring productivity, is calculating a global indicator of productivity, called „**Total Factor Productivity (TFP)**", which reveals how efficiently an enterprise use the means of production (inputs) to produce outputs.

According to the scientific researches of scientists from all over the world, TFP is used as an indicator of agriculture competitiveness.

The most frequent method of determination of TFP consists of productivity indices Malmquist, which are decomposed in two components: the index of technological change and the index of technical efficiency change (Cimpoieş D., Racul A., 2006; Bhattacharjea A., 2002; Chaudhary S., 2012; Fare R., et al., 1994; Knox L.C.A., 2003).

$$M_0(x^{t+1}, y^{t+1}, x^t, y^t) = \frac{D_0^{t+1}(x^{t+1}, y^{t+1})}{D_0^t(x^t, y^t)} [(\frac{D_0^t(x^{t+1}, y^{t+1})}{D_0^{t+1}(x^{t+1}, y^{t+1})})(\frac{D_0^t(x^t, y^t)}{D_0^t(x^t, y^t)})]^{\frac{1}{2}}$$

where,

Technical efficiency change is represented by

$$\frac{D_0^{t+1}(x^{t+1}, y^{t+1})}{D_0^t(x^t, y^t)}$$

Technological change is represented by

$$(\frac{D_0^t(x^{t+1}, y^{t+1})}{D_0^{t+1}(x^{t+1}, y^{t+1})})(\frac{D_0^t(x^t, y^t)}{D_0^{t+1}(x^t, y^t)})^{\frac{1}{2}}$$

TFP may take the following values:
a) TFP>1, then in the period t (between the moment t and t+1) was registered an increase of productivity;
b) TFP=1, in this case wasn't registered changes at the productivity level;
c) TFP<1, then was registered a decrease of productivity.

In the analyze of enterprise competitiveness was used the DEA (Data Envelopment nalysis) method of investigation, which is very popular in investigations of efficiency and productivity of enterprises. DEA allows frontier estimation using nonparametric programming models, establishing rankings based on technical efficiency for the analyzed agricultural enterprises.

The data processing was performed using the program DEAP version 2.1*.

The analyze of the efficiency, productivity and competitiveness of the agricultural enterprises was performed using the data from the National Bureau of Statistics of the Republic of Moldova.

RESULTS AND DISCUSSIONS

Agriculture is the traditional branch of economy of the Republic of Moldova. The share of agriculture, forestry and fishery in the GDP during 2011-2014 reveals that this sector contributes by 10-12 percent to the GDP (*figure 1*).

In 2014 the share of agriculture, hunting economy, forestry and fishery in GDP constituted 12,8, which represent an increase compared to 2012 by 1,9%, when was registered drought, which influenced negatively the agricultural production and compared to 2013 increased by 0,9% (BNS, 2014).
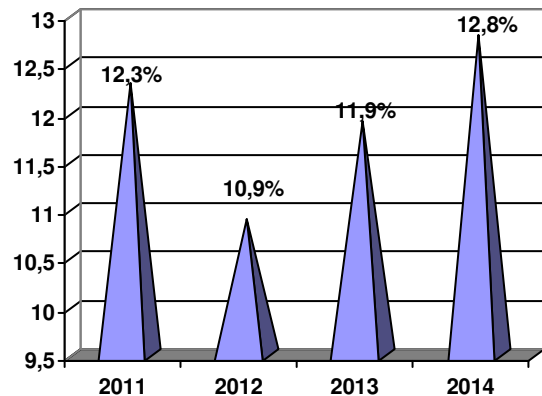

Figure 1 **The share of agriculture, fishery and forestry in GDP during 2011-2014**

The analyze of the structure of agricultural production by branches and all types of households for 2011 and 2013 reveals that in 2013 the horticultural production constituted 22,3% from total agricultural production, which represent a decrease compared to 2011 by 5,8% (*figure 2.a*).

Thus in 2013 the production of horticultural production per capita compared to 2011 registered the following trends:

➢ The production of vegetables decreased from 102 kg per capita in 2011 to 82 kg per capita in 2013

➢ The production of potatoes decreased from 99 kg per capita in 2011 to 67 kg per capita in 2013

➢ The production of fruits and berries increased from 106 kg per capita to 118 kg per capita in 2013.

From the data mentioned above we can reveal that the share of the horticultural production from total agricultural production in the last years decreased.

Thus using the linear programming duality there was determined the equivalent envelope of competitiveness of the agricultural enterprises, namely:

$$\begin{cases} \min_{\theta, \lambda} \theta \\ -y_i + Y\lambda \geq 0 \\ \theta x_i - X\lambda \geq 0 \\ N1^{\cdot}\lambda \leq 1 \\ \lambda \geq 0, \end{cases}$$

where:
θ- efficiency parameter;
n – number of farmers

Y – output vector, represented by the income from selling the agricultural products

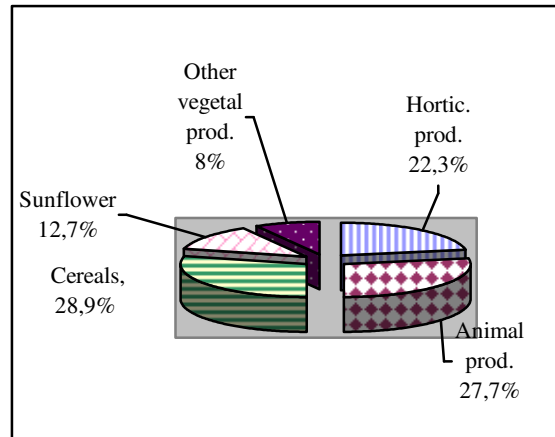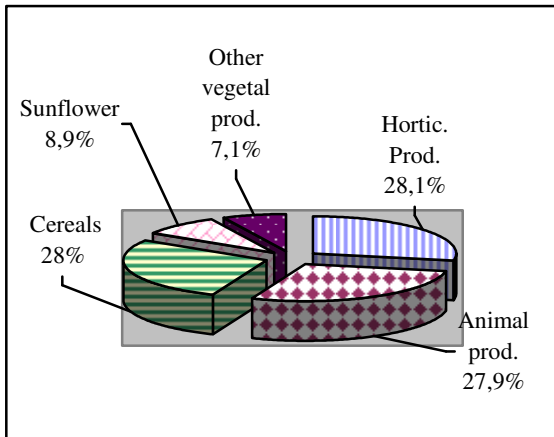X – input vector, $n^x 5$ dimensional, given by:

Figure.2.a and Figure 2.b **The structure of agricultural production on all categories of households in 2011 and 2013**

Source: elaborated by the author using the data from the National Bureau of Statistics of Moldova

a) Surface of the agricultural lands effectively seeded

b) Consumption for labor remuneration, thousands lei

c) Consumption for seeds and planting material, thousands lei

d) Consumption for chemical and natural fertilizers, thousands lei

e) Consumtion for auxilliary activities and and indirect consumptions, thousands lei

N1 – is vector n- dimensional with components 1;

λ – variable of linear programming problem which would be solved

The analyze of the competitiveness of the agricultural enterprises was performed on the base of 488 agricultural enterprises which performed activity during 2008-2012.

The results of the Total Factor Productivity evaluation of the agricultural enterprises from the Republic of Moldova are presented in the table 1.

Thus according to the table 1, it is revealed that the mean of TFP for 2009-2012 constituted 1,015, which reflects that the TFP increased by 1,5%, which was determined by the technical efficiency change by 4,8%. The technical efficiency change represents the product between the scale efficiency change and the pure efficiency change. Thus the pure efficiency change constituted 104,6 percent, while the scale efficiency change constituted 100,01%

Analyzing the technological efficiency change, it is revealed that the mean for the period 2009-2012, constituted 0,969, which means that the application of the advanced technologies in the process of production decreased by 3,1%, which reveals that there are not made investments in the process of modernization of the tractors and agricultural machinery park.

The dynamics of TFP during 2009-2012, shows that beginning with 2010, when TFP took the maximum value, constituting 1,328, which means that the TFP increased by 32,8%, this indicator continued to decrease, constituting in 2011, approximately 0,902, and in 2012 the value of TFP constituted 0,821, decreasing by 17,9%.

The decreasing of TFP in 2012 was caused by the excessive drought which affected the agricultural production, and determined the agricultural producers to highly use the irrigation systems, thus from the analyze of the table 1, was registered an increase of the technological efficiency change in 2012 compared to the previous year by 46,6% namely from 50,1% to 96,7 %.

Table 1

The TFP values of agricultural enterprises from the Republic of Moldova during 2009-2012

Year	Technical efficiency change	Technological efficiency change	Pure efficiency change	Scale efficiency change	Total Factor Productivity (TFP)
2009	1.104	0.978	1.151	0.959	1.079
2010	0.713	1.861	0.796	0.896	1.328
2011	1.800	0.501	1.441	1.249	0.902
2012	0.850	0.967	0.908	0.936	0.821
Mean	**1. 048**	**0. 969**	**1. 046**	**1. 001**	**1. 015**

Source: elaborated by the author using the software package DEAP 2.1.

Table 2

The TFP values of the horticultural production of agricultural enterprises from the Republic of Moldova during 2009-2012

Year	Technical efficiency change	Technological efficiency change	Pure efficiency change	Scale efficiency change	Total Factor Productivity (TFP)
2009	1.658	0.532	1.446	1.147	0.883
2010	0.772	1.539	0.621	1.243	1.188
2011	0.990	1.151	1.703	0.581	1.139
2012	1.308	0.771	1.290	1.014	1.009
Mean	**1.135**	**0.923**	**1.185**	**0.957**	**1.048**

Source: elaborated by the author using the software package DEAP 2.1.

Table 3

Grouping of the agricultural enterprises with horticultural production by the share of the sales income

Indicators	$\dfrac{\%Hor\_income}{Totalsales\_income} > 20\%$	$\dfrac{\%Hor\_income}{Totalsales\_income} < 20\%$	$\dfrac{\%Hor\_income}{Totalsales\_income} < 5\%$
Number of companies	160	143	62
Calculated average TFP	**1,089**	**1,068**	**0,985**

Source: elaborated by the author

Due to the excessive drought from 2012, the agricultural enterprises were less competitive compared to 2011, because of the decrease by 31,3% of the scale efficiency change, constituting 93,6% in 2012.

From the total 488 analyzed agricultural enterprises were selected those enterprises so that the production function frontier to be horticultural, constituting 303 agricultural enterprises with horticultural function of production.

The TFP of the horticultural production of the agricultural enterprises from the Republic of Moldova for 2009-2012 reveals that the TFP mean constituted 1,048, which reflects that the TFP for the horticultural production increased by 4,8% in the analyzed period, which exceeds by 3,3% the TFP mean of agricultural enterprises calculated for the total vegetal production.

Thus, in case of TFP calculation for the total agricultural enterprises were included besides the horticultural production other types of vegetal production as: cereals, sunflower, leguminous, etc., which determined the decreasing of TFP value by 3,3% compared to calculated TFP only for horticultural production. The agricultural enterprises specialized in producing horticultural production are more competitive, registering high values of TFP compared to the enterprises where the horticultural production is not the dominant, which determined the decreasing of TFP.

The increasing of TFP at the enterprises with the horticultural frontier of production from Republic of Moldova for the period 2009-2012 by 4,8% is determined by the increasing of the technical efficiency change by 13,5%. In its turn,

the technical efficiency change for the horticultural production is determined by the pure efficiency change and the scale efficiency change. Thus, the increasing of the technical efficiency change was influenced by the increasing of the pure efficiency change by 18,5%

Analyzing the technological efficiency change it is revealed that the mean of this indicator for 2009-2012 constituted 0,923, which represent a decreasing by 7,7%, which means that there is a necessity of investments in the agricultural park of machines and tractors, and respectively the subunitary value of this indicator expresses the nonperformance of the applied technologies in the horticultural sector from the country.

Analyzing the TFP value of the horticultural production in dynamics, it is revealed that in 2012, this indicator constituted 1,009, which represents a decrease by 3,9% compared to the mean of 2009-2012, when this indicator was equal to 1,048. The decreasing of the TFP value for 2012 year compared to the mean of the analyzed period, was caused by the decreasing value of the technological efficiency change for 2012 by 22,9%. The 2012 year was very difficult for the agricultural producers, because of the drought which affected the agricultural sector.

Also, analyzing the TFP value of the horticultural production (*table 2*) and the TFP values of the agricultural enterprises from the vegetal sector (*table 1*) for 2012, it is revealed that TFP for the horticultural production constituted 1,009, which represent an increase by 0,9% of TFP, while the TFP of the agricultural enterprises from vegetal sector decreased by 17,9%,

constituting 0,821. The highest value of the horticultural production compared to the TFP of the agricultural enterprises from the vegetal sector for the year 2012, was due to the increasing of the technical efficiency change by 30,8% compared to the previous year, while the technical efficiency change of the enterprises from the vegetal sector decreased by 15%, constituting 0,850.

In its turn the technical efficiency is determined by the technical efficiency change and the scale efficiency change. Thus, from the analyze of the scale efficiency change of the horticultural production compared to the scale efficiency change of the enterprises from the vegetal sector (*table 1*), it is revealed that in 2012 the scale efficiency change for the horticultural sector increased by 1,4%, thus the same indicator for the enterprises from the vegetal sector decreased by 6,4%. The highest scale efficiency of the enterprises with the horticultural frontier of production compared to the enterprises where the frontier of production besides the horticultural products contains other cultures as: cereals, leguminous, sunflower etc., reveal a high level of competitivenessof of the enterprises with horticultural production compared to the enterprises with cereal production or other types of production.

After grouping the agricultural enterprises with horticultural production (303 enterprises) by the share of the income resulting from the sales of horticultural production in the total sales income of the agricultural enterprise (*table 3*), was stated that 160 agricultural enterprises have the share of the income resulting from the sales of horticultural production in the total sales income of the agricultural enterprise more than 20% and 143 of the agricultural enterprises have the share of the income resulting from the sales of horticultural production in the total sales income of the agricultural enterprise less than 20%.

After calculating the average TFP of the agricultural enterprises which have the share of the income resulting from the sales of horticultural production in the total sales income of the agricultural enterprise more or less than 20%, was identified that the enterprises which have the share of the income resulting from the sales of horticultural production in the total sales income of the agricultural enterprise more than 20% registered a an average TFP of 1,089, which represent an increase by 0,020 compared to enterprises which had the share of the income resulting from the sales of horticultural production in the total sales income of the agricultural enterprise is less than 20%.

Supplementary were analyzed the agricultural enterprises where the share of the income resulting from the sales of horticultural production in the total sales income of the agricultural enterprises is less than 5%, and was identified that these enterprises have an average calculated TFP equal to 0,985, which is less than 0,10 compared to the enterprises where the share of the income resulting from the sales of horticultural production in the total sales income of the agricultural enterprise is more than 20%.

Thus once with the decreasing of the share of the income resulting from the sales of horticultural production in the total sales income of the agricultural enterprises, the competitiveness of the enterprises is going down compared to the enterprises where this share exceeds 20%.

From the above it is revealed that the enterprises which have the share of the income resulting from the sales of horticultural production in the total sales income of the agricultural enterprise more than 20%, are more competitive by 10% compared to the enterprises where this share is less than 5%.

According to the above analyze results it is revealed that the agricultural enterprises with predominantly horticultural production (over 20%) are more competitive compared to the agricultural enterprises where the horticultural production is not predominant (less than 20%).

CONCLUSIONS

Horticulture has a high importance in increasing the competitiveness of the agricultural enterprises from the Republic of Moldova.

The analyze of the competitiveness of the agricultural enterprises using the calculation of Total Factor Productivity for 2009-2012 reveals that the agricultural enterprises specialized in horticultural production, registered higher values of TFP compared to the agricultural enterprises where the horticultural production is not predominant.

The role of the cultivation of horticultural production in increasing the competitiveness of the agricultural enterprises is very high, because at the agricultural enterprises with a higher share of the income resulting from the sales of horticultural production in the total sales income of the agricultural enterprises, was registered a higher average TFP value, compared to the agricultural enterprises with lower share of the income resulting from the sales of horticultural production in the total sales income of the agricultural enterprises.

A serious problem in increasing the competitiveness of the agricultural enterprises by developing horticultural production is the low

application of the technological progress in the process of production, which determines low values of the technological efficiency change.

Thus to ensure the increasing of the competitiviness of the agricultural enterprises from the Republic of Moldova, there must taken into account that those agricultural enterprises will be competitive on the market, where the horticultural production will be predominant and in the process of production will be applied the results of the technological progress.

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214