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THE QUALITATIVE AND QUANTITATIVE ANALYSES OF ECONOMIC, SOCIAL AND ENVIRONMENTAL ROLES OF PERIURBAN AGRICULTURE IN THE CITY OF NIKŠIĆ

SUMMARY

Periurban agriculture is a form of agriculture practiced around urban areas, where it retains both urban and rural characteristics, and which has multiple roles. It has been gaining an increased attention from researchers, practitioners and decision makers, for the potential contribution it can make in the face of current societal challenges. This paper explores the roles of periurban agriculture in Montenegrin context. Through two surveys carried out in the city of Nikšić as a pilot area, economic, social and environmental roles of periurban agriculture have been assessed. The conclusions indicate that periurban agriculture has a significant social role in the target area, unrealised economic potential and an environmental impact that should be better managed. The results are used to argue that periurban agriculture should be mainstreamed into Montenegrin agricultural policy, for its potential to contribute to the quality of life and environmental protection in periurban areas, as well as to food security on the local and national level.

Keywords: periurban agriculture, multifunctional, food security, agricultural policy, Nikšić, Montenegro

INTRODUCTION

Current global crisis, such as the climate change and biodiversity loss, pandemic, wars and conflicts, all emphasize the importance of food security, stability of food supply chains as well as the reduction of the environmental footprint of agricultural production. In this context, the periurban agriculture is gaining an increased interest from both practitioners and researchers around the world.

There is no single unifying and globally accepted definition of periurban agriculture, but all the attempts to define it have several aspects in common: it is

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a human endeavour aimed at producing, processing, marketing and distribution of agricultural food and non-food products from plants and animals within and outside cities (Brown and Carter, 2003). The location of this agricultural production at the fringes of urban areas where it maintains both urban and rural functions is the primary factor that distinguishes it from rural agriculture, with which it can share some common properties (Mngumi, 2020). The resources (material and human) used for periurban agriculture mainly originate in and round a particular urban area, which in turn is usually the main destination of the products and services of periurban agriculture (Addo, 2010). It can play a solely subsistence role, but also be market oriented (Opitz *et al.* 2016).

Periurban agriculture can be a remnant of the previous agricultural activity on the land encroached by the expanding urban area, but increasingly it is a new trend driven by various other socio economic and environmental causes. Some of these key drivers of the rise of periurban agricultural include: the need for achieving food security in times of disrupted food supply chains and rising food prices, increased unemployment rates and the need for new or additional income generation options, exploration of new business opportunities, the urban population's need for recreation, migration of retired people to periurban areas, the pursue of healthier lifestyles by the younger population, and the growing environmental concerns (Dubbeling and de Zeeuw, 2010; Zasada, 2011; Gyasi *et al.* 2014).

This type of agricultural activity is considered to be multifunctional, providing economic, social and environmental functions to the surrounding urban and rural areas (Mngumi, 2020). Multifunctionality is reflected in the following: priurban agriculture provides the agricultural products - mostly perishable foods – like fresh fruits, vegetables, dairy, meat and poultry, but also non-food products, such as fibre, animal feed, medicinal/pharmaceutical and ornamental plants, which can be subsistence oriented, but also be marketed to other urban areas as well as tourism sector. By providing easily accessible, nutritionally adequate, affordable and culturally acceptable food to urban dwellers, periurban agriculture reduces food insecurity and shortens the food supply chains, making them more resilient (Brown and Carter 2003, Lang and Barling 2012, Kortright and Wakefield 2011, Smith *et al.* 2013, Opitz *et al.* 2016). It generates formal and informal employment along the supply chain and can provide new business opportunities.

Periurban agriculture also plays a recreational role – it is itself a leisure activity for urban dwellers (especially retirees), and the maintenance of semi-natural landscapes in periurban areas increases the landscape aesthetics, valued by the urban dwellers (Carrus *et al.* 2015) that use them for recreation. Opportunities for the interaction with the nature and biodiversity that periurban agricultural landscapes offer contribute to mental health and overall wellbeing (Livesley *et al.* 2016). In an increasingly modernised society, periurban areas still preserve pockets of rural lifestyles, maintain connections with local traditions, cultural heritage and the natural environment. With their hedgerows, treelines,

ponds, grasslands, periurban agricultural areas provide a patchwork of suitable habitat for biodiversity, including endangered and functionally important species, such as pollinators (Snep *et al.* 2006, Maclagan *et al.* 2018, Pandal *et al.* 2020). Additionally, they ensure the supply of ecosystem services, such as the water infiltration and purification (Haase and Nuisssl, 2007), flood prevention (Kenyon *et al.* 2008, Wheater and Evans 2009), local climate moderation (Lampthey *et al.* 2005) and carbon sequestration (Freibauer *et al.* 2004, Hutchinson *et al.* 2007).

Apart from considering the benefits and roles of periurban agriculture, it is important to consider some issues that are inherent in this type of activity. Firstly, although it can be market oriented, the practitioners of periurban agriculture are rarely agricultural professionals and don't always have farming background or experience (Dubbeling *et al.* 2010), which means that they won't necessarily apply the best land management practices, optimise inputs and outputs, or preserve soil, land and water resources. The location of periurban land at the fringes or urban areas means it is exposed to various sources of pollution such as industrial complexes, wastewater discharges, landfills and illegal rubbish dumps, runoff from transport infrastructure and urban surfaces (De Bon *et al.* 2010). These two issues also mean that the products of periurban agriculture do not always meet the quality and safety standards for food items, and contamination of periurban agricultural products with pollutants and biological agents can impact the health of consumers (Bryld 2003, Hamilton *et al.* 2014). Periurban landscapes are under continuous threat from urbanisation (Parsipour *et al.* 2019), and agricultural activity and preservation of natural assets in these areas competes with the more profitable land use forms such as the construction of housing, tourism, transport and other infrastructure.

As far as Montenegro is concerned, it has within the last century transitioned from agrarian society into industrial and service oriented one. However, the role of agriculture remains strong, in economic, social, cultural and environmental respect, and it remains one of the key development sectors, recognised by all the strategic documents. The priority of the agricultural policy is to meet the demands of the national market for agricultural products that can be continuously produced within Montenegro (Strategy for Development of Agriculture and Rural Areas 2015-2020). Also, the national spatial plan stresses the continuing role of agriculture in preservation of cultural landscape as well as sustainable management of natural resources through appropriate land use (Spatial Plan of Montenegro until 2020).

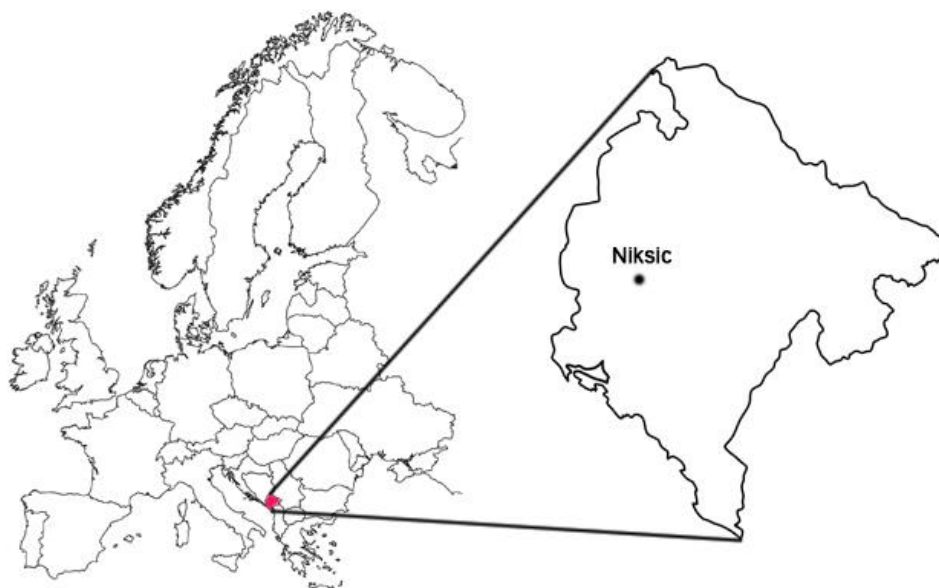
In this respect, periurban agriculture, as a subsector of agriculture, can play an important role, considering its multifunctionality described above. However, it has not been explicitly recognised by the Montenegrin agricultural policy, nor does the policy promote or support the purely subsistence orientation and leisure roles of agriculture, which are typical for periurban agriculture. Yet, as it was seen from the above, these, as well as other functions of periurban agriculture, should be preserved, as they are components of the overall multifunctional role that agriculture plays in Montenegrin context.

Considering the above, this research paper aims to provide the first insights into the roles of periurban agriculture in Montenegrin context.

MATERIAL AND METHODS

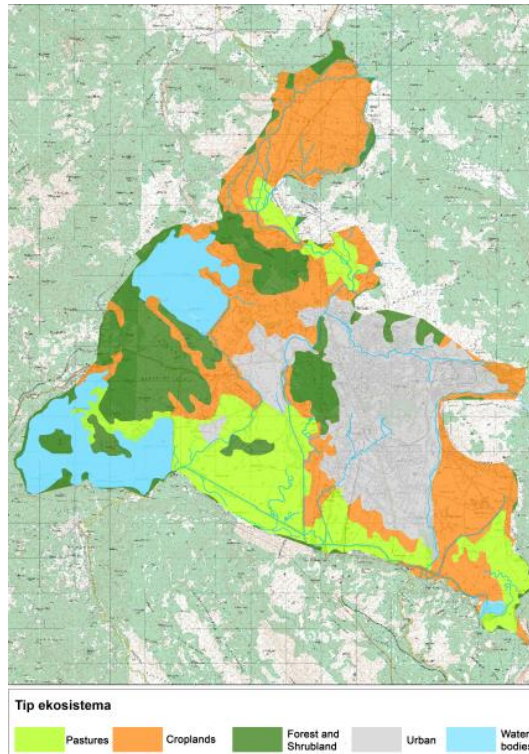
Target area

Nikšić city (central coordinates: 42.775920, 18.922371, picture 1) has been chosen as a pilot site for this research, for several reasons: it is the second largest city in Montenegro, which has in recent years experienced a decline in employment levels and an increase in the number of households and agricultural holdings within the periurban area (Spatial Urbanistic Plan of Municipality of Nikšić until 2020/2025). Agriculture is promoted by municipal development plans, which recognise it as a social buffer, providing additional and frequently the only income for about the third of households in Nikšić municipality (Spatial Urbanistic Plan of Municipality of Nikšić until 2020/2025). Such a setup is common to most other municipalities in Montenegro (Perošević 2020), making Nikšić a suitable pilot area as a model for assessing the roles of periurban agriculture in the wider national context.



Picture 1 – Geographic position of Montenegro and the City of Nikšić

The city is located in the Field of Nikšić, the most compact and continuous agricultural area in the municipality, covering 10578,55ha. Almost half of this area is agricultural land (30.45% of croplands and 18.63% pastures), and almost a third are natural and semi-natural areas (17.9% forests and shrublands, 11.66% water bodies). Urban areas cover 21.36% of the Field of Nikšić (picture 2, source of data – European Union, Copernicus Land Monitoring Service 2018, European Environment Agency). Such structure of land use is indicative of the potentials for periurban agriculture.



Picture 2 – Land use types in the Field of Nikšić (source of data: European Union, Copernicus Land Monitoring Service 2018, European Environment Agency)

Surveys

The research has been carried out through two structured surveys with multiple choice and open-ended questions. The first is a household survey, targeting periurban agricultural households, the purpose of which was to determine the role agriculture has for the periurban population, its social, economic and environmental impacts as well as the issues and vulnerabilities of this activity. It contained 50 questions. The number of participants was 48 agricultural households from the Field of Nikšić.

The second was a survey of the general public in the Municipality of Nikšić. The purpose was to elucidate the public perceptions of the economic, social and cultural role of the periurban landscapes and their products in the Field of Nikšić. The survey contained 26 questions. A total of 212 inhabitants participated in this survey.

Both surveys have been conducted online and in person, in the period between February and April 2022. Responses were analysed using SPSS software.

RESULTS AND DISCUSSION

The structure of the periurban agriculture in the Field of Nikšić

From the surveyed agricultural households, more than a half (54.2%) are practicing only plant production, while 41.7% practice mixed production. Only 4.2% households practice animal production only. Dominant products are vegetables (85.4% of participating households) and fruits (52.1% produce woody species apples, pears, walnuts, and 39.6% produce herbaceous and shrubby fruits such as berries and hazelnuts). Over one third (33.3%) of participants have less than 10% of their agricultural land under permanent crops, while little under one third (27.1%) have between 10% and 50%. Every fourth participant has greenhouse production, and the total area under greenhouses among the participants is 1590m². Households that raise cattle, sheep and goats mostly use their own pasturelands that are within the Field of Nikšić (64.3%).

Economic roles of the periurban agriculture in the Field of Nikšić

The vast majority of participants – 93.8% - use agricultural products for their own consumption. On the other hand, 27.1% sell their products. Of the producers that sell their products, most are between 20 and 49 years of age (65.1%). No participants older than 65 sell their products. This implies that younger producers (up to 49 years of age) are more oriented towards commercial agricultural production. These participants on average sell around 50% of their products, and the average annual income from these products for the previous year (2021) was 3,900EUR. Most of the sales are through informal channels – 85.7% participants sell their products to individuals within Nikšić (old and new customers, family members, friends, acquaintances), and most of them use internet as a sales channel. As the main barriers to sales, the participants have identified the inadequate state set purchase prices, the lack of organised purchase and the lack of infrastructure such are silos, cold storages and adequate transportation.

The average annual costs of agricultural production for the previous year (2021) were 3,027 EUR.

Almost a third of all participants (29.2%) have plans to expand the agricultural production, and 35.4% are uncertain. It is interesting to note that 35.3% of the participants 20 to 34 years of age do plan to expand the production, while 47.1% are still weighing on this decision. As the most common barriers to the expansion of agricultural production, the participants have identified the lack of agricultural machinery, lack of adequate facilities for production and storage (barns, silos, cold storage) and the lack of adequate financial support instruments.

Only 22.9% of the participants have used some of the incentive measures of the Ministry of Agriculture, Forestry and Water Management or the Municipality of Nikšić. The average amount of subsidies for the previous year (2021) was 4,238EUR. More than two thirds (66.7%) of participants think that the subsidies are adequate. A third (31.6%) of respondents who did not apply for the support measures are not interested; 21.1% stated that they could not fulfil the required conditions and 18.6% did not have the requested information. Also, 10.5% do not know how to access support systems.

Social roles of the periurban agriculture in the Field of Nikšić

For only 14.6% participants, agricultural production is the only or main activity, while for the majority (70.4%) it is a complementary or occasional activity. Agriculture as the only activity is mostly present with the participants between 35 and 49 years of age (42.9%). For 50% of respondents aged 65 and over, it is a supplementary activity. Although it is mostly a complementary or occasional activity, 63.3% participants do not plan to abandon agricultural production, and only 18.4% plan to change the land use on their property.

Other social functions of the periurban areas in the Field of Nikšić were recognised and valued by the inhabitants of Nikšić. According to the survey participants, the main benefits that this area provides to the local community and economy are in the form of provisioning ecosystem services – animal feed (pastures, hay meadows), clean drinking water and local food production, as well as the cultural services in the form of preservation of the local cultural and historic heritage and landscape aesthetics.

Most of the participating inhabitants of Nikšić spend part of their leisure time in the Field of Nikšić (88.7%), and the majority spend between one and four hours per week.

Regarding the origin of their food, for almost half of the participants (49.5%) it is very important to consume locally produced food and they try to maximise their consumption of it. For almost one third of respondents, between 10% and 50% of consumed food is locally produced. The respondents stated that it is necessary to have more domestic food in stores and local restaurants, but also to have appropriate labels and declarations on food, in order to increase the percentage of local food in their consumption.

Almost all respondents (99%) believe that agriculture in Nikšić Field is an important activity for the local economy and development of Nikšić, and they expect that the demand for the locally produced food will rise in the future. On the other hand, over half of the participants (51.4%) are of an opinion that agriculture in the Field of Nikšić is threatened, mostly by the pollution as well as from the lack of public investments.

Environmental roles of the periurban agriculture in the Field of Nikšić

Apart from the cultivated land, 66.7% of responding periurban households also have uncultivated land, that is used as hay meadows or pastures. They have estimated that meadows and pastures comprise between 10% and 50% of their land, which reflects the findings of the national level Agricultural survey from 2011.

They have also estimated the biodiversity values of their land, where the majority of participants identified their property as moderately rich in biodiversity (58.3%), and 22.9% as very rich. 43.8% of responding households are willing to designate a part of their property for biodiversity protection, and 20.8% would be willing to do so with appropriate incentive. This is particularly important, considering that only 6.1% of participants apply some of the nature friendly practices.

The most common land management practices among the participating households are: the use of cattle manure as fertilisers, land tilling every year, and

land tilling several times per year. Only 14.3% maintain records of fertiliser use. In terms of irrigation, the majority use water from the public supply network (60.9%), while every fourth depends solely on precipitation (26.1%). One fifth (20.5%) have drip irrigation systems.

The participating households do not have designated waste management systems. Agricultural waste is mostly burned (43.8%) or disposed on part of the property or in local dumpsters (29.2%). The problems with pests and diseases is mostly tackled with the use of artificial pesticides or by manual removal. However, participants do not keep registers of pesticide use, which suggests the need for education and capacity building in respect to pesticide use and their impact on the environment.

The producers believe that climate change significantly affects agriculture, with droughts being the most frequently observed impact.

Discussion

The results of the surveys, have led to the following highlights:

- Periurban agriculture in Nikšić is dominated by the production of fresh plant products (fruits and vegetables), mostly used for own consumption or direct sales locally

- It is a largely informal sector. Agriculture is not a primary source of income for the majority of participants, but rather a complementary or additional activity within the household, and its main goal is not income generation.

- Lack of professional approach is reflected in the fact that most do not make use of the existing subsidy schemes. Furthermore, producers implement agricultural practices that are not always in compliance with the principles of good agricultural practices or environmental concerns

- The distribution chain of products is local and informal, and the local consumers highly value the access to locally produced food, for which there is an increasing demand

- The products are not available in formal distribution, so the access of consumers to the products is limited. This informal nature of sales channels is also related with the somewhat limited consumer trust, as this does not allow for proper labelling of agricultural products, and thus ensuring compliance with the food quality and safety standards.

- The use of resources is not sustainable- especially in relation to water, which is primarily obtained from the public supply network. It is to be expected that the lack of enforcement of good agricultural practices in terms of fertiliser and pesticide use has negative environmental impact.

- Periurban agriculture in Nikšić is vulnerable to climate change impacts, particularly to droughts, and in its current form can cause competition with other forms of water use (especially drinking water).

- The periurban landscapes provide a suite of recreational opportunities that are highly valued by the local urban dwellers

- There is awareness within agricultural producers regarding the need for nature and environmental protection, as well as willingness to contribute to it, but human and financial capacities in this respect are needed.

Research results suggest that the periurban agriculture in Nikšić has an important social function, recognised by the local community, where local food security is more important than economic gain. It also has an economic potential, which, however, can be better realised through adequate support in the form of financing and capacity building. The environmental impact of periurban agriculture in this case can be reduced with capacity building and better enforcement of good agricultural practices and environmental legislation. Finally, this form of agriculture is vulnerable to climate change impacts, to which it doesn't appear to be adequately adapted.

The city of Nikšić stands as a quintessential example of the developmental processes that have characterised Montenegro since the mid XX century (Perošević, 2020), serving as a representative case study for other cities in the country. Expert opinion suggests that analogous circumstances concerning the significance of periurban agriculture and the challenges associated with it are likely to manifest around other urban centers across Montenegro. Therefore, it is important to analyse the periurban agriculture in the wider context of Montenegrin agricultural policy.

Montenegrin agricultural policy is almost exclusively production oriented. Although the policy recognises the multifunctionality of agriculture, it views it as a primarily economic activity associated with a continuous rural area. This is reflected in the design of subsidy schemes, where eligibility criteria such as minimum farm size (in terms of land area and/or number of animals) and farm location are often the limiting factors that small scale periurban producers cannot meet. As such, national and municipal agricultural and developmental policies do not explicitly recognise nor treat periurban agriculture.

For the reasons discussed above, we argue that this form of agriculture should be given more attention in Montenegrin agricultural policy. The first step in this process is to formally recognise it as a legitimate form of land use and mainstream it by providing definitions and designing specific measures that will offer a stimulus for periurban population to continue managing their land in a way that preserves environmental and social benefits in these areas, and not only stimulate the income generation and output maximisation. Periurban agriculture should also play a strategic role in the spatial and development planning processes, because it can enhance the quality of life and preservation of land, biodiversity and cultural heritage in the zones surrounding urban centres. Recognising this form of agriculture will also ensure that the risks associated with it (pollution, land degradation, food safety etc) can be mitigated through enhancement of the relevant legal framework and its enforcement.

An additional rationale for placing focus on periurban agriculture is its potential role as an experimental platform for the implementation of the “smart villages” concept. This innovative approach has gained prominence as a potential contributor to the sustainability and resilience of communities, especially in rural areas (Despotović *et al.* 2020, Garcia Fernandez and Peel, 2023).

Mainstreaming of periurban agriculture into policies and legislation should be accompanied with dedicated capacity building programs. In particular, the periurban farmers need to improve their knowledge and skills in relation to

environmental and food safety standards and adaptation to climate change impacts. Advisory and extension services, as well, should have a raised awareness and skills to provide their services in this respect.

CONCLUSIONS

Periurban agriculture provides a suite of benefits to local communities, which can be economic (commercial and non-commercial), cultural and environmental. As such it offers an opportunity to restructure farming beyond pure commodity production. Furthermore, periurban agriculture is viewed as one of the ways to contribute to addressing challenges of food insecurity, urban poverty and adaptation to climate change, and other issues originating from the increasingly urbanised and rapidly changing world. Finally, it should be born in mind that periurban agriculture is an integral component of urban systems, and as the urbanisation continues and the crises intensify, it is to be expected that this form of agricultural production will gain even more importance. Considering all this, as well as the fact that the umbrella objective of Montenegrin agricultural policy is ensuring the food security, we believe that periurban agriculture should be given more attention in the national agricultural policy.

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