

ECOLOGICAL AGRICULTURAL PRODUCTION – OPINIONS AND PRACTICES OF PRODUCERS IN SERBIA¹

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Abstract

Vegetable growing is one of the most intensive branches of agriculture, which is characterized by a high level of consumption of inputs, primarily fertilizers and pesticides. However, vegetable production can also be successfully achieved with reduced use of agrochemicals, actually in a more ecologically acceptable way. The aim of this paper was to examine the attitudes of vegetable producers in the area of eight local government units about ecologically acceptable cultivation practices for these crops. For the purpose of the research, one hundred and sixty vegetable producers were surveyed by questionnaire, and the collected data were processed in the SPSS statistical package, using the descriptive statistics method. The results showed that for 66% of farmers the priority in production is controlled and reduced application of agrochemicals in relation to high yield of vegetables, and also even 90% of producers are ready to shift from conventional to the ecologically acceptable production of vegetables, with the condition of certain benefits, meaning greater incentives for that kind of production. On the other side, direct payments and rural development measures are used by about 60% of surveyed, which may indicate that for expanding the concept of ecologically acceptable production, encompassing greater incentives from the national level, it is necessary to improve knowledge of this concept of production, as well as better applying of existing incentives.

Keywords: *ecological production, vegetable growing, subventions, regulations*

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Introduction

Agriculture is a traditional economic activity that people have been engaged in since ancient times while it was the only activity that involved the production process. With time, it has been increasing in importance and it has become the most significant branch of the economy (Subić et. al., 2017).

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The principles of conventional agriculture mean achieving high yields, which are realized with the intensive applying of agro-technical measures (mechanization, pesticides, mineral fertilizers). Overuse of pesticides and mineral fertilizers increases farmer's yields and profits but also it causes damaging effects on soil, water and the environment. Because of overuse of chemical agents, it happens that residues of chemical agents exist in the final products. Many authors concluded that the quality of the crops depends on the type of soil, the groundwork used for crops cultivation, the method of irrigation, and the type and amount of fertilizer applied (Asaduzzaman, Asao, 2018; Goldman et. al., 1999). Also, it is necessary to take in consideration the biodiversity of cultures which is major to sustainable development (Renna et. al., 2019).

Only the organic production is legally regulated in Serbia, in accordance with the Law on organic production (Official Gazette of the RS, No. 30/2010 and 17/2019 – other law), while ecological production hasn't been yet discussed. However, the principles of ecological production are contained in certain legal acts, namely: Law on Food Safety (Official Gazette of the RS, No. 41/09 and 17/2019), Law on Plant Protection Products (Official Gazette of the RS, No. 41/09 and 17/2019) and the Law on Veterinary Medicine (Official Gazette of the RS, No. 91/05, 30/10, 93/12 and 17/2019 – other law).

During 2015.year, in the area of the European Union (EU), vegetables for fresh using and vegetables for processing were represented on almost 2.2 million ha and accounted for 1.9% of arable land. According to EUROSTAT, half of the area under vegetables is in Italy, Spain and Poland. In the structure of seeded vegetables, melons, tomatoes, peppers, eggplant, zucchini, cucumbers and cornichons account for 27.6%, which is more than a quarter of the total vegetable crops grown. Fresh pulses (primarily peas and beans) are produced at 13% of the total area under vegetables, cabbages family (cabbage, cauliflower and broccoli) at 12.4% of the total area under vegetables and strawberries at 4.9% of the total area under vegetables. According to the SORS (Statistical Yearbook 2018), vegetables, watermelons and strawberries accounted for 1.9% of the total utilized agricultural area (UAA) in Serbia in 2017. The same percentage was in 2015, which means that participation in vegetables in Serbia is higher than in the EU. By analyzing the structure of the vegetable crops grown, it was calculated that potatoes make up 1.2% of the UAA; followed by pepper with 0.4%; beans and peas with 0.7%; cabbage and kale with 0.3%; onions, carrots, cucumber and garlic account for 0.1% and 0.4% in total; melons and watermelons occupy 0.2% of the UAA.

The production of vegetables in the greenhouse has become in importance in recent years, because it enables the early maturation of crops, which contributes to the realization of more significant profitability of production (Vlahović et. al., 2010). This type of vegetable production is operate through the seedlings, which is also the most sensitive stage in growing vegetables in a greenhouse. In order to obtain high quality seedlings, in the shortest possible time, it is necessary to ensure optimal conditions (Ilin et. al., 2002). A good location is essential for crop planning and growing (Canakci, Akinci, 2006). According to the Census of Agriculture in 2012 (SORS, 2013), the production of vegetables in a greenhouse in Serbia is 2.083 ha, or 0.06% of the UAA, while the average area under a greenhouse per farm is 0.02 ha.

The measures of agrarian policy, prescribed by the Ministry of Agriculture, Forestry and Water management (MAFW), contribute significantly to the further development of agriculture. Incentive measures that form an integral part of the agrarian budget of the Republic are distributed in such way to cover all types of agricultural production. In the period 2017-2019.years, the average share of the agrarian budget in the total budget of the Republic was 3.9%. In the structure of incentives, the dominant share has funds for direct payments and ranges from 70-80% of the total planned funds. Only 1% are special incentives,

about 2% represent funds for credit support, about 6% are funds for IPARD measures, and rural development measures account for almost 20%. In 2019 year, compared to 2017 year, the share of direct payments decreased and for rural development and IPARD measures increased.

Material and method of work

For the purpose of the research, the survey of one hundred and sixty vegetable producers was conducted, with eight different locations in the Republic of Serbia during 2018. The collected data were processed in the SPSS statistical package, using the descriptive statistics method. Also, data were used from the Statistical Office of the Republic of Serbia (SORS), the Official Gazette that publishes relevant legislation, as well as the work of experts relevant to the survey.

The attitudes of the farmers about ecologically acceptable vegetable production

Consider that ecologically acceptable vegetable production could be organized both in the open field and in a greenhouse, the results of the survey will be presented on the types of growing vegetables. Further, there are also given the results of the structure of the incentive funds for which they apply with the Ministry of Agriculture of the Republic of Serbia. Ecological acceptable vegetable production means reduced application of agro-technical measures, and consequently there is given an overview of the answers to the questions what guide them in the selection of fertilizers and pesticides and if their priority is to obtain health-safe products. Finally, there is shown their readiness to introduce ecological acceptable vegetable production. The sample consists of one hundred and sixty farmers from the area of eight local government units who answered the following questions:

1. *What kind of vegetables are grown, on which area and the method of cultivation (in the open field or in a greenhouse);*
2. *Do they use MAFW incentives and which one;*
3. *What lead them in the choice of fertilizers and pesticides;*
4. *Whether the priority is to achieve high yields with intensive application of agrotechnical measures or to realize satisfactory (lower) yields with less application of agrotechnical measures and materializing health-safe products;*
5. *The opinion of farmers about ecologically acceptable vegetable production;*
6. *Readiness to introduce ecologically acceptable vegetable production.*

By statistical analysis of the answer to the question "*What kind of vegetables are grown and the way of cultivation (in the open field or in the greenhouse)*" the following results were obtained:

- The farms covered by the survey grow 29 types of vegetables in the open field and 21 types in the greenhouse;
- In the area up to 0.5 ha only 19.3% of the farms grow vegetables in the open field and 49.7% in the greenhouse.
- 18% of farms produce vegetables in the open field on an area larger than 3 ha.

The structure of the answers of surveyed respondents is given (On the Fig.1) according to the area on which agricultural production is represented while recognizing the differences in the way of cultivation (open field or greenhouse). From the figure it is obviously that 51% of surveyed agricultural producers do not have agricultural land in the greenhouse, and 18% of them in the open field. In the greenhouse, up to 0.5 ha of arable land is cultivated by the

highest percentage of surveyed agricultural producers and ranges up to 80%, and 19.3% in the open field. We conclude that in the structure of the holdings of the surveyed respondents are dominated by small agricultural producers, with smallholdings predominating.

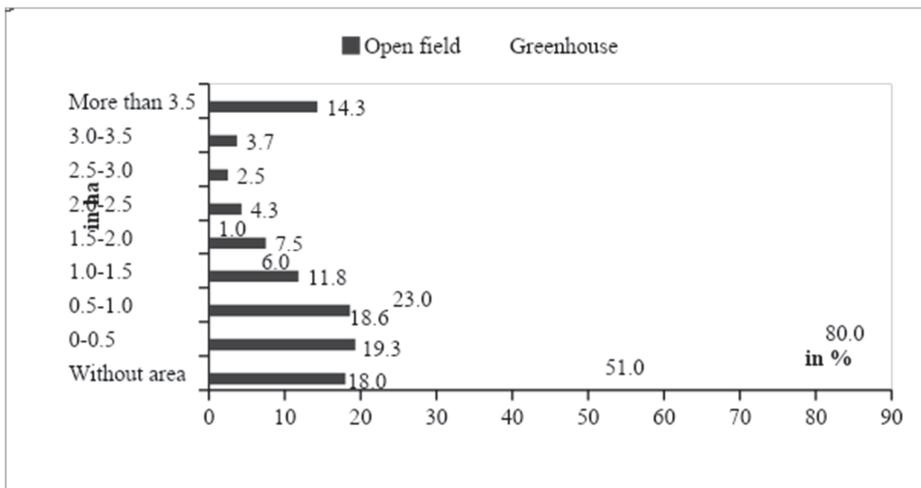


Figure 1. Structure of the agricultural holdings according to the UAA and method of cultivation

Analyzing the answer to the question "Do they use the MAFW incentives and which one", it was found that 62.1% of the surveyed respondents used the incentives. Further, 27 of surveyed, or 16.8%, use measures of direct payment and rural development measures, including one farmer who used credit support measures. As part of rural development measures, farmers applied for refunds for the procurement of irrigation systems as well as for greenhouse structures. On the Fig. 2. is given review of the structure of the measures used by the agricultural producers.

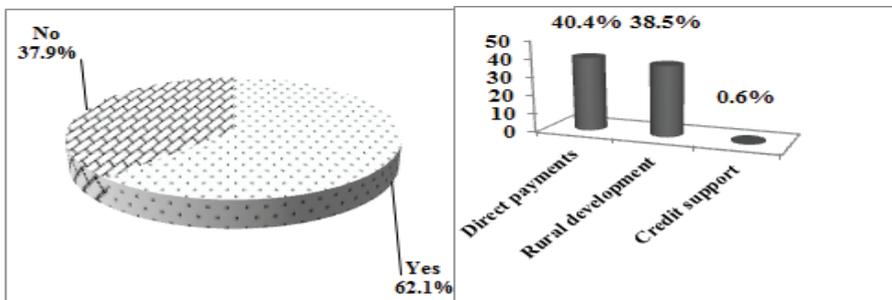


Figure 2. Share of producers which using incentives (left) and structure of used incentives of MAFW (right)

The graphs show that more than half of the surveyed respondents use current MAFW measures, while the ratio of incentives used for direct payments and rural development is

identical. In other words, both support measures for direct payments and for rural development are equally used.

To the question "What lead them in the choice of fertilizers and pesticides ", more than half of the surveyed respondents answered that they are most often guided by suggestions of the agricultural advisory expert service. About 68.9% of the surveyed respondents apply the agricultural advisory expert service suggestions when choosing fertilizers, while 72.7% of farmers take the advice when choosing pesticides. Since 59% of the surveyed rely on the personal knowledge and own experience when choose fertilizers or 50.3% of surveyed respondents when choose pesticides (Figure 3).

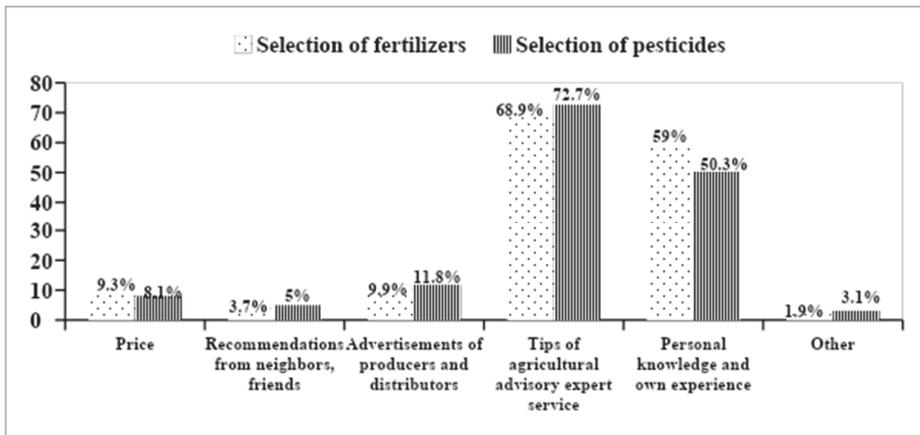


Figure 3. Structure of respondents' answers according to the method of choice of fertilizers and pesticides in agricultural production

Significantly less participation is achieved by the answers of the surveyed agricultural producers, who are guided by the advertisements of producers and distributors and their price, are much less active in the selection of fertilizers and pesticides. The recommendations of neighbors and friends are guided by only 3.7% of the surveyed respondents in the selection of fertilizers and 5% of the surveyed respondents in the application of pesticides. The surveyed respondents that do not use fertilizers or pesticides, as well as those who follow the advice of an agricultural pharmacy, are classified in the "other" category.

The answers of the surveyed respondents to the question "Whether the priority is to achieve high yields with intensive application of agrotechnical measures or to realize satisfactory (lower) yields with less application of agrotechnical measures and to obtain health-safe products" show that priority of the farmers is reducing application of agro technical measures for achieving satisfactory (lower) yields in order to get a health-safe product. It is obvious that the surveyed examinees recognize the importance of reduced application of agrotechnical measures as this answer was indicated by 65.8% of the surveyed agricultural producers. The structure of the answer is shown in the Figure 4.

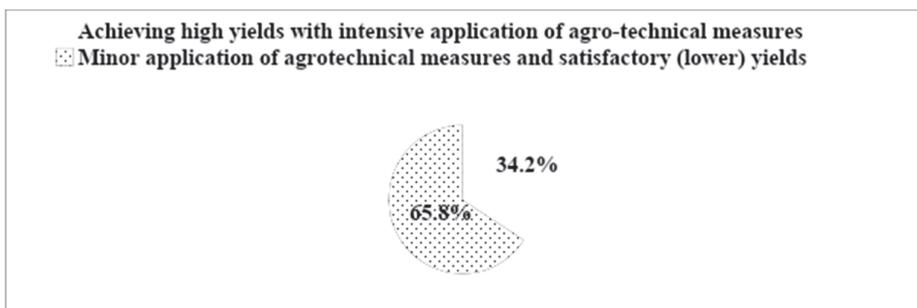


Figure 4. Structure of respondents' answers according to the priority in agricultural production

Therefore, farmers are aware that the reduced use of agrotechnics can produce health-safe products, that they will achieve and maintain customer confidence, but also preserve the health of water and soil nutrition due to reduced treatment of agricultural crops.

When is about the question "The opinion of farmers about ecologically acceptable vegetable production", surveyed respondents needed to answer what is represented by ecologically acceptable vegetable production. The structure of the answer is given in the Fig. 5.

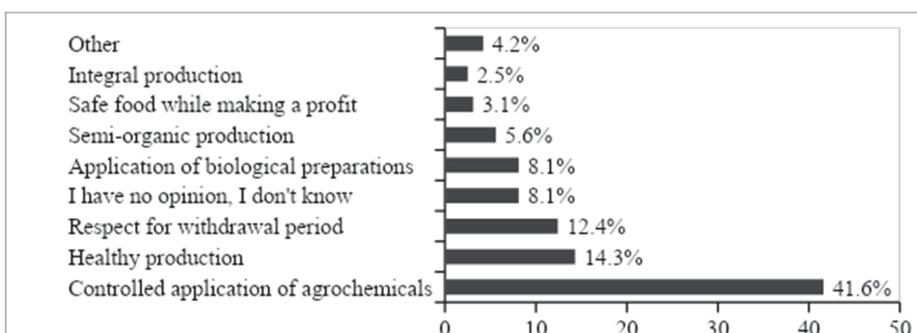


Figure 5. Structure of opinions of agricultural producers about ecological acceptable production

Figure shows that 41.6% of the surveyed respondents believe that ecologically acceptable production means less use of agrochemicals as well as controlled use of agrochemicals, 14.3% of the surveyed respondents believe that it is a production of health-safe food, 12.4% of the surveyed producers say that ecological production requires respecting the withdrawal period, 8.1% of the surveyed respondents do not know what ecological vegetable production is, and as many surveyed farmers have the view that biological preparations need to be applied. The remaining answers are 4.2%, which are: semi-organic production; safe food while making a profit; integral production; extensive use of pesticides to obtain satisfactory yields; less use of the preparation but higher yield; possession of major agronomic knowledge and implement measures on this basis; it is unacceptable; conventional in combination with ecological remedies; that a child can eat it; the most important is profit.

In general, the surveyed farmers are aware of the principles of ecologically acceptable production, as well as the benefits of this type of crops production.

The answers to the question *"Readiness to introduce ecologically acceptable vegetable production"* show that 90% of the surveyed respondents are expressed their readiness to introduce this type of production and 10% of respondents are not ready to implement it. This result shows that farmers are aware of the benefits of the principle of ecological vegetable production.

Mechanism of support to the plant production sector in the Republic of Serbia

The measures of the agricultural policy of the Republic of Serbia are contributed significantly to the further development of agriculture. When is about describing support, it is necessary to have a good database of information either for economic analyzes in agriculture and for the creation of agrarian policy measures, as well as for monitoring and evaluating the implemented measures (Pejanović et. al., 2013).

In the Republic of Serbia, financing of agricultural producers are regulated both by the Law on Incentives in Agriculture and Rural Development (Official Gazette of RS, No. 10/2013, 142/2014, 103/2015 and 101/2016) and by the Regulations on Incentives in Agriculture and Rural Development which are made annually. Financing of primary agricultural production is considered as the most complex problem of the domestic agrarian (Popović, Grujić, 2014; Grujić et. al., 2018).

In the period 2017-2019 the agrarian budget in the overall budget ranged on average 3.9% (in 2017 about 3.9%, in 2018 it was reduced to 3.7% and in 2019 it recorded the highest value of participation of 4.1%).

The Article 3 of the Law on Incentives in Agriculture and Rural Development of the Republic of Serbia provides the following types of incentives: direct payments, rural development measures, credit support, special incentives and IPARD funds. The structure of the planned incentives for the period 2017-2019 is given in the table 1.

Table 1. Structure of the planned incentives from agricultural budget for the period 2017-2019 (in %)

	2017	2018	2019
Direct payments	82.3	83.1	71.5
Rural development	12.5	11.7	19.6
Credit support	3.0	2.2	1.7
Special incentives	1.1	1.2	1.0
IPARD	1.1	1.7	6.3

Source: Regulations on Incentives in agriculture and rural development for 2017, 2018 and 2019.

It is obvious that the measures intended for direct payments account for the largest share, ranging from 71.5% in 2019 to 82.3% in 2017. Therefore, the allocated funds for direct payment measures are gradually decreasing in the total planned incentive values. In contrast to direct payments, rural development measures are up 56.8% in 2019 and 7.1 p.p. compared to 2017. In the three-year period, it is obvious a decrease of 43.3% that has been planned for credit support, a decrease of 9% for special incentives, while the funds for IPARD incentives are higher for 5.7 times.

Considering that in this paper realizes the specificities of plant production, there will be presented the incentive measures from the agricultural budget of the Republic of Serbia, which producers can await in 2019:

1. Within the *direct payments*, basic incentives for plant production are foreseen, as well as recourse for storage costs in public warehouses in the amount of 40%;
2. Within the *rural development* measures, funds are available for: raising perennial plantations; procurement of new machinery and equipment; recourse to insurance premiums for crops, fruit and perennials; organic plant production; conservation of plant genetic resources;
3. Within the *special incentives*, there are especially highlight of incentive measures for production of planting material and certification and clonal selection;
4. For *credit support*, the Ministry of Agriculture subsidizes the interest rate on agricultural credit approved by commercial banks;
5. Within the IPARD funds in plant agricultural production there are multiple opportunities for applying for incentive funds.

Organic production is a type of agricultural production that requires reduced and controlled apply of chemicals. The Article 2 of the Regulation on the use of incentives for organic plant production (Official Gazette of RS, No. 31/2018 and 23/2019) highlights that incentives for these purposes are higher by 70% than the amount paid for basic incentives for plant production.

Because of the importance of these activities for the economy and further economic development of Serbia, it is necessary to continue subsidizing agricultural production from the agrarian budget. In order to further improvement of agriculture and rural development in Serbia, it is necessary to increase the share of funds to support rural development in the coming period.

Conclusions

The lack of law regulation to legislate ecological agricultural production prevents higher production of health-safe food. As already mentioned, vegetable production can be organized both in the open field and in a greenhouse. In contribution, the data of survey also show those are represented 29 of different types of vegetables grown in the open field and 21 of types in the greenhouse to the one hundred and sixty farmers. The most common open field crops are cabbage with 45.3% and pepper with 40.4%. In the greenhouse, tomatoes are the most grown with 57.1%, peppers with 36.6% and cucumbers with 35.4%. The results showed that carrots, watermelons and celery weren't grown in the greenhouse. Consider that vegetable production is most represented in the area up to 0.5 ha, almost 80% of the surveyed respondents cultivate vegetables in the open field, and only 19.3% of farmers grow vegetables in the greenhouse. It is concluded that the structure of the cultivated vegetable crops is very diverse and is represented equally in the open field and in the greenhouse.

Also, greater allocation of funds from the agrarian budget would increase the interest of farmers to intensify agriculture in general. According to the survey, more than half of the surveyed respondents (62.1%) used MAFW incentives during 2018 year. This data shows that farmers are informed about current agrarian policy measures and then ready to apply for grants.

The high percentage of the readiness of farmers to engage in ecological vegetable production with satisfactory (lower) yields (65.8%) shows that their priority is to produce health-safe food and to preserve the health of consumers.

The current survey showed, on the one hand, that producers are aware of the meaning and principles of ecologically acceptable vegetable production, which can be confirmed by the high percentage of answers that this type of production involves the controlled use of agrochemicals (41.6%), and on the other hand, they are ready to adapt to customer requirements that imply a transition from conventional to ecological production (90% of the surveyed respondents).

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