

Economic Efficiency of the Agricultural Sector in the Republic of Macedonia

Prof. Dr. Ilaz Ameti^{1*}, Dr. Naser Ameti², McS.; Oriola Vukaj³

¹ State University of Tetovo, "Faculty for bussines administration", Address: Street: Kongresi Manastirit, Cair 1000 Skopje. Republic of Macedonia.

² European College, Faculty for Economy and Management, Prishtina, Republic of Kosovo.
Address: Street: Gustav Mayer no.19 Prishtina, 10000, Republic of Kosovo.

³ Assistant Agricultural University, Faculty for Economy University of Shkoder "Luigj Gurakuqi", Republic of Albania.

*Corresponding author email id: ilaz.ameti@hotmail.com

Abstract – Based on direct interviews with manufacturers of organic potato, the authors made an economical evaluation parallel to conventional production. This was based upon realized gross margin. It ought to be mentioned that the farmers with conventional production were located mostly in plain areas, and those with organic production in highland areas.

The research showed that organic farmers have 20% lower incomes, in relation to conventional production. However, they reach 51-54 % higher prices on the market. In the same time, the cost price of organic potato is 9.11% higher.

Final results of production indicated that the gross margin in organic production is approximately 124% higher.

Keywords – Potato, Organic, Conventional, Price, Variable costs, Gross margin.

I. INTRODUCTION

Organic agriculture is defined as an ecological production management system that is based on minimal use of off-farm inputs, and on various practices which restore, maintain or enhance ecological harmony (Britannica Pocket Encyclopedia). This system is considered to be the oldest agro-eco-system in the world and has become most popular in the last century with the beginning of rejection of contemporary agro-chemical products. They mainly include mineral fertilizers invented in 18th century, as well as mass produced pesticides which are in use since 1940s.

It is considered that the inception of organic agriculture in Europe was in 1924 when dr. Rudolf Steiner¹ had held eight lectures about bio-dynamical agriculture in front of a group of 111 farmers in Kobierzyce, Poland (4). After that, the philosophy of organic agriculture was further developed by dr. Hans Muler in Switzerland, and lady Eve Balfour and Albert Howard in England (16).

Since then, the organic agriculture began its progressive growth, thanks to increasing concern about human health and preservation of natural environment. Therefore, in 2010 an attempt was made for organic agriculture to become world-wide organization. Accordingly, 160 countries joined the organization, with 37.2 million ha in total (11), out of which 33% belongs to Oceania, 27% to Europe, 23% to South America, 7% to North America and Asia, and 3% to Africa. Today, there are 1.8 million organic farms across the world (7). However, the

distribution of organic producers per regions significantly differs. Most of them (34%) are locate in Africa, 29% in Asia, 18% in Europe, 17% in South America, and 1% in North America and Oceania (13).

According to this data, the average sized organic farm in Oceania has 687 ha, in North America 144.7 ha, in Europe 37.2 ha, in South America 30.7 ha, in Asia 9.7 ha, and in Africa only 2.0 ha.

World market for organic products during 2010 amounted to a total of 44.5 billion EUR (15). Seven countries (six European and USA) take part in 80% of market: USA has 45.28% share, Germany 13.53%, France 7.6%, England 4.49%, Canada 4.27%, Italy 3.48% and Switzerland 2.65%.

Due to increase in production, social and market value of organic production, there have been numerous scientific researches around the world, covering different aspects of organic and conventional production. There was a briefing 8 in January, 2007 which regarded potato production, and various data from conventional and organic potato production were gathered (12). For example, in Southwest England, in conventional production, with total variable costs of 2,461 EUR/t, one can gain 42.5 t/ha potato, with gross margin of 2,525 EUR/ha. But, organic production in this region has average yield of 25 t/ha, with variable costs of 3,037 EUR/t. Since organic potato has relatively higher prices, its gross margin is also higher (7,225 EUR/ha). The same source establishes that in conventional early potato production in Northwest Germany with variable costs of 2,001 EUR/t yield is 27.2 t/ha, and gross margin is 2,813 EUR/ha. In organic early potato, however, there is 16.3 t/ha potato yield, with total variable costs of 2,556 EUR/t, and gross margin of 5,816 EUR/ha. In Poland, the yield in organic potato production is 21.0 t/ha. During the process, the variable costs were 821 EUR/t and gross margin 788 EUR/ha. This is probably because Poland has lower prices of inputs as well as outputs. Kainter et al (2010) in Bulletin No. 876 from University of Idaho presented information that in organic production on small farms (12.15-20.25 ha), where average yield is 42.0 t/ha, one can gain income of 5,656.89 EUR/ha, with gross margin of 4,794.11 EUR/ha. The larger farms (40.5-48.6 ha) have 5,098.67 EUR/ha of variable costs, and gross margin is 5,352.33 EUR/ha. Aleksandra Despotovic (2005) in her PhD dissertation on page 111 claims that with ecologically produced potato there was 14.4 t/ha potato yields, or 20% less than conventional production. The variable costs were 2,385.00 EUR/ha, which is 9% less than conventional

¹ D-r Rudolf Joseph Lorenz Steiner, born 25 (27?) February, 1861., in Donji Kraljevec, Croatia; died on 30 March, 1925. In Dornach, Switzerland (http://en.wikipedia.org/wiki/Rudolf_Steiner)

production, while the gross margin was 1,935.00 EUR/ha, i.e. 846.00 EUR/ha less than in conventional production. Varis et al (1996) conducted comparative research of conventional, integrated and organic production of potato. He concluded that the incomes in integrated and organic production are 10%, i.e. 30% lower in comparison with conventional one. The cost price in conventional production was 0.296 EUR/kg², in integrated production 0.282 EUR/kg, and in organic production 0.397 EUR/kg, or 34.12% higher than conventional production.

The goal of this paper is to reach comparative analysis of productive-economical parameters in conventional and organic way of potato production.

II. METHOD AND DATA

To reach the given aim, we conducted interviews with three individual conventional potato growers and two who produced potato in organic way. First ones live in southwest region, at 600m above sea level, others at 1,500m – 1,700 m above sea level in northeastern region of the Republic of Macedonia. This method we selected gave us an immediate insight to relevant information about production technology, yields, production value, and variable production costs. In determining production value and variable costs, we used prices presented on local markets in MKD, and then converted them in EUR by using annual exchange rate 61.15 MKD/EUR. We rated the production methods (conventional and organic) by comparing it with a gross margin.

In determining the gross margin, we used following formula:

$$GM = TI - VC,$$

where: TI – total income, and VC – variable costs.

All the data relate to 2015.

III. RESULTS AND DISCUSSION

1. Conventional Potato Production

Potato originated in South America (Peru, Chile) and it has been part of the human nutrition for over 8,000 years. Its arrival in Europe was due to Spanish conquerors who brought it back home from America in 1565. The first book about potato production was written in France in 1789, by pharmacist named August Parmentier. Potatoes came to the Balkan Peninsula over Austria and Italy, in Macedonia over Turkey (Egumenovski, 1984).

There are 189 countries worldwide that use conventional potato production, exploiting approximately 18.5 million ha from all continents (Table 1.). Europe dedicated over 6.6 million ha for potato cultivation, taking almost 36% of world production. The countries-members of EU use 2,147,051 ha (2006-2010) for potato cultivation, which makes over 32% of overall Europe's surface. Interestingly, at the global level potato fields are slightly enlarging, while in Europe and in the Republic of Macedonia there is obvious downfall. Anyhow, in the Republic of Macedonia,

potato is significant crop which has 22% share of the surface dedicated to vegetabl

Table 1 – Harvested areas and potato yields

| Year | Area harvested (ha) | | | Yield (kg/ha) | | |
|------|---------------------|---------|-----------------------|---------------|--------|-----------------------|
| | World | Europe | Republic of Macedonia | World | Europe | Republic of Macedonia |
| 2008 | 18131559 | 6255556 | 13554 | 18073 | 19475 | 13852 |
| 2009 | 18651839 | 6275139 | 13527 | 17670 | 19722 | 13134 |
| 2010 | 18601994 | 6103771 | 13037 | 17432 | 17608 | 13351 |
| 2011 | / | / | 13 037 | 15694 | 13567 | 13346 |
| 2012 | / | / | 13204 | 16153 | 14278 | 12399 |
| 2013 | / | / | 13474 | 16144 | 14405 | 14552 |
| 2014 | / | / | 13360 | 15955 | 14222 | 16512 |

Source: www.faostat.org, <http://makstat.stat.gov.mk/>

Accordingly, we can argue that world and European potato production increases, because average yields are mildly increasing. But in Macedonia, production is decreasing because of two factors: the harvested areas and potato yields.

Furthermore, average potato yields in the Republic of Macedonia are 22.5% under the world average and 27% under average European production (Table 1.). The difference becomes more obvious when comparing Macedonian production with EU's with average potato yields of 28,144 kg/ha. The information from FAOSTAT for 2010 revealed that only four European countries (out of forty which produce potato) have lower incomes. The Netherland, for example, had the highest yields in 2010 (46,338 kg/ha), and the Republic of Moldova the lowest (9,251 kg/ha).

2. Organization of Conventional Potato Production in the Republic of Macedonia

The potato production in conventional way has almost the same technology across the Republic of Macedonia. Usually, the technological process begins in autumn with soil cultivation followed by fertilization using organic manure or mineral fertilizers. In the spring time, after having ploughed the field, it is treated with insecticides. In our case, potatoes were planted manually at the end of March, and field was then treated with herbicides. The production then continues with several actions: 2-3 times during vegetation period crops need irrigation and pollination, and three insecticide treatments against Colorado potato beetle. In this case, potatoes are gathered with specialized machine aggregated with tractor. After that, potatoes are manually placed in string bag, making the classification (by size and eventual damage) along the way.

3. Organic Agricultural Production in the Republic of Macedonia

Organic production nowadays becomes more and more popular, because richer people are more concerned for their health and protection of the future of agriculture, biodiversity and living environment is highly emphasized. Number of countries practicing organic production is getting higher per year (75% of 214 countries in 2009) and as a result, from 1999 until 2010 the harvested area enlarged 3.4 times (13). The two countries which are main potato producers (in Europe) are Denmark (2.10%) and Germany (1.58%) (11).

² The prices in the original paper are expressed in FIM. Accordingly, the following relations were taken: 1 EUR: 5.94573 FIM (Finnish markkas), the rate which was fixed on 31.12.1999 when Finland joined EU zone.

In the Republic of Macedonia, the first serious venture (strategic, systematic) for organic agriculture emerged in 2000. By the end of 2003, the first organic inspection (control) was conducted, while first organic certificate was issued in 2004. Of course, none of this would have happened without FiBL (Research Institute of Organic Agriculture, Switzerland). In the same year the first Law for organic agriculture production (Official Gazette of RM, No. 16/2004) was enacted.

Consequently, having all legislation covered, in the same time following world trends and market demands, organic production in the Republic of Macedonia started its abrupt growth. During the period of seven years, the harvested area was 25 times larger (266 ha in 2005, 6,580.92 ha in 2011) (Table 2.). The number of organic farms followed enlargement of organic fields, but with 15.6 times less intensity.

Table 2 – Number and size of organic farms in the Republic of Macedonia

| Year | Area certification (ha) | Number of subjects | ha/subject |
|------|-------------------------|--------------------|------------|
| 2007 | 714.47 | 150 | 4.76 |
| 2008 | 1,029.00 | 226 | 4.55 |
| 2009 | 1,373.83 | 321 | 4.28 |
| 2010 | 5,228.00 | 562 | 9.30 |
| 2011 | 6,580.92 | 780 | 8.44 |

Source: MAFWC and our calculations

As we can see in Table 3, in the Republic of Macedonia organic crop production dominates (59.9%). Interestingly, there are very few garden cultures in organic production (only 4%). Therefore, the possibilities are not fully exploited, concerning the fact that the Republic of Macedonia has natural comparative advantages, in comparison with great number of European countries. Standardized law for organic agriculture (plant production, livestock production and processing, enacted with EU regulative 2092/91) passed in December, 2009 (Official Gazette of RM No. 146/2009) and in April, 2011 this law was amended (Official Gazette of RM, No. 53/2011).

Table 3 – Organic areas in Republic of Macedonia in 2011

| Crop groups | Area (ha) | | |
|----------------|---------------|---------|-----------|
| | In conversion | Organic | Cumulated |
| Cereals | 3,292.38 | 378.03 | 3,670.41 |
| Industry crops | 182.63 | 14.15 | 196.78 |
| Vegetables | 192.67 | 70.54 | 263.21 |
| Forages crops | 784.48 | 260.76 | 985.24 |
| Fruit crops | 764.25 | 206.87 | 971.12 |
| Grapes | 11.07 | 29.67 | 40.74 |
| Fallow | 406.18 | 47.24 | 453.42 |

Source: MAFWC

In the Republic of Macedonia, according to MAFWC, organic fields for potato productions are decreasing: 31.77ha in 2009, 20.27ha in 2010 and 16.77ha in 2011. This is happening because on Macedonian market there isn't enough authorized (according to European standards) preventive chemicals. However, the Republic of

Macedonia has appropriate natural conditions (soil and climate) for organic production because 519,000 ha or 20.1% of state's territory is at 1,100 m – 1,650 m above sea level (3). Nevertheless, that whole soil capacity isn't suitable for optimal production. Having taken the assumption that only 1% is suitable, then with average yield of 21.4 t/ha (at the researched farmers) there would be 111.000 t of organic produced potatoes per year.

4. Organization of Organic Potato Production in the Republic of Macedonia

The farmer No.1 grows potatoes on 1,600m above sea level. When we chose this location, we wanted it to be isolated, so we could eliminate possibility of pest infestation: *Leptinotarsa decemlineata*, *Phthorimea operculella*, *Gryllotalpa gryllotalpa*, *Aphis fabae*, *Meloydogynae*, and diseases: *Phytophthora infestans*, *Alternaria solani*, *Fusarium solani*, *Erwinia* spp. To ensure there is no damaged crops the field is monitored occasionally. The field is ploughed once in autumn, and again in spring. After some extra work around the soil is made, the potatoes are planted around April 20th. For this purpose they use potato seeds which were preserved from last year production (1,200-1,500 kg/ha). Their average size is 25-38 mm, and they are planted 35 cm away from each other; the distance between rows being 65-70 cm. Three people use planting machine to finish the process. Only ten days after planting the field is shallowly ploughed, and it is repeated after the plant is approximately 10-15cm high. In this area, for there aren't any water recipients, there is no need for irrigation.

When potato's leaves start to lose their mass, it is sign that they need to be gathered, which occasionally happens around September 10th. Again, like in conventional production, machine collects potatoes, and classification is done manually while putting them in stripe bags with capacity of 20 kg. In the same time, they select potato seeds with diameter of 28-35 mm for next year's reproduct material. Potatoes are then stored in magazines with stable temperature of 8-10 °C and with 60-80% humidity. This farmer rents (compensation) machines for this process, because he has none of his own.

In case of farmer No. 2 potatoes are grown on 1,650 m above sea level. After autumn's plough, the field is fertilized with approximately 30,000 kg/ha organic manure and the surface treated with rotary cultivator, to ensure fertilization. In spring time it is ploughed one more time, after which the rows are made, and plantation starts immediately. After they are planted, potatoes are covered with soil using plough pulled by horse. When plants reach 30 cm, they are treated with extract of so called showy mullein (*Verbascum* sp.). The plant's leaves are grinded with mortar and pestle and with small amount of water strained into a bucket, after which it is diluted with large amount of turbo-atomizer and applied. During vegetation period, the crops are treated with Lactofol and Ecoorganic.

In second half of September harvesting starts with tractor machine and continues with manual gathering in stripe bags.

5. Economics of Potato Production in the Republic of Macedonia

In the process of conventional potato production there are on average 23.83% higher yields than in organic production (average, farm No.1 + farm No. 2). Individually (farm No.2), with usage of approved fertilizers and pest control mechanisms, they could have higher results (for 1,13%) in comparison with conventional production, but the material costs are also higher. Because farm No. 1 rents mechanization, total amount of variable costs is almost the same as one in conventional production (Table 4.). The cost price of organic potato is around 0.1185 EUR/kg which is 9.1% higher than conventional.

Table 4 – Comparative review of variable costs

| Type of technology | Type of costs (EUR/ha) | | | | Total |
|--------------------|------------------------|---------------------|-----------|----------|----------|
| | Salary | Fuel and lubricants | Materials | Services | |
| Organic I | 160.14 | / | 595.98 | 2,092.87 | 2,848.99 |
| Organic II | 309.23 | 311.62 | 1,195.22 | 407.23 | 2,223.30 |
| Average, organic | 234.68 | 155.81 | 895.60 | 1,250.05 | 2,536.14 |
| Conventional | 1,053.00 | 345.60 | 1,333.20 | 147.20 | 2,879.00 |
| Differences | -818,32 | -189.79 | -437.22 | 1,102.85 | -342.86 |

The researched farmers sell organic potato to familiar clients from local market for average price of 0.3762 EUR/kg, which is 53.42% higher than potatoes from conventional production.

Table 5 - Comparative review on the gross margin

| Type of technology | EUR/ha | | | Index |
|--------------------|-------------------|----------------|--------------|-------|
| | Production income | Variable costs | Gross margin | |
| Conventional | 6,499.34 | 2,879.00 | 3,620.34 | 100 |
| Organic I | 10,954.87 | 2,848.99 | 8,105.88 | 224 |
| Organic II | 5,232.18 | 2,223.30 | 3,008.88 | 83 |
| Average, organic | 8,093.52 | 2536.14 | 5,557.38 | 154 |

Market conditions, such as those in 2010 in the Republic of Macedonia, led to relatively high gross margin. This fact should present a challenge for the farmers who don't have potato in their assortment of production, especially those who live in highland areas, or have ability to transfer potato production in these areas.

IV. CONCLUSION

The organic production, worldwide and in the Republic of Macedonia, is rapidly growing. This is because new information showed that this system secures safe food and good income.

If Macedonian farmers fully implement this system, it would be no stress in this segment of market. Macedonians use 26.2 kg potato per capita, which means that they need 53,676.359 kg for domestic consumption. In the same time, netto amount of produced potato is 156,457.037 kg. Consequently, with acceptance of constantly decreasing potato yields in organic production (for 19.7%) in relation with conventional production, netto production will amount to 118,907.348 kg. This means that there would be enough potato for domestic production and for export.

Higher gross margin, realized in organic production will economically stimulate Macedonian farmers to accept this system.

REFERENCES

- [1] Despotovic Aleksandra (2005). Megjuzavisnost organizaciono-ekonomskih ciniaca i rezultata u proizvodnji krompira u Crnoj Gori, doktorska disertacija, Univerzitet u Beogradu, Poljoprivredni fakultet (Interdependence of organizational and economic factors and results in potato production in Montenegro, doctoral dissertation, University of Belgrade, Faculty of Agriculture), Beograd-Zemun.
- [2] Egumenovski P. (1994). Odgledovanje na kompirot (Growing up for the kompirot), ZOP "Nova Kniga", Skopje.
- [3] Painter K. et al (2010). Costs and returns for irrigated organic russet Burbank potato production in Southern Idaho, Bul 876, University of Idaho.
- [4] Paull J. (2011). Attending the first organic agriculture course: Rudolf Steiner's agriculture course at Koberwitz, 1924, European Journal of Sciences – Volume 21, November 1 (2011), pp 64-70.
- [5] Pesevski M., Zivkovic D. (2004). Energetska efikasnost proizvodnje krompira na porodicnim gazdinstvima, Tehnika – Menadzment (Energy efficiency of potato production on family farms, Technique - Management), 54 (4), 21-28, Beograd.
- [6] Varis E. et al (1996). Comparasion of conventional, integrated and organic potato production in field experiments in Finland, Acta Agricultural Scandinavica, Section B – Soil & Plant Science, Volume 46, Issue, 1996, pp 41-48.
- [7] Willer Helga, Lukas K (Eds.) (2011). The World of Organic Agriculture, Statistics and Emerging Trends 2011. FIBL-IFOAM, Bonn and FIBL, Frick.
- [8] <http://www.fao.org/3/a-il127e.pdf>
- [9] <https://www.daera-ni.gov.uk/articles/organic-potato-production>
- [10] <http://faostat.fao.org/site/377/default.aspx#ancor>
- [11] <http://faostat.fao.org/site/570/DesktopDefault.aspx?PageID=570#ancor>
- [12] <http://makstat.stat.gov.mk/pxweb2007bazi/Database>
- [13] www.organic-world.net
- [14] <http://www.pan-europe.info/Archive/publications/potato.htm>
- [15] www.fibl.org
- [16] <http://www.potatoes.co.za/SiteResources/documents/Organicpotatoes.pdf>
- [17] www.fibl.org/fileadmin/.../mm-organic-agriculture120214-graphs.pdf
- [18] www.wikipedia.org/wiki/organic_farming
- [19] http://ec.europa.eu/eurostat/statisticsexplained/index.php/The_EU_potato_sector_-_statistics_on_production,_prices_and_trade

AUTHORS' PROFILES



Ilaz Ameti State University of Tetovo, Faculty for bussines administration, Skopje, Republic of Macedonia. Address: Street: Kongresi Manastirit, Cair 1000 Skopje.



Naser Ameti European College, Faculty for Economy and Management, Prishtina, Republic of Kosovo Address: Street: Gustav Mayer no.19 Prishtina, 10000, Republic of Kosovo.



Oriola Vukaj Assistant Agricultural University, Faculty for Economy University of Shkodër "Luigj Gurakuqi", Republic of Albania. Address: Sheshi 2 Prilli, Rruga Studenti 24, Shkoder, Albania.