

**PLANT PROTECTION PRACTISE OF ORGANIC FARMERS IN MACEDONIA  
AND THE ROLE OF HIGHER EDUCATION INSTITUTION IN PROVIDING  
SUPPORT**

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**Abstract**

Recent data from the Department of Organic Farming of the Ministry of Agriculture, Forestry and Water Economy are showing decrease of interest by farmers to continue the organic practice and new farmers are not sufficient in numbers to compensate the number of those one who made their decision to turn back to conventional principles. Searching for the reasons of such trend, the Department of Organic Farming at the Ministry of Agriculture, Forestry and Water Economy conducted own research and analysis present that major reason are low economic benefit.

But, is it so? Is this the only reason for losing interest? A Study for Development of Organic Farming in the East Planning region in 2010, performed by the Faculty of Agriculture at Goce Delchev University in Shtip could be revealing something else under the surface. An interview on 983 farmer households, from 80 rural settlements in the East Planning Region was performed in a search of what are practices of the farmers, what is their understanding of what organic farming is.

Finally, research in 2014 was conducted with an assistance from one of the certification bodies, aiming to find out if our farmers are familiar with permitted pesticides that can be obtained on the market and are they relying on their application.

**Keywords:** *plant protection, organic farming, higher education institutions*

**Introduction**

Agriculture (along with forestry and fishery) is the third largest economic sector in Macedonia, following services and industry (MAFWE, 2012). Macedonia has 1.120.213 ha of agricultural land, of which 511.316 ha arable land and 608.176 ha under pastures. Main production crops are wheat, barley and tobacco with 76.545 ha, 41.096 ha and 19.679 ha respectively (State Statistical Office, 2012).

Making its first steps in 1997, organic farming in Macedonia had always been considered as something 'easy to be achieved'. First certified organic products were several kinds of tea from indigenous herbs, prepared and produced by the largest pharmaceutical factory in Macedonia. The next year, 4-5 farmers from Ohrid, Strumica and Kumanovo initiated the first organic activities on farm level. By the end of 2000 with assistance of EU experts on organic practice National framework for development of organic agriculture was developed. In 2001, The Law on Organic agriculture was adopted and first national associations were established. One of the strongest beliefs on organic's future depended on Macedonian farmers' long traditional farming practice, the belief that it does not require drastic changes in understanding, behavior and belief, and finally that prices of organic commodities are higher on foreign market. Unfortunately, such expectations or desires were not substantiated by performed strategic analysis on farmers' habits, level of education, markets, absolute absence of modules on organic farming at the Faculties of Agriculture. While Table 1 indicates the

level of governmental support through the years, Table 2 indicates the number of farmers that considered change of practice. (Zlatkovski *et al.*, 2010, MAFWE, 2013).

Table no.1 – National budget for organic farming support

Year	MKD	€
2005	6.000.000	97.561
2006	0.00	0
2007	11.000.000	178.862
2008	36.500.000	598.360
2009	66.938.000	1.098.360
2010	70.800.000	1.160.656
2011	110.000.000	1.788.618
2012	130.000.000	2.113.000
2013	67.000.000	1.089.430

Table no.2 – Area under organic production

Year	ha	Certified operators
2005	266	50
2006	509	102
2007	714	150
2008	1.029	226
2009	1.374	321
2010	5.228	562
2011	6.581	780
2012	4.663	576
2013	3.167	400

Table 2, clearly points out that despite the volume of subsidy in 2012, highest since organic farming got under governmental support, there was a drop in number of hectares under organic and drop in number of operators. So, considering that there is insufficient volume of subsidies or ‘unsatisfactory return rate’ cannot be proven as prevailing factors for losing interest.

### Materials and methods

As far as method is concerned, a direct approach (visit on-site) was used when institutions and individuals are considered. Questionnaires were developed and before proceeding to obtaining answers, interviewees were given explanation for the significance of their sincere answer.

### Results and discussion

Mihajlov *et al.* (2013) consider several parameters that define Macedonia as favorable for organic farming, especially due to the following:

Low-polluted areas	Unpolluted resources (water, soil)	Fertile valleys
Diverse vegetation	Low input of pesticides	Low use of fertilizers
Vast area under pastures	Significant number of animals	Strong governmental support

On the other hand, there are number of ‘issues’ that pose serious obstacle to the development process:

Lack of strategic document on regional limiting factors (weather, soil etc.)	Poor volume of literature in Macedonian
No training camps/sites	Poor knowledge about organic farming among extension/advisory service
Too rigorous state inspectorate	Underdeveloped processing industry

Three climatic zones can be determined that have their influence over the living beings in Macedonia. The Mediterranean, which is present along the valleys of the rivers Vardar and Bregalnica (south and east) and in these areas the temperature in July – August often exceeds 40°C. On the other side there is mountain climate, which dominates the western part of the country. This climate is characterized by long winter, lots of snow and short summer period. Majority of the country enjoys moderate climate with warm and dry summers, relatively cold and wet winters.

Beside the weather, many other different factors determine the profitability level of agricultural production, of which the following are considered as most influential ones: inputs expenses (seed, pesticides and fertilizer), post-harvest technology, level of knowledge for farm management, advantages & disadvantages of farm location, proximity to markets etc.

The results from a poll on 983 farms in the East Planning region, are implicating to the following situation. Analysis of the age structure of examinees are that in the East planning region people that deal with agriculture are older than 50 years (44% of the examinees), the young population (20-30 years old) that deals with agriculture is only 4%. The largest number of the working age population is between 30 to 40 years old (16%) and 40 to 50 years old (36%). Regarding the sex structure of the examinees, 93% were male and only 7% were female, which indicates to the traditionally subordinated role of women in Macedonian agriculture, where the dominant role is left to the man, as a head of the family. An analysis of the education level of examinees show that only 3% of them have higher education, 46% are with secondary education and most of them are with elementary education. In one of the municipality 97 examinees answered that they deal exclusively with organic agricultural production. On the other hand, the analysis of the question's answer "What is organic farming?" as well as the answers of the question "What kind of manure do you use?" shows that a small part of the examinees know the real importance of this type of production, because all examinees use artificial fertilizers! This indicates to ignorance of the organic agriculture as a system of production and the examinees probably consider the organic production as something they cultivate for their own needs without application of pesticides. Regarding the professional assistance during work, the greatest part of the examinees responded that they don't get any professional assistance (86%). Part of them answered that they get professional assistance by the Agency for Development of the Agriculture (6%), agricultural pharmacies (pharmacists) and agronomists (3%) and by the state/Ministry of agriculture, forestry and water management (3%). As a source of professional assistance, with less than 2% are listed the following things: municipalities, agricultural programmes, seminars, parents, children and friends (Mitreva *et al.* 2010).

The weather conditions and those one which are determining the development of organic farming in the East Planning Region as described by Mitreva *et al.* (2010), are providing conditions to reveal that growing plants in Macedonia is not as easy as it might seem. Having frequent cases of rainy spring with high relative humidity and reasonably high temperatures, offer more than favorable conditions for disease outbreak, especially of the farm location is not on suitable terrain i.e. in valleys, near rivers etc. Such locations provide more than excellent conditions for development of economically most significant diseases such are those of *Phytophthora*, *Plasmopara*, *Erysiphe*, *Sclerotinia* etc.

Own research in 2014, conducted in collaboration with ProCert certification body, aiming to check farmers' pre-organic period experience and farms location 'suitability' gave very interesting in-depth information. The sample and results refer to the 176 (of 400 organic farms nationwide) and farm type:

Table 3 – Number and type of organic farms under analysis

<b>Farm type</b>	<b>Number of operators</b>
Fruit production	24
Wine and table grape	6
Vegetables	7
Small grains and forage	33
Animal husbandry and plant production (plant production for feed)	65
Animal husbandry	34

Bee-keepers and plant production (fruits and forage)	4
Plant production and processing (vegetables, spices and medicinal herbs )	3

In order to find-out how farmers are managing with prevention disease out-break or in case of disease severity what they do, a questionnaire was developed with 16 group of questions, divided in three groups of questions:

**Prevention of out-break**

Activity	Practice	Survey results
Disinfection	VF seed removing plant residues soil steam treatment	0% of the farms are using VF material;0% are destroying plant residues; 0% practice soil steam treatment;
Time asynchrony	Earlier/later seeding/planting w/relation to the pathogen, vector of development phase/stage	0% of the farms are using these techniques;
Mandatory practice	Rotation Use of repellent-crops, Adding organic matter to the soil, Use of repellents in storing facilities	100% use of crop-rotation system; 100% use of repellent-crops; 80% add organic matter to the soil; 0% use repellents in storing facilities;
Spatial isolation	Sowing crops away of: pest-host plants, weed population,	0% of farms practice sowing away of pest-host practice;
	non-crop removal except growing one;	50% keep the interplant space without vegetation (100% in orchards/vineyards); 40% are having barrier-crops;
	growing barrier crops,  physical separation from colonizing organisms	60% of the farms;
Natural conditions disruptors	Mating confusion, traps, release of sterile males, birds protection nets, reflecting tapes and sounds against birds	0% of farms use mating confusion techniques or release of sterile males; Only fruit and sunflower growers use protections nets;

**Regulation of population**

Activity	Practice	Survey results
Resistance of host-plant	Elimination of poorly developed plants	100% in vegetable farms
	Resistant varieties/cultivars	100% in vegetable farms
	Increased crop spacing	100% in vegetable, fruit & grape farms
	Plant extracts	10% of the farms
Intercropping	Mixed crops	1%
	Strip cropping	0%
	Green manures	30%
	Incorporation of repellent plants	10%
Competition	Use of herbivores and microbial activity for decreasing population	0%

of weeds		
Predator host-plants or pest-attracting plants	Flowering plant presence by the edges, strips, pre-determined areas,	0%
	Keeping beneficial birds	40%
	Nests for predator birds	40%
Curative actions		
Activity	Practice	Survey results
Organic pesticides	Soaps	5%
	Oils	20%
	Compost tea	0%
Non-organic pesticides	Sulfur (dust) and sulfur spray	100% (vine, fruits & vegetables)
	Diatomaceous earth	0%
	Micronutrients	0%
	Iron phosphate	0%
	Carbon dioxide	0%
	Nitrogen	0%
	Bordeaux mixture	100% (vine, fruits & vegetables)
Bio-control	Predators (predatory mites, lady bird)	0%
	Parasitoids	0%
	Bacteria ( <i>Bacillus thuringiensis</i> )	5%
	Fungi	0%
	Virus	0%
Physical methods	Setting traps	10%
	Vacuuming	0%
	Hand removal	20% (most in vegetable growing)
	Hunting	2% (in orchards)
Other methods	Flambination – use of flame to disinfect the top earth layer in vegetables plantlet production (57% - 4 out of 7 producers)	

Here are some other results of the research conducted with the organic inspectors:

95% of the farms which decided to turn to organic in the period of 2007-2010, never considered checking farm location as a possible factor for disease & pest outbreak. They turned organic only by being attracted by higher subsidy level.

90% of the organic farms are turning for plant protection advice to the inspectors of the certification body and only 10% are searching for an answer with the extension/advisory service or more experienced farmer. Exclusion to this practice are bee-keepers, for which three-out-of-four (75%) are having regular exchange of know-how. Three farms, of different type have reached development stage and are implementing applicable technology to the extent to be considered as possible group leaders.

Until 2012 neither of the higher education institutions in Macedonia had developed as study program for organic farming. At present, only the Faculty of Agriculture at Goce Delchev University in Shtip has this course in all of its 10 study programs. Furthermore, prior 2012 no higher institution in the country had possibilities to perform research in organic practice. Since 2012, 9 ha of Goce Delchev University's land were applied for conversion and this year (2014) that land will be certified as organic. Following faculty's policy for obtaining best possible conditions for students to gain practical knowledge, the area under organic is expanded to additional 7 ha and preparations are in progress for turning this area into Training site/Farmer Field School.

In 2013, a survey on availability of human resources in advisory sector and their capability/knowledge in organic, presented disturbing data. Out of 23 interviewed advisors from two Regional offices of the National Extension Agency none had a degree in organic, nor had received any training in it. Similar to this, no experience was in possession with regard to organic plant protection practice as well.

As illustrated in Table 2, the number of operators and area under organic farming had dropped almost to double. While most of the government authorities feel that this could be remedied by simply increasing the volume of subsidies, there is a strong belief that by simply increasing financial support and not dealing with the rest of the factors will not bring much of a difference. Namely, organic farming is based on awfully different principles than the conventional one. The organic's holistic approach, anticipating what is to be happening rather than acting aftermath, living in harmony with the surrounding organisms and heavily depending on their 'collaboration' in 'maintaining pest population balance' etc. are just one of the things farmers in Macedonia are not introduced to prior their decision to turn to organic. Furthermore, the processing industry is almost none existing, hence the disappointment feelings when organic product is to be sold by price as conventional and in raw format. On the other hand, the only organic specialized store in national's capital is full with processed products, but imported. Finally, farmers can hardly understand that in order to make their farm profitable, before they sign the papers for first inspection they need to do their homework much better than just simply being attracted by high subsidy volume. Careful market analysis, deep research in soil, weather, pollution possibilities, recent disease & pest outbreaks and crop-types presence is something they need to consult a specialist before jumping into big decision as turning into organic is.

On the other hand, as usual nothing is as negative as it seems. One of the positive things is the decision of the Faculty of Agriculture at Goce Delchev University in Shtip to certify a part of their production sites into organic. This could be much better utilized if the Ministry of Agriculture, Forestry and Water Economy would transfer part of their subsidy budget into this site and turn it into training site. Farmers, their children and other interested parties can receive training through specially tailored programs in:

Growing crops (which in some cases can reach up to two crops per season);

How to restructure their production by starting growing more profitable crops (such are medicinal herbs and spices rather than depending only on small grains);

Most significant plant pest & disease life cycle and required growing conditions;

Plant protection according to the organic principles (since the survey clearly points out the low level of knowledge farmers possess in using means to control disease & pest outbreak).

The Department of Plant and Environment Protection of the Faculty of Agriculture at Goce Delchev University in Shtip since 2010 had launched an internet-based application containing all pesticides registered for use in Macedonia and a special part for organic farming, with uploaded manuals, guidelines and other scientific materials, based on free-access use. No matter Macedonia had fully harmonized its legislation to the EU, thus making possible for organic pesticides to be imported/sold on the market, yet very few of them, or perhaps better to say close to zero can be purchased commercially.

### **Conclusion**

If the period of 9 years since the organic farming begun officially recognized in Macedonia can be considered as innovative way of farming, then by applying the basic principles of diffusion of innovation can significantly contribute to stop, then maintain and finally attract more farmers. As described by Rogers (1983), diffusion is the process by which an innovation is communicated through certain channels over time among the members of a social system. Communication is a process in which participants create and share information with one

another in order to reach a mutual understanding. The diffusion process typically involves both mass media and interpersonal communication channels.

Since plant protection in organic farming is very close to be considered as something new and in full respect to the four main elements of the diffusion of innovations and giving respect to the S-curve of diffusion as described by Rogers (1983), the following is to be considered:

Improve human capacity in understanding the principles of organic farming, especially in the area of plant protection (preventive and curative activities);

Determine target groups which will serve as ‘early adopters’, who will lately ‘be used’ as a model of plant protection practice;

The National Program for Agricultural and Rural Development should be upgraded by expanding a budget line for projects that will engage higher education institutions in establishing Training centers or Farmer Field Schools for activities in teaching organic principles through their or farms that have reached certain level of development;

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