STRUCTURE OF FARMS WITH LIVESTOCK ENTERPRISES
AND ITS IMPORTANCE FOR AGRICULTURAL POLICY

Rade Popovic

Abstract:

The main objective of this paper is to explore livestock farm structure as a baseline to agriculture policy measures. The relations were tested on the case of dairy farms structure and its response to milk premiums during period 2001-2014. By economic size, small and middle sized livestock farms in Serbia are dominant, with 97.2% share they own two third of livestock units. Farms position in food supply sector has changed, as well as position of other participants in successive levels of food chains, during previous decade. Bigger livestock farms become more favourable for processors because of higher quantity and quality of products. The findings show that agricultural policy measures in dairy sector, since 2009 become focused on bigger farms. Unfavourable market conditions as well as farmers demographic structure with neglecting of importance of small and middle sized dairy farm from policy makers resulted in further cow milk production decrease.

Key words: livestock farm, farm structure, dairy farm, agricultural policy

Introduction

Animal husbandry is main branch of Serbian agriculture. It is dominantly based on family farms, which own 84% of livestock units (LSU). During period between two Agriculture Censuses in 1960 and 2012 farms passed through significant structural changes. Number of livestock farms decreased with faster rate than total number of farms, what is similar in

1 Rade Popovic, Associate professor, University of Novi Sad, The Faculty of Economics Subotica, 24000 Segedinski put 9-11, Phone no. +381638041301; popovicr@ef.uns.ac.rs
most of EU countries. Total number of LSU decreased over time, but with slower rate. All processes resulted in increase of average number of LSU per farm from 2 to 3, according methodology of LSU used before 2012. Farms productivity and use of resources like agricultural land and capital also increased over time.

Livestock farm is the basic organisational unit of livestock production. Good understanding of livestock farm structure is main precondition for effective agricultural policy. How they are organised, quantity and quality of resources that use, resource distribution, applied technologies, development dynamics and much other information are necessary for agricultural policy. Primal source of farm structure data is Agricultural Census, which gives base of understanding of farm structure and its development patterns. With such information, choice of real development goals and appropriate agricultural policy measures, its monitoring and evaluation of effects, become a possible.

Broad literature about structure of farms usually exploit analyses by economic and sometimes by physical units of farm size (Kay, Edwards, Duffy, 2008; Davidova et al, 2013). Similar approaches are used for statistical or political purposes. Economic terms of farm size have advantage on physical units, because of ability to compare whole range of various types of farms. Most used economic measures of farm size are: total revenue per year, value of farm production, value of farm assets, standard output, cash farm income, etc. In EU common approach to measure farm size is to use standard output (SO) as economic term, and number of hectares of utilised agricultural area (UAA) as physical measure. The SO is the average monetary value of the agricultural output at farm-gate price of each agricultural product (crop or livestock) in a given region. It is calculated per hectare or per head of livestock, by using basic data for a reference period of 5 successive years (EC – FADN, 2014).

In this paper is applied EU approach (Davidova et al, 2013), where small farms are defined as those with SO less than 8,000 EUR or with less than
5 ha of UAA. Besides that, it is added category of middle size and big farm. Farms with SO from 8,000 to 25,000 EUR, or with 5 to 20 ha of UAA are treated as middle size. Farms above those levels are in category of big farms.

Analysed data are from publication and databases from Agricultural Censuses conducted in 1960 and 2012. Used statistical data are without data for Kosovo and Metohia.

**Livestock farm structure**

In Serbian agriculture 489,364 farms are occupied with livestock production. Structure of farms by organisational form in Serbia is not differing much from many other countries. From all farms occupied with livestock production in Serbia, 99.87% are family farms. Rest of 0.13% farms are legal entities, which are more specialised in livestock production and own 16% of livestock units (LSU).

**Graph 1** *Number of farms and its livestock units by economic size class in 2012.*
In structure of livestock farms by economic size class (Graph 1), the most numerous types are small farm with 83.9% share and possession of 40.4% of LSU. One third of LSU is owned by 2.8% of big farms, and some above one quarter LSU is at 13.3% of middle sized farms. From rural development point of view it is important to notice that 410,537 small and middle sized family holdings in Serbia support income, from results of livestock production. Livestock production in Serbia is by two third LSU based on small and middle sized family farms.

Data in Graph 2 shows level of farmer’s interest in livestock production by economic size of farms. Diversification is main tool for production risk for small (except the smallest) and middle sized farms. In groups of farms from 4.000 to 15,000 EUR of SO, over 92% of them raise at least one livestock variety. Bigger farms, with increase of economic size, are losing interest for livestock enterprises in production plan. The lowest levels of interest for livestock production have farms with less than 2,000 EUR and the biggest ones with more than 100,000 EUR of SO.

**Graph 2 Shares of farms with and without livestock production by economic size class in 2012.**
Structure of livestock farms by number of hectares UAA presented in Graph 3 is rather different than in Graph 1. The biggest farms, those with more than 100ha own significantly less LSU than in case of biggest farms by SO. Answer is in land resources of big farms specialised in poultry and pig production. Those farms usually do not have big land area and often use feed bought on market.

From total number of livestock farms by size in UAA, 368 thousands (75.2%) are in category of small farms, with 45.4% share in LSU. Middle sized farms embrace 22% of all livestock farms and rear one third of LSU. Biggest farms, according this measure of size, rear significantly less LSU, just 20%.

**Graph 3** *Number of farms and livestock units by size class in utilised agricultural area in 2012.*

Four main livestock branches by value of production in Serbia are raise of: cattle, pigs, poultry and sheep. Structure of livestock farms according size of LSU per farm presented in Graph 4 shows dual structure. On one side farms with capacity up to 9 LSU raise majority of sheep, pigs, cattle and one third of poultry. At another side farms with 20 and more LSU breed majority of poultry and about third of pigs and cattle. Relatively
small number of livestock is rearing on farms with capacity from 10 to 19 LSU. It is especially expressed in case of poultry production.

**Graph 4** Share of cattle, pigs, sheep and poultry by total livestock unit on farm size class in 2012.

---

**Farm position in food chain**

Food supply chain structures in Serbia passing acceleratory changes in recent decades. Privatisation of food processing and retail sector, as well as one part of farm sector, concentration and vertical integrations brings wholly new market relations for farmers and other participants at downstream level. Slaughter houses and dairy plants which survived after privatisation become focused for inputs on bigger farms, or to middleman. Their behaviour was reasonable, since it was only way to secure and improve input supply. Bigger livestock products processing companies also invested in vertical cooperation process with bigger or growing middle sized farms. It was perceived in almost all agriculture branches, but leading examples of vertical cooperation happened in dairy sector. Processors gain, through cooperation with farmers, secure input base, but maybe even more important is high standards of inputs quality. From farmers point of view they benefited through cooperation with processors.
on several ways. Sale of agriculture product was ensured; they got higher prices per unit because of reached higher standards, and additional price stimulation become available because of higher and constant amount of delivered products. In some cases new cost saving technology where provided to farmers, through processors financing schemes. Farmers got option to repay it through delivering specific agricultural products in contracted amount and period.

Concentration process in food processing sector, after privatization, was noticed as well as in retail sector. Only difference was higher rate of concentration in retail sector. Such trend brings market power to retailers, which in previous period was in hands of food processors. In new market situation for food processors it become even more important to be oriented on bigger and middle sized farmers, as higher quality and quantity of inputs helps to cut collecting and processing cost.

Small livestock farms, in relatively short period, come to side position in food supply chain. Inability to offer bigger quantity with standard quality of products with general lack of cooperative action among farmers decreased its chances to be well integrated in food chains. Literally, they were abandoned by big food processing companies. In new situation farmers use rest of marketing channels like: small and medium sized food processing enterprises (SME), green market, and direct sale to consumers. Besides that, farm household consumption, especially of livestock products, is at high level in Serbia.

Small farms have more challenges to become well integrated in food chains. In recent years, SME which are more oriented to small farms intensified cooperation with them. SME use various strategies, for example in dairy sector some SME processors start to cooperate more and coordinate activities with small farms. Dairy plants invest time in extension work with farmers and capital in cooperation and provide farmers with cooling tanks and in some extreme situation with feed and some other inputs. At other side several SME dairies keep vertical coordination with small farms and invest in vertical upstream and
downstream integration, building its own bigger dairy farms and small dairy shops retail network.

**Farm structure and agricultural policy – Milk case**

Every fourth farm in Serbia is producing cow milk. On 155,859 dairy farms 431,290 cows was reared in 2012. Average dairy herd size in period among two Agricultural Censuses increased from 1.6 to 2.8 cows per farm, what is considerably smaller from 8.9 cows per farm in EU-27 (Rohnen-Thielen, 2008). Dairy farms are passing through structural changes since 1960 (Graph 5). Until 2012 number of farms decreased for two thirds and cow number is almost halved. At same time, average milk yield increased three times to almost 3,000 l/cow/year. It is still far away from EU-27 average milk yield of 6.478 l/cow/year.

**Graph 5 Number of farms and cows, and average milk yield in 1960 and 2012.**

Data in Graph 6 give answer on question “Who produce milk in Serbia?”. Estimates for average milk yield per herd size are made based on statistical and expert knowledge. Average milk yield varied from 2,500 litres on small grazing farms in Serbia-south region to 7,700 litres on big
farms in Serbia-north region. Farms in Serbia-south region, with 1 to 9 cows, are producing the more than half of milk. Generally in Serbia such farms are producing two thirds of milk. Farms with 10 and more cows are more important in region Serbia-north. Biggest farms with 100 and more cows produce only 11% of milk.

**Graph 6** *Production of cow milk by regions and cumulative share by herd size class in 2012.*

**Graph 7** *Milk productions by herd size class in 1960 and 2012.*
In period between two Agriculture Censuses cow milk production increased from 751 to 1,442 mill litres. Structure of cow milk supply by herd size presented in Graph 7 had changed. During 1960 most of milk where coming from farms with 1 and 2 cows. After half of centuries and increase of average herd size and milk yield, main producers of milk with 52% share become farms with 3 to 20 cows in herd. Farms with 1 and 2 cows, supply 26% of milk, while the biggest farms with more than 20 cows in herds supply rest of 22% of milk.

Dairy farm structure by economic size presented in Graph 8 showed that small farms with less than 8,000 EUR of standard output (SO) are most numerous, and owns 42% of dairy cows. Middle sized dairy farms, those with 8,000 to 25,000 EUR of SO, are second important group of dairy producers accounting with previous type 96% of all dairy farms and 79% of cows. Third group of dairy farms with more than 25,000 EUR of SO accounts 4% share and owns 21% of cows.

Graph 8 Share of dairy farms and cows by economic size class in 2012.
Table 1 Milk policy development 2001 to 2014.

<table>
<thead>
<tr>
<th>Year</th>
<th>Milk premiums in RSD</th>
<th>Prerequisite 1</th>
<th>Prerequisite 2</th>
<th>Eligibility</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Favoured area</td>
<td>Less favoured area</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td>3.6</td>
<td>4</td>
<td></td>
<td>Milk under standards in rule book of milk quality</td>
</tr>
<tr>
<td>2002</td>
<td>4</td>
<td>4.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2004</td>
<td>3.8</td>
<td>4.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td>3</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year</td>
<td>2007</td>
<td>2008</td>
<td>Farms for milk sold to dairy plants</td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>------</td>
<td>------</td>
<td>----------------------------------</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>3</td>
<td>min 2,500 l per quarter</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.4</td>
<td>2.4</td>
<td>Registered family farms for milk sold to dairy plant</td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td>1</td>
<td>2</td>
<td>min 3,500 l and max 3,000,000 l per quarter</td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>4</td>
<td></td>
<td>All registered farms for milk sold to dairy plants</td>
<td></td>
</tr>
<tr>
<td>2011</td>
<td>5</td>
<td></td>
<td>min 3,000 l and max 3,000,000 l per quarter</td>
<td></td>
</tr>
<tr>
<td>July</td>
<td>2012</td>
<td>7</td>
<td>min 3,000 l per quarter</td>
<td></td>
</tr>
<tr>
<td>2013</td>
<td></td>
<td></td>
<td>min 3,000 l for FA and 1,500 l for LFA per quarter</td>
<td></td>
</tr>
<tr>
<td>2014</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In period 2001-2005 milk premiums were paid to farmers for milk delivered to dairy plants. From 2003 amount of milk premium per litre decreased year by year until 2010. Meanwhile, eligibility for milk premiums changed several times. From 2006 milk premiums has been payable only to registered farms and in 2009 only family farms was eligible for milk premiums. Prerequisite in minimum quantity of 2,500 litres per quarter introduced in 2009 restricts number of farms eligible for milk premiums. In every next year level of minimum quantity were changed, sometimes several times in just one year. This prerequisite cuts number of small farms able to got premiums even more from 2010 when minimum was pushed on 4,000 and later established on 3,500 litres. Practically, small grazing farms with less than 7 cows in Serbia-south region and with less than 4 cows in Serbia-north region were excluded from milk premiums. After 2009 when milk premiums reached lowest level with just 1 RSD/l in following years it increased up to 7 RSD/l of milk sold to dairy plant. Agricultural policy measures in period from 2009 to 2014 were focused on small number of farms with dairy herds bigger than average expecting that increase of production. In fact those farms increased production of milk, but vast number of small and medium sized farms, neglected from policy makers, decreased production faster, what in
total resulted with continuing decrease of total cow milk production in Serbia.

Market price signals played additional and even stronger role for dairy farmers’ decision. Low milk prices during periods 2005-2006 and 2009-2010 (Hemme, 2013) additionally push farmers to reduce production especially those with smaller number of cows in herd, and those with older labour.

After premiums were cut for small farms, they also were left out from big dairy processors. For example just IMLEK cut number of supplier farms from 30 to 6 thousands in period from 2005 to 2010. Dairy processors squeezed from retailers tried to save costs with orientation on bigger farms with higher milk quality and quantity.

Milk production in Serbia after reaching level in 80-es, with exception of first half of 90-es was relatively stable (Graph 9). The recent trend of decrease in milk production starts in 2006 and continues to 2013. It comes from both regions from Central Serbia and from Vojvodina, although it started 3 years later in Vojvodina.

**Graph 9** *Production of cow milk in Serbia 1980-2013.*
Biological lags in dairy productions are one of the longest in agriculture and it makes this branch highly sensitive. Any change, positive or negative, takes a long period of several years to arise, and same time to be stopped and reversed in case of negative ones. Decrease in farm number and total cow number coming from small farms with 1 to 5 cows and mostly from region Serbia-south. Development of middle sized and bigger dairy farms is happening but with slower rate. From 2006 those two trends are not balanced and total milk production in Serbia is decreasing. Reasons for farm decrease are various and come from: market, demographic of dairy farmers and improper agricultural policy measures.

**Conclusion**

Livestock production in Serbia is mainly based on small and middle sized family farms. According applied definitions of small and middle sized farms, they are most numerous, own two third LSU, control greater share of agricultural land and situation on them will still have bigger impact on total livestock production. Those kinds of farms are especially important in cattle, pig, sheep, goat and beekeeping production. Only in poultry production bigger farms have bigger share in LSU. Higher diversification and hard position in food supply chain are main characteristics of small farms. Bigger farms use effects of economics of scale, using cost minimising new technologies. Large quantity and higher quality of livestock products allows them better prices and less risk on the market.

Agricultural policy and its measures have to keep in focus small and middle sized farms as well as big farms. Analysed case of milk production proved sensitivity of dairy farms on turbulent market and political changes. Decision of Ministry of agriculture, forestry and water management to live out of milk premiums about 90% of farms in tangible market moment in 2010 and later, caused faster reaction of small farmers to decrease dairy production. Some of them quitted dairy enterprise at all; some went to other market channels like direct sale or green market. Of
course, agricultural policy is not main reason for decrease in milk production. Unfavourable demographic structure of dairy farm owners and long term difficult market situation are stronger factors. But, with good understanding of farm structure and trends that farms follow, policy makers with optimal measures can slow down some negative trends and generate and accelerate positive ones. Otherwise, without whole picture of sector, inappropriate measures can foster just opposite effects.

Agricultural policy is part of rural policy which includes it completely. Future of livestock farming, which are labour intensive and employ most of agricultural population in rural areas, is not just question of agriculture development, but of whole rural development process. Agricultural policy measures for livestock farms in Serbia in previous decade favoured bigger farms. Neglecting small and medium sized farms, that are still main suppliers of livestock products on national market, except poultry, revenged in decrease of total livestock production. Therefore, in future period policy measures for small and medium sized farms should be carefully created, keeping in focus income support for small farms and support to prospective middle sized farms to develop faster and become prepared for future market situation. Not less important measures are: direction of Agricultural extension service to work more with groups of small and middle size livestock farms, education and support for self-organising capacities i.e. cooperatives, and foster farm transfer to younger generation.

**Literature**

Апстракт: Главни циљ у раду је био истражити структуру газдинстава која се баве сточарством као основну претпоставку за мере аграрне политике. Однос структуре газдинстава и мера аграрне политике је тестиран на примеру структуре произвођача млека њихове реакције на премије за млеко у периоду 2001-2014. Мала и средња газдинства са сточарском производњом имају удео од 97,2% према економској величини и две трећине свих условних грла у власништву. Током претходне деценије променио се положај пољопривредних газдинстава, као и учесника на другим нивоима у ланцу снабдеванља храном. Већа пољопривредна газдинства су
постала фаворизована од стране млекара и кланица, због већих количина и вишег квалитета сточарских производа. Мере аграрне политике у сектору млекарства су од 2009. године биле усмерене доминантно на велика газдинства. Неповољни тржишни услови, као и демографска структура власника газдинстава заједно са занемарињем значаја малих и средњих произвођача млека од стране креатора аграрне политике резултирали су са даљим смањењем производње крављег млека.

Кључне речи: пољопривредно газдинство, структура газдинстава, произвођачи млека, аграрна политика