

ORGANIC BEEF PRODUCTION AS A SUSTAINABLE SOLUTION FOR THE EU MARKET - A CASE STUDY OF THE REPUBLIC OF SERBIA

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Review paper

Abstract: The European Green Plan and its implementation strategies defined very demanding and ambitious goals for establishing the first "climate neutral continent" in the world. The implementation of the "Farm to Fork Strategy" (F2F) strategy will have an extremely immense effect on quantitative changes in the area of animal production (reduction in the number of animals and volume of production), increase in prices of beef and products of animal origin, the decrease in citizens' standards and increase in inflation. The appearance of the so-called "leakage effects" can be expected in NON-EU regions with the lowest population density (LU/ha), such as Serbia and the countries of the Western Balkans. At the same time, this effect represents a development opportunity for organizing extensive to semi-intensive production of organic beef based on the Cow-calf system - grass-fed beef production. In addition to the production of organic meat, these systems will contribute to improving biodiversity, maintaining the microbiological and pedological structure of the soil, regulating the carbon cycle, preventing erosion and forest fires, stopping population migration from villages to cities, reducing the use of artificial fertilizers and biocides, etc.

Key words: organic production, beef, sustainable, EU market

Introduction

The European Green Plan (December 2019, European Green Deal) covers the most important sectors of economic and agricultural activities within the framework of the EU, which aims to mitigate climate change and further deterioration of the natural environment. The main goal is aimed at reducing the

emission of gases with greenhouse effects (GHG) by 55% (compared to 1990) by the year 2030, that is the creation of the first "climate neutral continent" in the world by the year 2050. The realization of the set goals includes reforms in the most important sectors related to renewable energy sources, new climate laws, the establishment of a circular economy, reduction of air, water and land pollution, creation of sustainable agricultural production and food industry through higher quality and safety of food, less food waste, protection and preservation of the entire biodiversity. The countries of the Western Balkans have accepted the green agenda that refers to the region (*Guidelines - Green Agenda for the Western Balkans, 2020*), which is fully complementary to the European green plan. Within the framework of the general Green Plan, the "Farm to Fork Strategy" (F2F) strategy will have the most significant impact on agricultural and livestock production. Within this strategy, a key role is played by the action plan (period 2021-2027) for the development of organic production and preservation of biodiversity (*EC, 2020b, Regulation (EU) 2018/848*). This strategy represents a sustainable model of organic production and consumption, especially for small and medium-sized farms. In the forthcoming years, the mentioned strategies will have a significant impact on the restructuring of the volume and type of animal production, the movement of prices of products of animal origin, as well as on the overall market of agricultural and food products. The changes will not be visible only in the EU countries, but the influence of the strategies will reflect in the countries of the Western Balkans and Southeast Europe.

The production and market of beef in the EU are facing increasing pressures concerning campaigns to reduce red meat consumption, linking red/beef meat with environmental protection, negative impact on climate change, lack of welfare on farms, poor treatment of animals, lower and lower incomes generated on farms, etc. Furthermore, over the last 20 years, there has been a noticeable trend of a continuous decrease in the number of cattle, which in the year 2021 was at the lowest level with around 75.6 million animals (*Eurostat, 2021*). This size of the cattle population enables the production of about 6.8 million tons of bovine meat (beef and veal carcasses). Furthermore, the population density of farmed animals per ha within the EU is remarkably uneven. In the year 2016, there was an average of 0.8 livestock units/ha in the range of 0.2 to 3.8, while the percentage of cattle was almost half of the total population of domestic animals. Furthermore, from the total number of cattle, 20.5 million are milk cows and 10.8 are fattening cows (*Eurostat, 2021*). However, the share of organic in the total livestock production is constantly increasing. The total organic agricultural sector is growing rapidly and currently represents 8.1% / 14.6 million ha in relation to the total arable area of the EU (*Trávníček et al., 2021*). The trend of increasing the number of farmed animals in organic production is also increasing and is at about 3% in relation to all farmed animal species, or 6% in relation to the percentage of cattle. In addition, the share

of pasture used for the production of organic milk and meat is 5.6 million/ha (44%) (*EU Agricultural Markets Briefs, 2019*).

Commission's for markets, income and environment for the period 2021-2031 predicts a continuous decline in beef meat production of 8% but also a decline in demand (consumption of 0.3-0.9%) within the framework of the European Union (*EC - agricultural outlook, 2021*). In addition, in the period 2009-2020, beef meat production decreased by 1.7% (*Bundesanstalt Bericht, 2021*). On the other hand, in accordance with the predicted population growth until 2031, migration movements of the population, and religious and traditional habits of consumers, it is predicted that the consumption of meat globally in this period will grow annually by 1.4% until 2030 (1.3% until 2050), and it is expected increase in demand for meat of all types on the world market by 0.3% (*OECD - FAO, 2021; Alexandratos et al., 2012*). This trend will certainly be reflected in the EU market in the form of changes in trade chains (meat deficit), export and import quotas in the EU, meat prices, regular supply of the market, etc. According to the estimates of the American Chamber of Commerce, since 2010, the European market has constant deficit of around 250,000 to 300,000 tons of beef, which is compensated mainly by imports from the United States and Latin American countries.

The aim of the present research was to investigate the sustainable model of organic beef production for the EU market through the case study of the Republic of Serbia, after implementation of the "Farm to Fork Strategy" (F2F).

The effects of the implementation of the Farm to Fork Strategy - F2F

The most important quantitative goals of the F2F strategy until 2030 refer to reducing the use of chemical pesticides by 50%, mineral fertilizers by at least 20%, reducing the sale of antibiotics in farm animal production and aquaculture by 50%, reducing food waste by 50% in the retail and consumer sectors, reducing the loss of nutrients in the soil by 50%, reducing the nitrogen (N-nitrate) balance by 50%, increasing organic production by at least 25%, etc. Groups of researchers (*Barreiro-Hurle et al., 2021; Beckman et al., 2020; Henning et al., 2021*) used different models to investigate the economic impacts on the implementation of F2F in the EU framework. The applied models mainly included a large number of different quantitative objectives of the strategy at the current level of technical and technological development of agriculture. The results of these studies unequivocally indicate that the F2F strategy will lead to a significant reduction in the volume of agricultural production, a reduction in the number of domestic animals and their products, with a simultaneous increase in food prices on the market of EU countries. Furthermore, *Henning et al. (2021)*, state that the most pronounced decrease in the number of animals will be in fattening cattle (- 45%)

and dairy cows (- 13.3%), and estimates a decrease in the production of beef by 20% and milk by 6.3%, with an increase in the price of beef by 58%. Similar results were obtained in their research by *Barreiro-Hurle et al. (2021)*, and *Beckman et al. (2020)* who state that the decrease in beef production will be around 13.5% and milk from 10.0% to 11.6%. Given that the implementation of F2F requires additional, enormously high costs of adapting to new conditions on the market (rising prices, falling production, reduced net exports from the EU, etc.), the consequences of this will be felt to the greatest extent by consumers. Therefore, the implementation of the F2F strategy will directly affect the appearance of pronounced inflation and the loss of well-being among citizens. *Wesseler (2022)*, states that from an economic perspective, the implementation of F2F will obviously not be a free experiment within the EU. Furthermore, *Henning et al. (2021)* especially point out that the strategy will not justify its most important purpose and goal at all, because it will be "climate ineffective" due to the appearance of obvious leakage effects towards NON-EU countries. An additional 54.3 million is expected. t CO₂ eq. in areas outside the EU borders. Of this, the most pronounced effect will be in animal production, namely in the production of beef (36 Mil. t CO₂eq).

The strategy generally suggests the emergence of risks in households with low incomes and indicates the necessity for radical changes and transformations in the way of food production, processing, food supply chains, etc. In any case, the implementation of the F2F strategy will require significant technical-technological and institutional changes, such as innovative biotechnological solutions (*Wesseler, 2022*).

The role of Ruminants

A large number of calls/tenders within the framework of EU funds are focused on finding the most optimal solutions in the beef production sector. Comprehensive and detailed studies like *Eip-Agri (2021)* based on respect for agroecological principles, offer long-term sustainable solutions through grass-based beef production systems. These systems often appear in different variants such as Cow-calf systems (suckler cows/beef) and contribute to the improvement of biodiversity, maintenance of microbiological activity of the soil and its pedological structure, regulation of the carbon cycle, prevention of erosion and forest fires, stopping population migration from villages to cities etc. In addition, their most important role is the transformation of inedible resources into food suitable for human consumption with high nutritional value, as well as contributing to the economic development of rural areas (*Gantner et al., 2022; Oltjen and Beckett, 1996; Eip-Agri, 2021; Domingos, 2022*). In rural areas where it is not possible to grow arable crops, and where pastures are used for grazing ruminants, this type of animal enables the long-term sustainability of the agro-ecological

functions of the land, reducing the C footprint by its better binding in the soil (indirectly reducing enteric GHG emissions), improving water infiltration and its retention in the soil improves soil fertility, reduces the use of artificial fertilizers and biocides, etc. (Teague, 2018; Grandin, 2022). In this sense, adequate management of pastures and grazing through integrated crop-livestock systems provides numerous positive effects (Planisich *et al.*, 2021).

Considering the above, the long-term ecological sustainability of the agroecosystem should be regulated by agropolitical measures, which provide a protocol for the regenerative management of crops and pastures.

Cattle and beef production in Serbia

From the aspect of farm size, degree of automation, present equipment and applied technology, cattle production in the Republic of Serbia (RS) is characterized by keeping cattle on small family farms of an extensive type, through medium semi-intensive farms, all the way to extremely specialized large farms with a pronounced degree of intensive and exclusively commodity production (Kučević, 2022). In 2021, 859,514 cattle were bred on 116,292 farms in Serbia (RSZ 2021; SEEDEVA, 2020). In an extremely fragmented structure of farm sizes (70% own 2-5 cows on average), about 2/3 of the production is distributed in the central part of Serbia, while is the remainder in the plains in the north of the country. Farms located in the north of the country are typically diversified crop/livestock agricultural holdings (Kučević *et al.*, 2019b). In terms of breed composition, the Simmental breed and cattle of the Simmental type dominate with about 75%-80%, the second most important are black and white cattle and the Holstein-Friesian breed with about 15%, and the rest belong to autochthonous and specialized fattening breeds, crossbreeds with the aforementioned breeds, etc. (Perišić, 2022; Bogdanović, 2016). A number of fattening breeds are underrepresented, even in the controlled cattle population, it is about 1% (Expert reports GOO, 2021). The most represented fattening breeds are Aberdin Angus, Limousin, Charolais and Hereford.

Beef production in the Republic of Serbia is below 1% compared to production in the EU (Vlahović, 2015). In 1990, the production of beef amounted to 140,000 tons, but in 2021 it would drop to only 77,000 tons (RSZ, 2021). The total gross domestic production was currently based on around 320,000 total slaughtered animals during the year (Laćarac, 2020). During that period, meat exports were around 7,000 tons with an average of 115% self-sufficiency. About 50% of beef is produced for an unknown customer, 20% for own needs and only about 30% for the organized market chain (SEEDVb, 2020). The Republic of Serbia has had a quota of 8,700 tons per year for the export of "baby-beef" beef to the EU for decades, and this possibility of export is used by an average of about

10%.

Cattle and beef production in Serbia; Cow–calf system - grass-fed beef production

The Republic of Serbia has more than sufficient natural and social resources that enable the successful organization of both intensive commodity and traditional (and organic) cattle production (Kučević, 2022). A particular advantage relates to the possibility of establishing production in the Cow-calf system, which would be organized on meadows and pastures in hilly and mountainous areas (Perišić, 2022). The percentage of areas under meadows and pastures amounts to over 30% of the total agricultural land (about 1.5 million hectares). It is an ideal resource from the point of view of organizing cheap and profitable beef production. Unfortunately, a significant part of the area under meadows and pastures is not used due to poor yields of grass mass, poor quality, inaccessibility of the terrain, weediness, disordered property relations, etc. (Kučević, 2022). In addition to the mentioned resources, there are enough processing facilities (slaughterhouses, facilities for the production of animal feed) available, a sufficient number of which also have export permits. In the year 2019, the Veterinary Administration registered 439 approved facilities (361 red meat facilities and 78 white meat facilities) engaged in slaughtering, cutting and processing meat. In the RS, in addition to small craft facilities, there are around 120 processors of medium and larger capacities (Mitrović, 2016). Advisory and professional support to farmers is organized through an advisory system in agriculture that includes 35 agricultural and advisory services. With regard to facilities for housing cattle, it was determined that there are housing capacities for 2,557,926 animals and that 64% is of the maximum capacity (Radivojević et al., 2014).

According to available statistical data, there is still a sufficient number of available labour on agricultural farms (Bogdanov and Rodić, 2014). However, the age structure of the owners of the farm is unfavourable, considering that over 67% are older than 55 years of age and over 70% do not have the necessary IT education.

There are no precise data on the number of established cow-calf systems in the RS. Judging by the share of specialized fattening breeds in this type of production, the number of farms producing beef from specialized fattening breeds is insufficient. Given the above, it is necessary to strengthen the further import of fattening breeds and improve the establishment of national mother farms (nucleus of the herd). On the other hand, it is necessary to use the genetic potential of the most numerous Simmental breed, which can be directed to the production of quality beef through a successful selection program (defined breeding goal). A large number of farmers in EU countries have just decided to use the Simmental

breed for meat production in the cow-calf system both in purebred and through crossbreeding programs (crossbreeding with fattening and dairy breeds) to achieve the heterosis effect in the F1 generation (*Kräußlich, 2005; Grogan et al., 2005*). Improvement of production traits of domestic cattle breeds could be realized through the import of positively tested animals or semen in accordance with the breeding goal (*Kučević et al., 2005*). Respecting breed characteristics, vertical rezoning could be successfully organized in the cow-calf system (*Perišić, 2022*). Considering that Simmental is the most widespread breed in Serbia and because of the agro-climatic conditions, are the most common type of beef production systems (*Kučević et al., 2019a*).

The development and organization of extensive to semi-intensive beef production should be based on the maximum utilization of plant mass from meadows and pastures. The breeding technology in this system should be adapted to the selection of breed, the quantity and quality of grass mass, feeding possibilities, final body mass before slaughter, market requirements, etc. Available natural and social resources and adequate climatic conditions provide a comparative advantage for this type of production. However, currently, it is minimally and extremely ineffectively used. For the successful organization of the cow-calf system, considering the current state and characteristics of the beef production sector (socio-economic factors, demographic structure and migration - leaving the village, level of education of farmers, etc.), it is necessary to define a long-term action plan that should the following areas are improved:

- Strengthening cooperatives and clusters that are market- and export-oriented (improving the competitiveness of farmers, defining long-term contracts for production planning and secure purchase at market prices, cooperation with export agencies and chambers of commerce);
- Alignment of legislation with EU standards in the area of classification and evaluation of the quality of beef carcasses on the slaughter line (equalization and improvement of the quality of meat and halves, formation of adequate prices of meat concerning quality, etc.);
- New investment funds for starting and improving production (working capital of farmers through rural development programs);
- Education of farmers according to the specific requirements of the farm (needs in cultivation technology, knowledge from the IT sector and modern equipment, the introduction of standards necessary for exporting meat to foreign markets);
- Implementation of defined breeding goals and selection program (correct selection of breed in accordance with producing conditions and the preferred type of production);
- Prevention of illegal trade in livestock;
- More efficient management of meadows and pastures in order to increase the

- yield and quality of plant mass (reseeded, selection of specific grass mixtures in accordance with the requirements of the soil and climate, enrichment of the soil with N-nitrogen through agroecological cycles, regulation of property-ownership relations, new legislation in this area etc.);
- More efficient organization of grazing (application of new technologies and IoT, sensors - precision livestock grass management, construction of solar farms on pastures, etc.);
 - Improvement of the process of certification, marking and guarantee of product origin (organic production standards, names of origin and geographical indications, labels of traditional products, etc.);
 - More efficient access to existing national subsidies, and their timely and purposeful realization (more efficient systems of information transfer to farmers);
 - Improvement of rural-ethno tourism based on gastronomy with the consumption of locally produced beef and products of animal origin.

Based on a survey conducted with farmers engaged in the production of beef (different systems and technology) in several regions of Serbia, over 90% of the surveyed farmers expressed their willingness to double their production in 3-5 years (unpublished data of the author, research conducted in the year 2015). A prerequisite for such a thing is to improve a certain number of the above-mentioned areas. This would mean that in the short term, based on existing resources and capacities as well as the current number of livestock, the volume of meat production could be increased to the level of 10-15 years ago, i.e. 120,000 tons (*RSZ, period 2010-2020*). Increasing the volume of meat production could be further accelerated by the organized import of specialized fattening breeds of cattle and the formation of national nucleus farms. Using the example of an investment by purchasing 10,000 pregnant heifers of fattening breeds, in 10 years we could increase the initial number of breeding stock to over 30,000 female breeding animals (author's calculations based on recursive formulas, *Matić-Kekić et al., 2011*). In this way, the potential of around 90,000 additional fatteners could be ensured.

Cattle and beef production in Serbia; Organic beef production

Serbia has fully developed legislative and institutional frameworks for organizing organic agricultural (livestock) production. The complete national legislation (Laws and Regulations) is harmonized with EU regulations (Council Regulation (EC) No. 834/2007 Commission (EC) No. 889/2008). At the Ministry of Agriculture, Forestry and Water Management, a special sector was established as a competent authority that performs tasks related to organic production. This

body accredits control (certification) organizations under the SRPS EN ISO/IEC 17065 standard. A certain number of control organizations deal with the control and certification of organic products intended for export to the EU market.

Organic agricultural production is in an upward trend in the RS. Currently, about 21,000 ha of organic arable agricultural land is cultivated, of which about 6,000 ha are meadows. However, despite the regulated system that fully enables the organization of organic production, organic livestock production is extremely poorly developed, especially organic cattle production, which is at the level of 0.1% (*Organska proizvodnja u Srbiji, 2020*). Considering the growth trends of cattle in organic farming in the EU for the last decade (*EU Agricultural Markets Briefs, 2019; Kučević et al., 2016*), the current state of organic livestock production should be improved.

Conclusions

The European Green Deal and the strategies within this concept will certainly lead to substantial changes in the meat market in the EU (especially beef) in the forthcoming decades. The most significant changes will be related to the decrease in the volume of agricultural production, the number of domestic animals and their products (fattening and dairy cows), changes in the volume and type of imports and exports, with an accompanying increase in food prices (meat and milk). Furthermore, the expected increase in inflation will have a negative impact on the level of well-being of EU citizens. On the other hand, the expected continuous increase in both consumption and demand for meat on the market may cause interruptions in the regular supply of the market and even supply deficits. Additionally to the mentioned, as a consequence of implementation strategies, the emergence of the so-called "leakage effects" can mostly be expected in NON-EU regions with the lowest population density (LU/ha), such as Serbia and the countries of the Western Balkans.

The production of beef in the Cow-calf system (suckler cows/beef) plays an extremely important role in improving biodiversity, maintaining the microbiological activity of the soil and its pedological structure, regulating the carbon cycle, preventing erosion and forest fires, holding population migration from villages to cities, etc. Therefore, this type of production can be reasonably expected in the future as well. A further step in the form of "upgrading" and advancement of this system in the form of technology and breeding methods would refer to the conversion of existing conventional farms to the production of organic beef. Such business decisions would be fully aligned with EU strategies for increasing the share of organic production, but also with current trends in production, consumption and demand for beef until the year 2030 and 2050, respectively.

The Republic of Serbia has exceptionally good comparative advantages in relation to the available natural and social resources and capacity. They enable the unobstructed development of extensive to semi-intensive beef production in Cow-calf systems (suckler cows/beef). This type of production should be maximally based on the utilization of plant mass from meadows and pastures. Given that the legislative and institutional frameworks in the RS for organizing organic livestock production are fully existing, it would be economically justified for this type of production to be certified according to the methods for organic beef production at one point. In support of this are the existing trade agreements, which enable the unobstructed export of beef (conventional and organic) to the EU market. If current long-term trends in meat considered, this production system will have a long-term sustainable perspective.

However, a prerequisite for the successful organization of this type of both conventional and organic production at the national level is the definition of a long-term action plan that should improve existing weaknesses and deficiencies in a number of the mentioned sectors. Finally, the implementation of such an action plan should be established in a timely manner in relation to the beginning of the implementation of EU concepts and strategies.

Organska proizvodnja govedeg mesa kao održivo rešenje za potrebe EU tržišta – studija slučaja Srbija

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Rezime

Evropski zeleni plan i strategije za njegovu realizaciju definisale su vrlo zahtevne i ambiciozne ciljeve za uspostavljanje prvog „klimatski neutralnog kontinenta“ na svetu. Implementacija strategije od „njive do trpeze“ (Farm to Fork Strategie, F2F) će imati izuzetno veliki uticaj na kvantitativne promene u oblasti stočarske (animalne) proizvodnje kroz smanjenje broja životinja i obima proizvodnje, povećanje cena govedeg mesa i proizvoda animalnog porekla, pada standarda građana i rasta inflacije. Nakon implementacije F2F strategije, može se očekivati i pojava tzv. “efekta curenja” (leakage effects) u regionima i zemljama izvan Evropske unije sa najmanjom gustom naseljenosti uslovnih grla po hektaru. To se najpre odnosi na Republiku Srbiju i zemlje Zapadnog Balkana. Međutim, novi regionalni izazovi upravo mogu biti i razvojna šansa za pomenute države, kroz organizovanje ekstenzivne do poluintenzivne proizvodnje organskog govedeg mesa zasnovane po sistemu “krava tele – krava dojlja”, bazično organizovane u

regijama bogatim livadama i pašnjacima. Osim proizvodnje organskog mesa, ovi sistemi će doprineti unapređenju biodiverziteta, održavanju mikrobiološke i pedološke strukture zemljišta, regulisanju karbonskog ciklusa, sprečavanju erozije i šumskih požara, zaustavljanju migracija stanovništva od sela ka gradovima, smanjenu upotrebu veštačkih đubriva i biocida i slično.

Ključne reči: organska proizvodnja, goveđe meso, održivost, tržište EU

Acknowledgement

This research was funded by the Provincial Secretariat for Higher Education and Scientific Research of Autonomous Province of Vojvodina, Republic of Serbia, through project no. 142-451-2696/2021-01.

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Received 1 February 2023; accepted for publication 15 April 2023