

## DAIRY FARMS GROSS MARGIN – CASE OF KOSOVO

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The economic efficiency of dairy farms in Kosovo is studied. It's a descriptive and quantitative survey and the random sampling technique was used to select the respondents ( $n = 138$ ). Two methods of data analysis were used, namely; descriptive statistics, and gross margin analysis. The objective of this study was the comparison of the performance of the medium (5–10 cows) and large (11–50 cows). In Kosovo the largest farms are managing 50 milking cows. The authors are defining the small farms those who are breeding 1-4 cows (the most common farm size), 5–10 cows as medium farms and 11–50 cows as large ones, because the farm sizes are not yet determined by Kosovo legislation. The annual farm income, the cost of milk production, and the problems faced by the farms were studied.

**Key words:** dairy farm; gross margin, farm income; income per cow; sized farms

## БРУТО ПРИХОД КАЈ МЛЕЧНИ ФАРМИ – СОСТОЈБА ВО КОСОВО

Проучувана е економската ефикасност кај млечните краварски фарми во Косово. За да се избераат примероците ( $n = 138$ ), користени се описни и квантитативни истражувања, како и техника на случаен избор. Употребени се две методи за анализа на податоци и тоа: дескриптивна (описна) статистика и анализа на бруто приход. Целта на студијата беше споредување на перформансите помеѓу средни (5–10 крави)<sup>1</sup> и големи краварски фарми (11–50 крави). Во Косово најголемите фарми се со 50 молзни крави. Авторите за дефинирање на мали фарми ги земаат оние во кои се одгледуваат 1-4 крави (најчеста големина на фарма), 5–10 крави како средни фарми и 11–50 крави како големи. Бидејќи големината на фармите се уште не е утврдена во законодавството на Косово беа проучувани: годишниот приход по фарма, трошоците за производство на млеко и проблемите со кои фармите се соочуваат.

**Клучни зборови:** млечни фарми; бруто приход; приход на фарма; приход по крава; краварски фарми

## INTRODUCTION

Kosovo continues to be a predominantly rural economy with 12 percent of GDP generated by agriculture, which is also the largest employing sector, accounting for approximately 35% of total employment (Qeveria, 2013).

The average agricultural land per capita in Kosovo is low (between 0.15 and 0.18 hectares) which is less than half of the EU average, and the overall area planted with forage crops was 110,314 ha which counts for 37 percent of the total cultiva-

ted area (MAFRD, 2014). Fragmentation and small size of agricultural plots represent a major barrier for the agrifood sector growth and competitiveness. Around 90 percent of the rural population own agricultural land, 55 percent own livestock, while 15 percent of farm production is used for domestic consumption (World Bank, 2011).

Agriculture still remains subsistence-oriented due to a very small average size of farms, on average, the farm size is 3.2 ha agricultural land (including common land/pasture) and about 3.9 cattle (about 2 milking cows). Most of the farms are mix-

ed ones and only 1–2 percent of agricultural land is used by commercial farms, more than 10 ha/farm (MAFRD, 2014).

The dairy sector is a very important activity in Kosovo agriculture, as milk is one of the largest agricultural commodities and generates a regular flow of income to the farmer's family throughout the year. However the success of dairy farms largely depends on the effective management of operations. According to Agriculture Census in Kosovo, there are 130,775 agricultural farms, which are breeding 261,689 cattle (51 percent of which milking cows). It is estimated that today there are about 91,200 livestock farms in Kosovo (ASK, 2015).

Most dairy farms produce for self-consumption, thus small and middle-sized farms are the dominant ones. Domestic raw production accounts for more than 4/5 of the milk consumption and processing. An increase in domestic production of cows' milk will help to reduce the quantity of imported milk. According to the MAFRD (2014) estimates the average number of dairy cows in agricultural households is 1–4 heads, who constitute the majority of dairy cows in production (94.2%). Farms with more than 5 milking cows which are considered commercial farms, during 2014 were 5,472 (7.8 percent of the dairy farms). These farms are the main suppliers to the dairy processing industry with a total of about 62 million liters of milk per year, or about 18 percent of the milk produced in the country (MAFRD, 2015; and authors' calculation). The rest is used for feeding calves, for own consumption, sold as raw milk (in one of 19 dairy processors) or white cheese on the various local unregulated (green) markets (Nushi, 2010; Bytyqi et al., 2014). Traditional dairy products are yogurt, butter, curd and different kinds of cheese.

Many small scale farms in Kosovo have experience in breeding the local breed, which is smaller in size, produces less milk and has modest feeding requirements. The dairy producers have preserved many of their traditional practices of husbandry and management with imported cattle, despite the fact that they have higher milk production capacity and special feeding requirements. This is one of the main causes behind the low production performance and high production cost. More specifically, typical local dairy farms face the following problems: a) low yield due to health problems and improper feeding, b) a high percent of culled cows due to mastitis and other pathological conditions, c) reproductive problems caused by varieties of factors among which the most important is poor farm management, hygiene conditions at the farm

and thereby low revenues (Bytyqi et al. 2009). Therefore, there was need to assess the economic efficiency of smallholder dairy farmers.

Direct payments for dairy cows started in 2009 and were given to farmers that owned at least 5 ears tagged dairy cows and registered in Identification and Registration system (I&R system). In 2012 the amount of the budget for the dairy cows' payment was three times higher compared to 2009 (FAO, 2014). In 2013, direct payments for dairy cows were distributed to 5,075 farmers with a total of 42,119 heads and the amount was 50 Euro/cow (MAFRD, 2014). The expansion of dairy sectors depends, among other things, on the profitability of milk production at farm level. In Kosovo, very few studies are conducted on the milk production profitability; therefore the present study was undertaken to evaluate the gross margin of medium and large dairy farms. According to Delgado et al. (2003) larger producers may survive with low unit profit because of the large volume of business; in fact, such producers may deliberately push unit profit to low levels to squeeze out smaller producers from the market. However, as emphasized by Moran (2009) to be successful, farmers must be able to manage their resources to meet the challenges of varying costs, prices, climatic conditions, understanding of the technology of the end product, and the ability to run the day-to-day operations at a profit and to make wise decisions regarding investments in its sustainable future.

Returns in dairy farming are deeply determined by variable cost and production cost and the correlations existing between farm size, milk yield, variable cost, total cost and milk price are important to be studied and kept under control by farmers (Dhuyvetter, 2010).

This paper has presented the findings and recommendations of the dairy farms analyses in Kosovo, which had been carried out during 2015. The findings of this study are important because they reveal some information to help dairy farmers and all stakeholders in the dairy industry to try and improve economic inefficiency.

## METHODS AND MATERIALS

This study was conducted to collect on farm data pertaining to revenue and expenses on medium and large sized dairy farms and make an economic analysis based on gross margin. In brief, the gross margin is the total income minus the total expenses (variable cost). Variable cost includes the

cost of: feed (from farm fodder production and feed bought in the market), labor (from family member and hired labor), veterinary (including and insemination), water, electricity, transportation, and miscellaneous.

A list of dairy farms, breeding more than four cows, is available from the Ministry of Agriculture, Forestry and Rural Development (MAFRD) based on the direct payments. The random sampling techniques were used to select the respondents. One hundred-thirty-eight dairy farms were monitored and interviewed in the seven regions of Kosovo.

**Data collection:** A structured questionnaire was used for collection of all information related to dairy farming. The questionnaire was examined by a panel of specialist to verify its content and validity. To avoid confounding questions and for clarity, the questionnaire was pre-tested on a pilot group of seven farmers. In the case of inconsistent questions, it was modified accordingly. Face-to-face interviews were conducted. According to the questionnaire the following data were recorded:

**Income and expenses:** (i) Milk yield per cow; (ii) Milk production per farm; (iii) Quantity of milk sold; (iv) Price of milk sold; (v) Quantity and price of meat sold (live body weight); (vi) Expenses for the fodder production; (vii) Expenses for the animal feed bought in the market; (viii) Expenses for veterinary service and cow's insemination; (ix) Expenses for fuel, electricity, water, trips, lease on the land, and the land tax; (x) Estimated cost of labor needed to take care of the herd per year. (xi) Incomes per Farm from sales of milk and meat (IpF milk+meat); (xii) Incomes per Farm

from sales of milk (IpF milk); (xiii) Gross Margin per Cow from sales of milk and meat (GMpC milk+meat); (xiv) Gross Margin per Cow from sales of milk (GMpC milk).

Gross Margin per cow of milk produced is a key measure for determining how successful a dairy operation has been historically as well as an indicator of the financial success the dairy might have in the future.

**Technical data, such as:** Insemination (artificial or natural mating); Milking (by machine or by hand); and type of animal feed used (including microelements or premix).

It was observed that in the monitored and interviewed dairy farms, the family members provided all or most of the labor resources. The family members are not compensated on a set wage basis, but they withdrew money as needed to meet living and other personal expenses.

**Data analysis:** For data analysis was developed a model in Microsoft Excel program, while the statistical data processing was done with Statgraphics Centurion XVI.

## RESULTS AND DISCUSSIONS

Data on number of cattle and cows per farm, milk yield, IpF milk + meat, IpF milk, Gross Margin per Cow (GMpC milk+meat and GMpC milk), milk cost, the ratio milk quantity sold in the market vs total milk production, prices of milk and meat sold, milking and insemination method, for medium and large dairy farms, are summarized in Table 1.

Table 1

### Technical data

Number of heads	No of Farms	No of cattle per farm	No of cows per farm (average)	Milk yield (liter)	IpF (milk + meat) (Euro)	IpF (milk) (Euro)	Variable cost per farm	GMpC (milk + meat) (Euro)	GMpC (milk) (Euro)
5–10 cows (small size farms)	68	12,54	7,25	3166	8168	7799	8486.4	-45.2	-96.4
11–50 cows (medium size farms)	70	37,85	20,93	3932	29974	28086	24992.7	193.93	101.83
<b>Total</b>	<b>138</b>	<b>25,38</b>	<b>14,19</b>	<b>3555</b>	<b>19228</b>	<b>18089</b>	<b>16859</b>	<b>76.1</b>	<b>4.17</b>
Number of heads cows	Milk cost (Euro/kg)	Milk sold vs milk produced (%)	Price of milk sold (Euro)	Price of meat sold (Euro)	Milking		Insemination		Feed expense vs variable cost (%)
					By hand (%)	By machine (%)	Natural (%)	Artificial (%)	
1-10	0,369	62,96	0,347	2,69	44,1	55,9	44,1	55,9	66,4
11-50	0,298	71,60	0,333	3,02	11,4	88,6	37,1	62,9	71,8
<b>Total</b>	<b>0,333</b>	<b>68,2</b>	<b>0,336</b>	<b>2,85</b>	<b>27,5</b>	<b>72,5</b>	<b>40,6</b>	<b>59,4</b>	<b>69,2</b>

Source: Data from the farm visits and interviews.

The milk yield of large sized farms (ranging from 2000 to 6238 kg/cow) is 24.2 percent higher than the medium sized farms (ranging from 1633 to 5742 kg/cow). The milk cost of medium farms is 23.8 percent higher than large farms, while the milk price of medium sized farms (ranging from 0.25 to 0.60 euro cents/kg) is 4.2 percent higher than the large sized farms (ranging from 0.22 to 0.50 euro cents/kg). About 12 percent of the farms in both medium and large sized are selling the milk directly to the market and getting the highest price of 0.50-0.60 euro cents/kg.

In variable cost, feed took the highest share by 69.2 percent, ranging from 66.4 percent for the medium farms to 71.8 percent of the large farms, because the large farms are spending more on concentrate feed as the milk yield is higher compared with medium farms.

According to Moran (2009) several cost efficiency indicators can be calculated as below:

Feed cost ratio (%): Total feed costs/Total farm income  $\times 100$ . In our case the values are 60.6 percent for the all farms, ranging from 69 percent per medium farms to 59.9 percent for the large farms.

Variable cost ratio (%): Total variable costs/Total farm income  $\times 100$ . The value is 87.6 percent of the all farms ranging from 103.9 percent for the medium farms to 83.4 percent for the large farms. Both figures are higher from the study conducted by Bytyqi et al., (2014).

According to the observation of the main author (during the interview visits) and the data taken by the answers of the farmers, large farms had better access to artificial facilities (62.9 percent vs 55.9 percent) and milking machine (88.6 vs 55.9) compare to the medium farms. In addition, 25 percent of medium farms and 57.1 percent of large farms raise heifers in their herds.

The returns of the dairy farms came from the sale of milk and meat. The highest share of total returns for all categories of farms came from the sale of milk (93.7–95.5%) and sale of calves (4.5–6.3%).

The GMpC milk+meat and GMpC milk have negative values for the medium sized farms – 45.2 Euro/cow and – 96,4 Euro/cow, respectively, while the large farms have positive value (193.93 Euro/cow and 101.83 Euro/cow, respectively).

However, for the all farms monitored, the values are positive 76.1 Euro/cow for the GMpC milk + meat and 4.17 Euro/cow for the GMpC milk. According to MAFRD (2015b) analysis of competitiveness of agriculture of Kosovo shows that currently only a small share of farms can compete in the regional market, EU and international level.

The IpF milk+meat in the large sized farms are 267 percent more than the medium ones (29974 Euro vs. 8168 Euro) while the IpF milk on large farms is 260 percent more than the medium farms (28086 Euro vs. 7799 Euro). These significant differences are coming as the result of the number of cows, milk yield, the price of milk and meat sold, that in most of the cases are higher at large sized farms compare with medium sized ones. The IpF milk + meat, IpF milk, GMpC milk + meat and GMpC milk are several times higher at large farms compared with medium ones because most of the medium farms are losing money from milk production, as the cost of production is very high. With respect to dairy, some studies have found a negative relationship between expenditures for purchase feed per cow and measures of financial profitability (Gloy et al, 2001). In addition, several studies have reported that the highest share of the milk production cost is represented by feeding, which is more sensitive to variation than average milk cost; therefore, milk economics deeply depend on feeding cost. (Bytyqi et al., 2014; Popescu 2009). A higher milk yield requires a higher production cost, an aspect that farmers should take into consideration and handle in the most efficient way (Popescu, 2014).

The farm inefficiency decreased as farm size increased, it means that there is ample scope to raise farm profitability by improving economic efficiency and minimizing profit loss. Production efficiency measured by the amount of milk sold per cow is often thought to be a strong indicator of management ability, and is frequently considered to have an important impact on profitability. Many studies have reported a positive relationship between milk production per cow and various measures of financial success (Gloy et al., 2001).

Statgraphics Centurion XVI was used for statistical data processing, comparing medium and large farms for: IpF milk+meat vs. Number of cows/year; IpF milk vs. Number of cows/year; and Milk Cost (cent/Euro) vs. Milk Yield, and results are shown below:

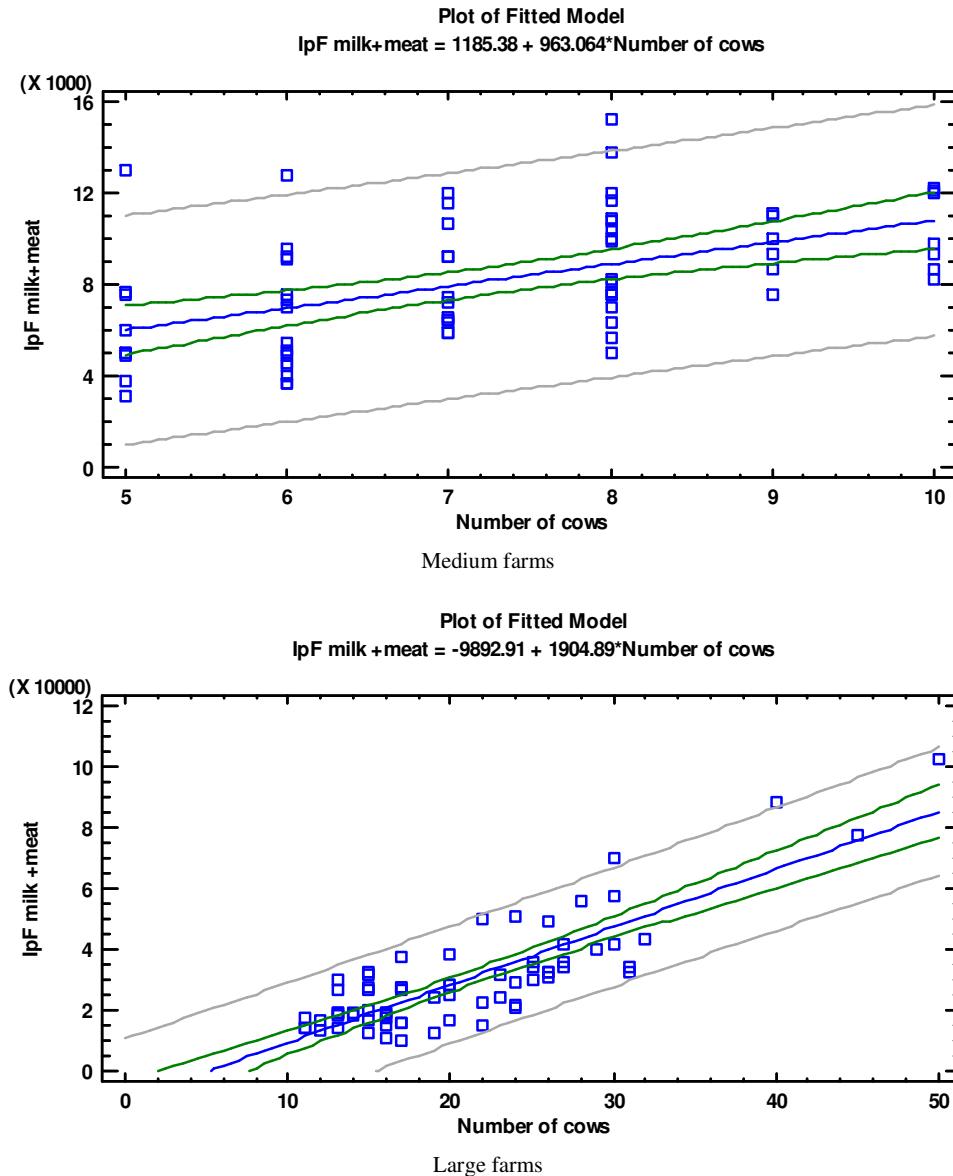


Fig. 1. Medium and Large farms IpF milk+meat vs. Number of cows/year

**For the medium farms:** IpF milk+meat =  $1185.38 + 963.064 \times \text{Number of cows}$ . The correlation coefficient equals 0.51032, indicating a moderately strong relationship between the variables.

**For the large farms:** IpF milk + meat =  $-9892.91 + 1904.89 \times \text{Number of cows}$ . The correlation coefficient equals 0.840564, indicating a moderately strong relationship between the variables

Since the P-value in the ANOVA table is less than 0.05, for both groups of farms, there is a statistically significant relationship between IpF milk + meat and Number of cows at the 95.0% confidence level.

**Medium farms:** IpF milk =  $74.5926 + 1065.36 \times \text{Number of cows}$ . The correlation coefficient equals 0.559758, indicating a moderately strong relationship between the variables.

**Large farms:** IpF milk =  $-10464.1 + 1842 \times \text{Number of cows}$ . The correlation coefficient equals 0.815097, indicating a moderately strong relationship between the variables.

Since the P-value in the ANOVA table is less than 0.05, for both groups of farms, there is a statistically significant relationship between IpF milk and Number of Cows at the 95.0% confidence level.

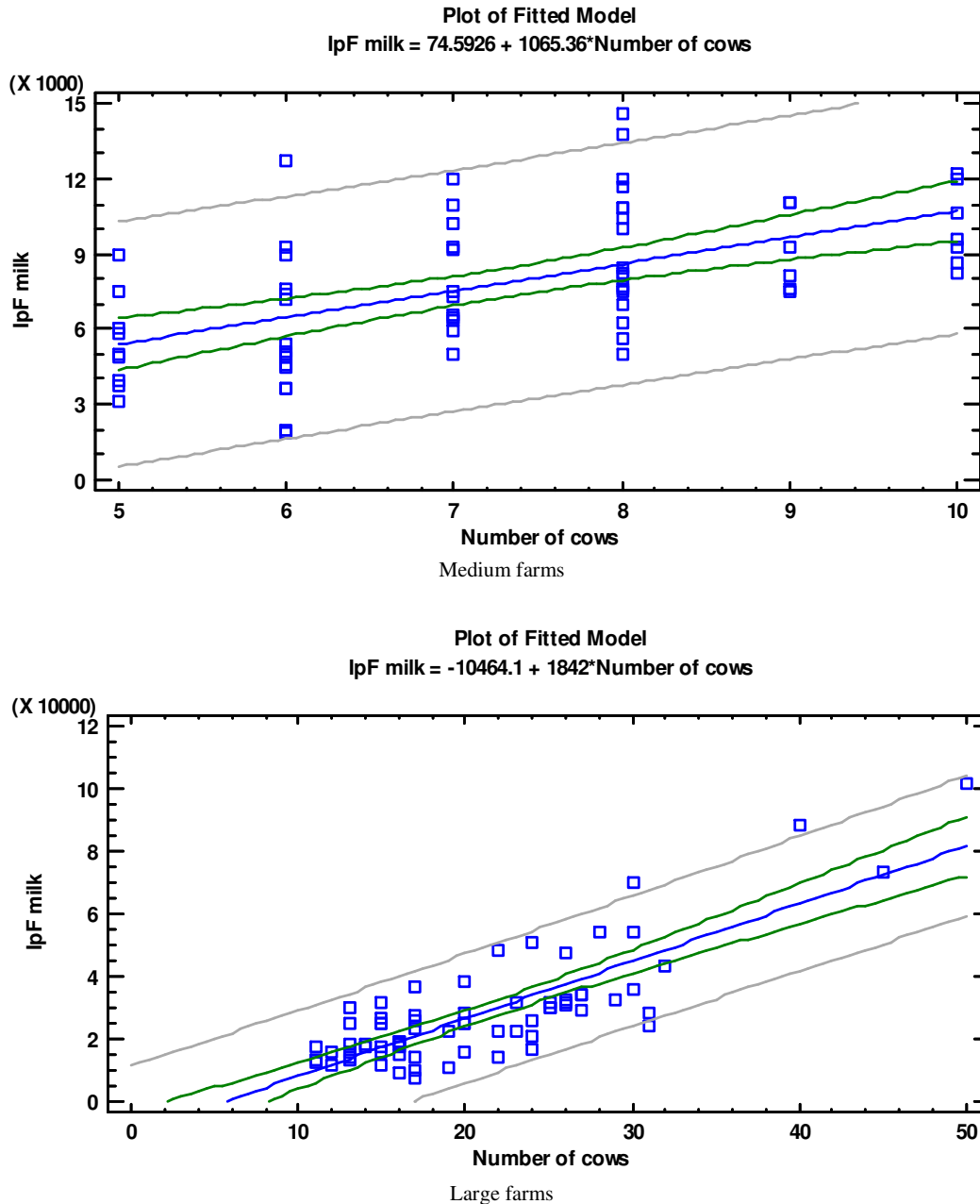


Fig. 2. Medium and Large farms IpF milk vs. Number of cows/year

**Medium Farms:** Milk cost (euro cents/kg) =  $0.619292 - 0.0000730186 \cdot \text{Milk Yield (kg)}$ . The correlation coefficient equals  $-0.545522$ , indicating a negative moderately strong relationship between the variables.

**Large farms:** Milk Cost (euro cents/kg) =  $0.466738 - 0.0000378847 \cdot \text{Milk Yield (kg)}$ . The correlation coefficient equals  $-0.557623$ , indicating a negative moderately strong relationship between the variables

Since the P-value in the ANOVA table is less than 0.05, for both groups of farms, there is a statistically significant relationship between Milk Cost (euro cents/kg) and Milk Yield at the 95.0% confidence level.

These data of our study show that large sized farms had better results than the medium sized farms for milk yield, production cost, incomes per farm, incomes per cow, gross margin per cow, use of artificial insemination and milking machine.

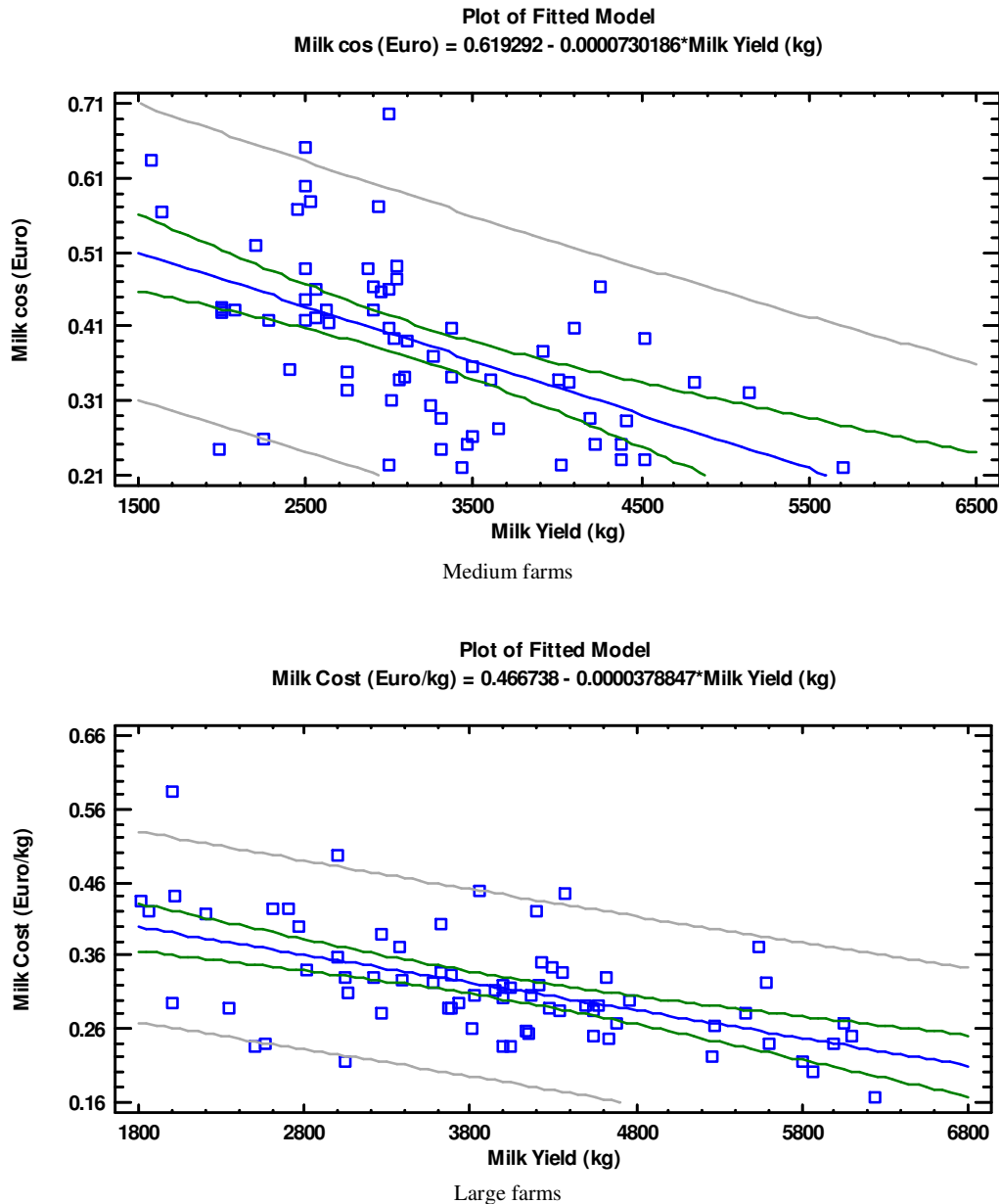


Fig 3. Medium and Large farm Milk Cost (euro cents/kg) vs. Milk Yield (kg)

## CONCLUSION

Cow milk is the most important livestock production in Kosovo. In the recent years, attempts are being made for the production of milk to move from production for home consumption, in production for the market, to improve conditions of breeding, application of good practices in agricultural farms of milk production and increase capacity of farmers for the production of high quality milk.

Most farmers intuitively think about farm costs and returns. However, greater use should be

made of ways to make them become aware of the relative importance of all their financial inputs, in terms of their contribution to the cost of production per kilogram of milk produced on the farm.

The economic results of our study are much better for large sized farms than for medium sized farms such as milk yield (24.2 % higher); milk cost (23.8% less); better access to artificial facilities (62.9 percent vs 55.9 percent) and milking machine (88.6 vs 55.9). The GMpC milk+meat and GMpC milk have negative values for the medium sized farms -45.2 Euro/cow and -96,4 Euro/cow,

respectively, while the large farms have positive value (193.93 Euro/cow and 101.83 Euro/cow respectively). The IpF milk+meat and IpF milk in the large sized farms are 267% and 260%, respectively, more than the medium ones. The farm inefficiency decreased as farm size increased, it means that there is ample scope to raise farm profitability by improving economic efficiency and minimizing the profit loss.

In our opinion, maybe the farmers are satisfied with their situation because they are supported from MAFRD with direct payments of 50 Euro/cows. In addition, they have profited from other crops of their farms (cereals and/or vegetables) and they do not understand that they are losing money from milk production.

As the medium sized farms have negative incomes for the milk production is a must for extension service to train farmers to keep the financial record separate for milk, and other crops. In addition the extension service needs to train the farmers for better: management of their farm, feeding system, fodder production, animal health etc. Developing a better understanding of the factors that influence dairy farm profitability is potentially important to many parties. Farm managers should be able to use this knowledge to improve their operations and increase profitability. Extension educators and other firms that interact with farmers can use the results to assist farmers in improving the profitability and long-term viability of their operations. The results may also serve to guide extension programming as topics are prioritized for educational emphasis.

## REFERENCES

- [1] ASK,: Rregjistrimi i bujqesise ne Republiken e Kosoves 2014, Rezultate perfundimtare (Agriculture Census in Republic of Kosovo 2014, Final Results) (2015).
- [2] Bytyqi, H., Thaqi, M., Hoxha, F., Misini, A., Haxhija, B., Cabrera, V,: Economic assessment of dairy farm production in Kosovo. *Proceedings of the 11<sup>th</sup> European IFSA Symposium, 1-4 April 2014, Berlin*, pp. 1486–1492, 2014.
- [3] Bytyqi, H., Rrustemi, M., Mehmeti, H., Kryeziu, A., Gjinovci, V., Gjonbalaj, M.: Milk production in commercial cattle dairy farms in Kosovo. *Stočarstvo* **63**, (4), 275–285 (2009).
- [4] Delgado, C., Narrod, C., Tiongco, M.: *Policy, technical and environmental determinants and implications of the scaling-up of livestock production in four fast-growing developing countries: A synthesis*. Final report of IFPRI–FAO livestock industrialization project. Phase II. IFPRI, Washington DC (2003).
- [5] Dhuyvetter, K.: Factors impacting dairy profitability: An analysis of Kansas farm management association dairy enterprise data. *Ag Manager info*, August, 1–18 (2010).
- [6] FAO.: *Agriculture and agricultural policy in Kosovo. FAO-Agricultural Policy and European Integration in Southeastern Europe*, pp 107–120 (2014).
- [7] Gloy, B. A., Hyde, J., LaDue, E. L.: Dairy farm management and long term farm financial performance. *Agricultural and Resource Economics Review* **31** (2), 233–247 (2001).
- [8] MAFRD: Program for agriculture and rural development for 2015. (2015).
- [9] MAFRD: *Green Report Kosovo 2014*. Ministry of Agriculture, Forestry and Rural Development. 1–143 (2014).
- [10] Moran, J.: Key performance measures of farm profitability. In: *Business Management for Tropical Dairy Farmers*. Landlinks Press, Australia, pp 157–171, 2009.
- [11] Nushi, M.: Review of agriculture and agricultural policy in Kosovo under UNSCR 1244/99. In: *Agriculture in the Western Balkan Countries. IAMO Studies*: pp 123–144, 2010.
- [12] Popescu, A.: Research on profit variation depending on marketed milk and production cost in dairy farming. *Scientific Papers Series “Management, Economic Engineering in Agriculture and Rural Development”*. Vol. **14** (2), 223–230 (2014).
- [13] Popescu, A.: Analysis of milk production and economic efficiency in dairy farms. *Animal Sciences and Biotechnology*, Vol. **42** (1), 507–512 (2009).
- [14] Qeveria: Deklarata e Politikave Prioritare Afatmesme 2014–2016. *Zyra e Kryeministrit*. 4–40 (2013).
- [15] World Bank: Agriculture and rural development project. *Document of the World Bank Report No. 61497-XK*. pp. 1–55 (2011).