

## COMPARATIVE ECONOMIC ANALYSIS OF WHEAT PRODUCTION USING CERTIFIED AND UNCERTIFIED SEED: THE CASE OF OVCEPOLE REGION IN REPUBLIC OF MACEDONIA

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### Abstract

*The use of certified seeds of improved varieties is one of the basic factors towards increasing productivity and quality in crop production, consequently raising the income of the farmer. In this study the economical benefit of the wheat production using certified and uncertified seed in the region of Ovcepole in Republic of Macedonia, have been evaluated by using data collected by using pre-tested interview schedule, applying face- to-face interview method. The average productivity in wheat farming using certified seeds is 22,5 % higher than production with uncertified seeds. The total production costs in wheat production using certified seeds are 11,3 % higher compared to the wheat production using uncertified seeds. Gross margin in wheat production using certified seeds is 36 % higher compared to wheat production using uncertified seeds. Net profit per hectare in wheat farming using certified seeds is 26,5 % higher compared to wheat production using uncertified seeds.*

**Key Words: Wheat, Certified seed, Uncertified seed, Production costs, Profitability, Productivity.**

### Introduction

Increased food demand by humans and livestock, followed by decreased cereal fields, can be satisfied only by increasing productivity per unit area. However, yield increasing through the improvement of growing techniques is an easier and shorter term approach to a solution. The use of certified seeds of improved varieties is one of the basic factors towards increasing productivity and quality in crop production, consequently raising the income of the farmer.

From the arable land in Macedonia, which amounts approximately 415 thousand hectares, 76.5 thousand hectares (18,5%) are allocated for wheat production. Wheat is one of the indispensable source of nourishment for animals and human beings and it's production is varying from about 250-350 thousand tons, and the yields from 2.500- 3.600 kg per ha., depending on the year and weather conditions in Macedonia (table 1).

Seed and seedling materials are produced under control by the Office for seed and seeded material under Ministry of Agriculture, Forestry and Water Economy of Republic of Macedonia The Office is issuing a certificate with whom is confirming that the

seed and seedling materials are fulfilling the conditions for trade. The certificate is a complementary part of the seed and seedling material that is intended for trade.

The increasing use of certified seeds of improved varieties in farms can contribute to the economy of farms and provide high quality and constant domestic supply for flour milling industry. Usage of high quality seed in crop production is assessed in terms of yield gain, costs, received prices by the farmers and profit derived per unit area or product. Widespread cultivation of new certified varieties on farms is not only an economic event, but at the same time it is closely related to the demands and tendencies of the growers and flour milling industry.

The aim of this study was to determine the economical benefit of the wheat production using certified and uncertified seed in the region of Ovcepole in Republic of Macedonia. In the study, usage of physical input, production costs of wheat farming made using certified and uncertified seed, and productivity, gross margin and net profit per unit area have been examined in comparative way.



Table 1. Production of wheat in Macedonia

	2004	2005	2006	2007	2008	2009	2010	2011
Area of wheat (ha)	101.607	108.881	100.815	102.081	97.506	101.500	79.865	76.545
Production (t)	356.825	333.880	309.772	247.492	342.770	308.280	243.137	256.103
Yield (t/ha)	3,51	3,07	3,11	2,45	3,50	3,04	3,04	3,35

## Materials and Methods

This study was mainly based on primary information collected from the farmers of Mustafino, Ergelija and Orel villages of Ovcepole region of Macedonia. The data is collected from 10 farms that are producing wheat from uncertified seed, and 12 farms that are using certified seed, determined through the random sampling method. Primary information was collected by using pre-tested interview schedule, applying face-to-face interview method. The collected information was first tabulated, coded and entered into computer. The data necessary for the study has been collected through the survey of sample farms.

All the local measurements were converted into standard unit and final analysis was done by using computer software packages: Microsoft Excel and Statistical Package for Social Science (SPSS).

Physical data related to wheat cultivation practices, costs, and yield, use of physical input and sale quantity and selling prices has been collected in 2010-2011 production year.

The results, calculated in the national currency unit, have been converted to EU-€ at the Macedonian Central Bank's middle rate of exchange of the production years.

In order to determine the profitability of wheat farming using certified and uncertified seed, an accounting model was established. The accounting model used in this study is an enterprise budget, defined as an estimate of the average annual costs and returns for the enterprise.

The model calculates variable and some of the fixed costs. These costs are summed to derive the total cost of production on a per hectare basis. Variable costs refer to those costs which vary directly according to the level of production of grown crop. These costs include seed, hired labour, fertilizers, pesticides, machinery operating costs, and hired machinery. Fixed costs are defined as costs that do not change with the level of production. These costs include depreciation and interest and, repair and maintenance and insurance. The model will

calculate machinery depreciation and interest on machinery and repair and maintenance. Taxes and other overhead, such as landownership are not taken into consideration.

In the cost analysis, data related to labor demand and machine power in the production activities of the farms, production practice, input usage, quantity of production and selling prices have been taken as a basis. Costs have been determined on the basis of the quantity of input used by the farmers in wheat farming. In the determination of the gross production value, main and by-product sale prices received by the farmers and the average amount of wheat and straw have been taken into consideration.

The cost, productivity and profitability levels of wheat farming using certified and uncertified seeds are examined in the comparative analysis.

The gross margin is the difference between the gross return and the total variable cost:

(1)

$$\text{Gross margin} = \text{Gross return} - \text{Total variable cost}$$

Net profit has been calculated by subtracting the total production costs from the total financial output:

(2)

$$\text{Net profit} = \text{total financial output} - \text{total production costs}$$

## Results and Discussion

Economy data are compiled in three main sections: 1) usage of physical input in wheat farming and productivity; 2) production costs; and 3) Output returns.

Use of physical input in wheat farming and productivity are presented in table 2 and figure 1. In wheat farming with traditional uncertified seeds, the demand of labor force per hectare (46,5 h/ha) is almost 90 % higher than that of wheat farming with certified seeds. The reason for this is over usage of labor in wheat farming with uncertified seeds, and this is mainly because of the hand sowing and hand application of artificial fertilizers and pesticides. The demand for machine power in wheat farming with certified seeds (26,3 h/ha) is almost 14, 5 % higher than that of wheat farming with

uncertified seeds, above all because of the machine sowing and application of artificial fertilizers and pesticides.

Wheat production with certified seeds is using nearly 11,5% less seeds (250 kg/ha) in a comparison to wheat production with uncertified seeds (285 kg/ha).

On average, 190 kg/ha of fertilizer and 1 kg/ha of pesticides are used in wheat farming with certified seeds, and 146,5 kg/ha of fertilizer and 0,8 kg/ha of pesticides are used in wheat farming with uncertified seeds. Fewer amounts of chemical fertilizers and pesticides are used then recommended on most of the farms in Ovcepole region, where uncertified seeds are used, since working capital is inadequate and extensive farming techniques are carried out.

The average grain yield is 2.750 kg/ha in wheat production using uncertified seeds, and 3.550 kg/ha in wheat production using certified seeds. The average productivity in wheat farming using certified seeds is 22,5 % higher than production with uncertified seeds. Also the average straw yield wheat farming using certified seeds is almost 7 % higher than production with uncertified seeds. The production costs of wheat farming on farms have been analyzed in details, according to wheat production using certified and uncertified seeds. Variable costs in wheat farming with certified seeds has been calculated as 366,75 €/ha, and in wheat farming with uncertified seeds has been calculated as 326,90 €/ha. The total variable cost is 10,8 % lower in wheat production using uncertified seeds in comparison to wheat production using certified seeds.

Table 2. Use of physical input in wheat farming and productivity

Indicators	Production with uncertified seeds	Production with certified seeds
Seed (kg/ha)	285	250
Chemical fertilizer (kg/ha)	146,5	190
Pesticides (kg/ha)	0,8	1
Labor force (h/ha)	46,5	24,5
Machine power (h/ha)	22,5	26,3
Fuel (l/ha)	123,6	145
Grain yield (kg/ha)	2.750	3.550
Straw yield (kg/ha)	2.100	2.250

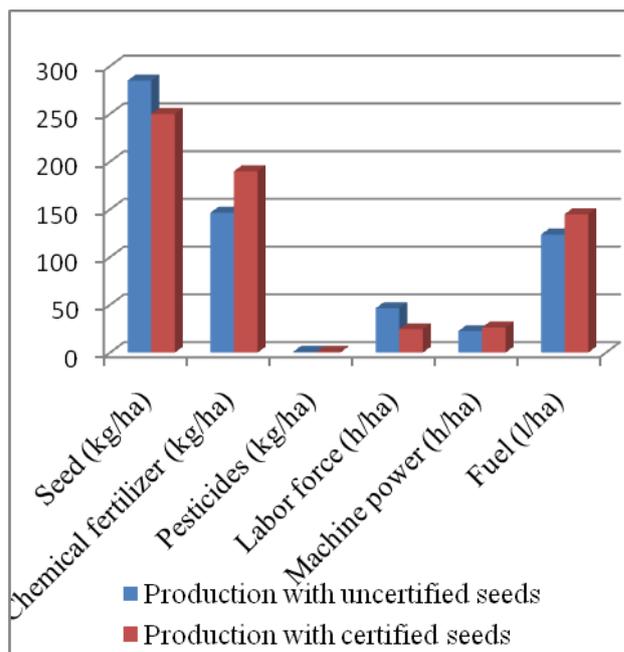


Figure 1. Use of physical input in wheat farming

The production costs of wheat farming on farms have been analyzed in details, according to wheat production using certified and uncertified seeds. Variable costs in wheat farming with certified seeds has been calculated as 366,75 €/ha, and in wheat farming with uncertified seeds has been calculated as 326,90 €/ha. The total variable cost is 10,8 % lower in wheat production using uncertified seeds in comparison to wheat production using certified seeds.

The cost for seed per hectare is 89,5 €/ha in wheat production using certified seeds, and 56 €/ha in wheat production using uncertified seeds. The cost of certified seed per hectare is 37,3 % higher than that of uncertified seeds. The cost per 1 kg of certified seed is 0,35 € and 0,20 € for uncertified seed. Total production costs in wheat production using certified seeds is 402,36 €/ha, and in wheat production using uncertified seeds is 356,70 €/ha. The total production costs in wheat production using certified seeds are 11,3 % higher compared to the wheat production using certified seeds. The costs for seed, chemical fertilizers, pesticides and fuel in wheat production using certified seeds are higher in comparison to wheat production using uncertified seeds.

Total financial output (€/ha) in wheat production has been calculated when subventions that the farmers are getting for the sowed areas are added to gross production value.



Table 3. Production costs in wheat farming

Costs	Farming using uncertified seed	Farming using uncertified seed
<b>Total variable costs (€/ha)</b>	<b>326,90</b>	<b>366,75</b>
Seed (€/ha)	56,00	89,40
Chemical fertilizer (€/ha)	42,28	64,23
Pesticides (€/ha)	30,89	34,96
Fuel (€/ha)	96,08	101,63
Hired labor (€/ha)	40,65	23,58
Hired machinery (€/ha)	61,00	52,96
<b>Total fixed costs (€/ha)</b>	<b>29,80</b>	<b>35,61</b>
Depreciation and interest (€/ha)	26,32	30,24
Repair and maintenance (€/ha)	3,48	5,37
<b>Total production costs (€/ha)</b>	<b>356,70</b>	<b>402,36</b>

Table 4. Total output in wheat farming

Output	Farming using uncertified seed	Farming using uncertified seed
Grains yield (kg/ha)	2.750	3.550
Straw yield (kg/ha)	2.100	2.250
Sale price of wheat grain (€/ha)	0,20	0,20
Sale price of straw (€/ha)	0,07	0,07
Subsidy per ha wheat area (€/ha)	130,08	170,64
Gross production value (€/ha)	673,17	839,02
<b>Total financial output</b>	<b>803,25</b>	<b>1.009,67</b>
<b>Gross margin</b>	<b>476,35</b>	<b>642,92</b>
<b>Net profit</b>	<b>446,56</b>	<b>607,31</b>

Gross production value (€/ha) has been calculated by multiplying the grain and straw yields with their selling price. Total financial output in wheat production using certified seeds is 1.009,76 €/ha, and in wheat production using uncertified seeds is 356,70 €/ha. The total financial output in wheat production using certified seeds is 20,4 % higher compared to wheat production using uncertified seeds. This comes as a result of the higher subventions of 23,7% that the farmers are getting for using certified seeds. Gross production value in wheat production using certified seeds is 839 €/ha, and in wheat production using uncertified seeds is 673,17 €/ha. Gross production value output in wheat production using certified seeds is 19,7 % higher compared to wheat production using uncertified seeds. This is because of the higher yields in wheat production using certified seeds.

To measure economic efficiency, gross margin (total output value minus variable cost) was used to assess profitability in wheat production. Gross margin in wheat production with certified seeds is 642,92 €/ha, and in wheat farming with uncertified seeds is 476,35 €/ha.

Gross margin in wheat production using certified seeds is 36 % higher compared to wheat production using uncertified seeds. Accordingly, wheat farming using certified seeds provides the highest contribution to the welfare of the producer.

Net profit is calculated as 607,31 €/ha in wheat farming with certified seeds and 446,56 €/ha in wheat production using uncertified seeds. Net profit per hectare in wheat farming using certified seeds is 26,5 % higher compared to wheat production using uncertified seeds. According to the research done, there can be concluded that wheat farming using certified seeds makes the largest contribution to the welfare of the producer. Also, it provides a higher net economic benefit and contributes more to a higher living standard for the producer.

### Conclusions

The use of physical input (chemical fertilizers, pesticides, machine power and fuel) in wheat farming using certified seeds is higher when compared to wheat production using uncertified seeds. More labor are used in wheat farming using uncertified seeds is higher when compared to wheat production using certified seeds. The high level of



use of labor in region where production is made using uncertified seeds is related to the hand application of chemical fertilizers and pesticides, and hand sowing.

Nearly 11,5 % less seeds have been used in wheat production with certified seeds in comparison to wheat production with uncertified seeds.

The grain yield in wheat farming using certified seeds is 22,5 % higher than production using uncertified seeds, and straw yield in wheat farming using certified seeds is 6,6 % higher than production using uncertified seeds.

The total production costs in wheat farming with uncertified seeds have been discovered to be lower than wheat farming using certified seeds (11,3 %). The subsidy payments per hectare for certified seeds is 23,7 % higher than subsidy payments for production using uncertified seeds.

Gross margin in wheat production using certified seeds is 36 % higher when compare to wheat production using uncertified seeds. Net profit per hectare in wheat farming using certified seeds is 26,5 % higher when compare to wheat production using uncertified seeds.

According to the conclusions, wheat farming using certified seeds makes the largest contribution to the welfare of the producer. As contribution of wheat production with certified seeds to the welfare of the producer is higher than the contribution of wheat production with uncertified seeds, wheat production of producers using certified seeds is becoming widespread.

Institutions producing and distributing seeds and agricultural extension institution should emphasize advertising studies of varieties suited to the region that have high productivity and quality, can be sold at relatively higher price, have high resistance to negative climatic conditions and fit to the farming aims of the producers. Increasing the use of certified seeds in farms by showing that it will be economically advantageous will also be useful.

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