



THE STATE OF MACEDONIAN AGRICULTURE

GENERAL OVERVIEW OF THE AGRICULTURAL SECTOR

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1 THE STATE OF MACEDONIAN AGRICULTURE IN A WIDER CONTEXT

1.1 GENERAL OVERVIEW OF THE AGRICULTURAL SECTOR

The agricultural sector in Macedonia is third biggest GDP contributor right behind the services and industry with 12% contribution. Altogether with the food processing industry contribute 18% from the total GDP. The possibility for bigger contribution to the national GDP is bigger than the number represented in the statistic, if this sector use its potential and available resources supported by the tradition and favorable climate conditions.

According to SSO (2017), 1,263 million ha or 49% of total area is agricultural land (cultivated land and pastures), 38% are under forests while about 13% are water and other surfaces. Cultivated land represented approximately 514.000 ha or approximately 41% of total agricultural land. From the total cultivated land approximately 81% are occupied under arable land and gardens, 3% under orchards, 4% under vineyards, while the meadows represent 12% from total cultivated land. Pastures are represented on 750.000 ha or 59% of total agricultural land in the Republic of Macedonia.

Table 1. Trade with industrial, agricultural and fishery products in million €

		Total trade (industrial + agricultural products)	Total trade with agricultural, processed and fisheries products	Share of agricultural, processed and fisheries products in total trade
2016	Export	4.329,27	530,52	12,25%
	Import	6.106,73	718,01	11,76%
	Balance	-1.777,46	-187,49	10,55%

Data source: SSO, 2017.

The most important Macedonian agro-food export products to the EU-28 in 2016 were: un-manufactured tobacco (share of 28,9% of the total export), biscuits and wafers (10,8%), wine (10%), other vegetables prepared or preserved (6,7% of total export), lamb meat (5,1%), vegetables (uncooked or cooked by steaming or boiling in water), frozen (4,2%) and other vegetables, fresh or chilled (4,5%) (SSO, 2017). With total value of €613,8 million, the EU-28 is definitely the most important partner of the Republic of Macedonia in the trade with agri-food and fisheries products in 2016. Around half of the total exported and imported agro-food and fishery products' value was realized with the EU-28 (i.e 48,7% share on the export and 49,5% share on the import side) (SSO, 2017).

Republic of Macedonia is net exporter of wine as a strategic export product for the country. In terms of the overall export value of agricultural products, wine export holds the second position right after tobacco. The average annual wine production fluctuates between 110 and 130 million liters (SSO, 2017). The trend in wine production, however, points to a certain decrease in quantity terms, due to the fact that most of the smaller entities are focused towards production of quality bottled wine. Grapes and vine production contributes 17-20% of total agricultural GDP. Currently, there are 75 registered wineries located in the main grape producing areas in the Republic of Macedonia and the total processing capacity is almost twice the annual wine production. Total export of wine in 2016 reached 770.754 hl with a value of €47,7 million (SSO, 2017).

The crop production structure is broken down into five main groups: production of cereals, industrial, forage, horticultural crops, orchards and vineyards. The structure of sown area under cultivation and horticultural crops (total 278.000 ha), accounting for approximately 58% of cereals, 18% of vegetable crops, 14% of forage crops and 9% of industrial plants. Orchards occupies an area of 16.000 ha or 4%, while vineyards about 22.918 ha or 4% of total cultivated land (SSO, 2017).

The vegetable production is one of the most important and traditional agriculture sectors which cultivated on 53.000 ha or 19% of total sown area under arable land and gardens (277.000 ha). Vegetable production takes place mainly in the open field conditions, greenhouses and under plastic with or without heating. The volume of production of vegetable crops ranged from 800 thousand tons to 1.200 thousand tons, depending on the climate benefits in some years. The early vegetable is cultivated under green houses and plastic tunnels with total area of 4.223 ha out of which 217 ha are green houses and 4.006 ha are plastic tunnels (SSO, 2017).

The largest portion in the total milk production in the Republic of Macedonia goes to the cow milk production. In average it covers about 89% of total production, while the production of sheep milk is about 8% and goat milk of about 3% (SSO, 2017). Agriculture along with hunting, forestry and fisheries with share of 10.0% in the overall Gross Domestic Product (GDP) is the third largest economy sector, right after the sectors of services and industry.

1.1.1 AGRICULTURAL POLICY OVERVIEW

Since receiving the status of the candidate country in 2005, Macedonia has started to adjust national agricultural policy toward the Common Agricultural Policy (CAP) of the EU. Thus, the Law on Agriculture and Rural Development (LARD; effective from 2008), consisted of two acts: one for regulation of the agricultural markets and another for rural development, and represents a gradual transition toward the CAP. The Law on Agriculture and Rural Development, adopted in 2010, is a further adjustment towards CAP, and currently it serves as a legal framework of the agricultural policy in the country. Beside this law, agriculture is regulated by a dozens of other laws; namely, Law on Agriculture Activity, Law on Agricultural Land, Law on Tobacco, Law on Wine, Law on Livestock Breeding, Law on Pastures, Law on Organic Agricultural Production, Law on Farm Accountancy (FADN), Law on Agricultural Inspection, Law on Waters, Law on Water Communities, and Law on Water Management Enterprises. The Ministry of Agriculture, Forestry and Water Economy (MAFWE) is the competent authority for planning, monitoring and evaluation of agricultural policy measures and instruments, while the Agency for Financial Support in Agriculture and Rural Development (often called the Paying Agency) is responsible for the implementation and control of the agricultural policy measures as an independent body of the state administration. The funding of the policy is from the national budget, as well as from donations and contributions from other sources, such as the EU budget.

In 2014 the Government of Macedonia adopted a six-year National Strategy for Agriculture and Rural Development 2014 - 2020 to strengthen the ability of Macedonia's agricultural sector to compete in the EU and other regional markets and to promote sustainable development of rural areas. The strategy, which is a pre-requisite for receiving EU Instrument for Pre-accession Assistance (IPA) II assistance in agriculture, also aims at improving the marketing of agricultural products and implementation of minimum quality standards according to the EU approximated Law on quality of agricultural products and respective by-laws. Consequently, the total agriculture budget (including financial support to agriculture development and subsidies to farmers) has increased from USD 49.3 million in 2007 to USD 176 million in 2017 and accounted for around 4.58% of the national budget in 2017 (MAFWE, 2017). The government has promoted agriculture as one of the most important sectors for the development of the economy in Macedonia and adopted and amended several agricultures related laws to comply with EU requirements. As of January 1, 2009, in accordance with the Law on Veterinary Public Health and the Rule Book on sanitary and hygiene conditions for food production, every establishment that is involved in production and/or trade of food products has to implement HACCP standards in order to be able to operate.

A large share of rural development is financed by the EU, via the Instrument for Pre-Accession Assistance for Rural Development (IPARD). The main objective of the IPARD program is to improve the competitiveness of agricultural holdings and the food industry in order to bring them into compliance with community standards and at the same time to ensure sustainable environmental and socioeconomic development of rural areas by increasing economic activities and employment opportunities.

1.2 BUSINESS MODELS OF FARMING IN MACEDONIA

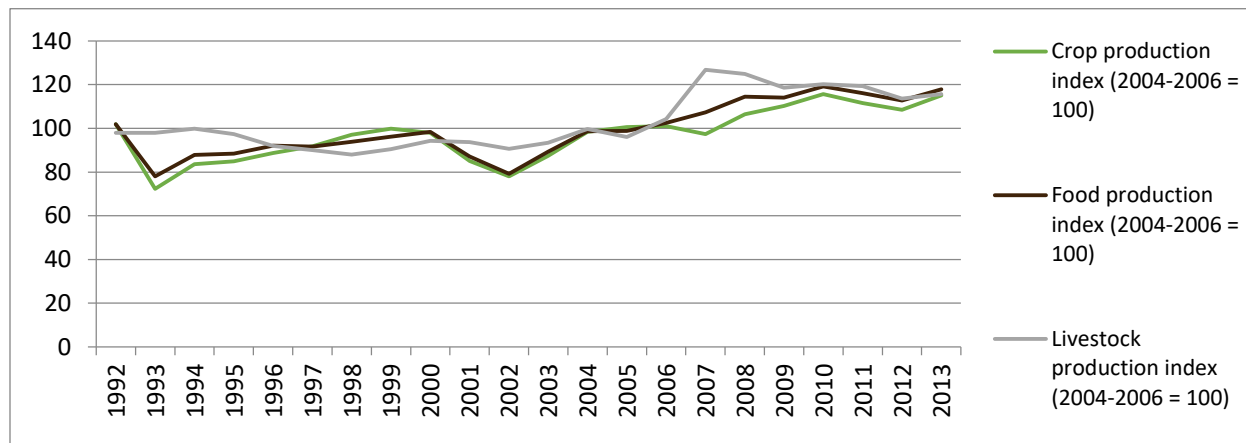
1.2.1 EMPLOYMENT IN AGRICULTURE SECTOR

The long-standing drop among the European population employed in agriculture has occurred in parallel with the increased specialization of farming jobs. For example, the total workforce of Macedonia employed in agriculture, forestry, fishing and hunting has dropped from 475956 people in 2006 to 431966 in 2015 (SSO, 2017). The employment in the agriculture sector out of total country's employment in 2000 was 22% comparing with 17.3% in 2014, out of which, female was 22.2% in 2000 and 17.6% in 2014 (FAO, 2017). As broad, family-farm structures give way to larger, monoculture farm operations, the number of young people with a comprehensive understanding of farming has seen a substantial decline.

1.2.2 FARM ECONOMICS

Small-scale agricultural holdings dominated agricultural production both before and after the privatization process in the 1990s. The farm structure survey from 2013 reported 170 885 agricultural holdings utilizing 315 863 ha of agricultural area, with an average farm size of 1.85 ha (SSO, 2013). This is slightly higher than the average farm size recorded in the agricultural census of 2007; namely, 1.73 ha (SSO, 2007). However, over 58% of agricultural holdings still utilize less than 1 ha.

Figure 1. Agri-food production index in the Republic of Macedonia (1992-2013)



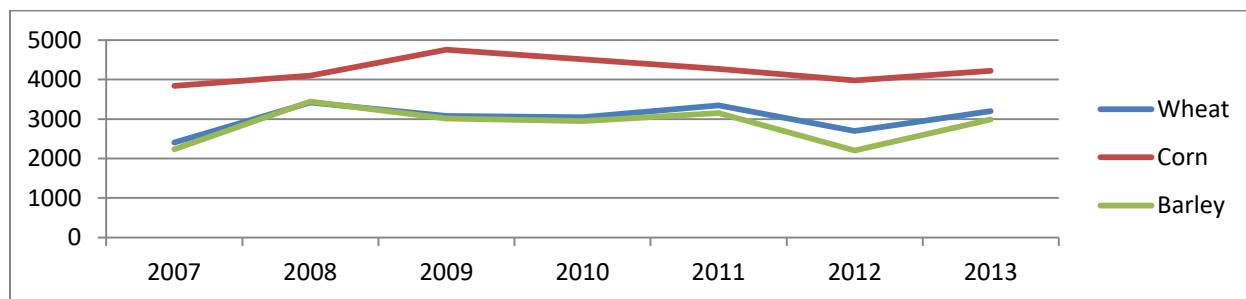
Source: World Bank, 2014.

Long-term strategy for agriculture and rural development based on preference for subsidizing production and quantity makes Macedonian farmers (especially those 0.1% large-scale agri-food companies) maintain “the socialist habit” of mass and managed production (Trendov, 2017).

1.2.3 FARM PRODUCTIVITY

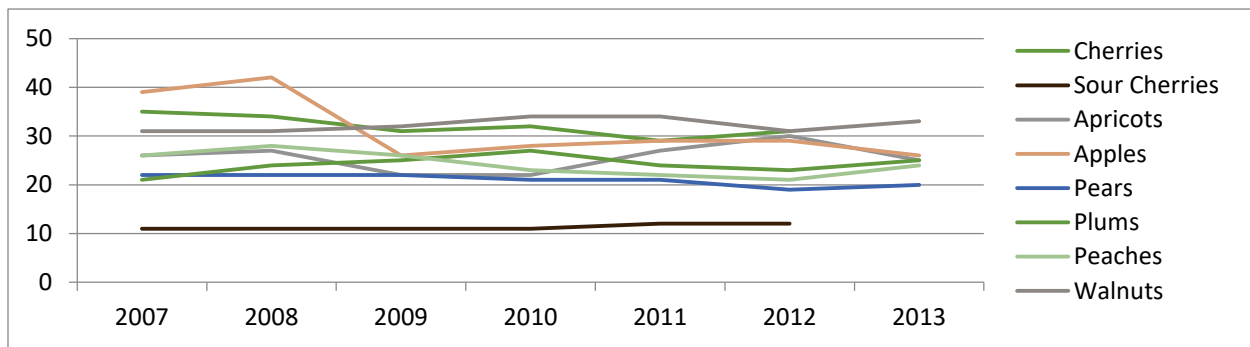
Productivity in agricultural production in the Republic of Macedonia in comparison with EU countries is ten times lower. Even increasing on an annual level (from 1.93 in 2006 up to 2.35 in 2013 [SSO, 2017]) the TFP is lagging behind the world projection of 3-5%. Multiple analyses show that it is the highest correlation depending on the application of technical and technological solutions or the development research activities. We believe that the productivity of the agricultural sector in the Republic of Macedonia can be increased through the adoption of new technologies of crop production and livestock farming.

Figure 2. Average cereal yields in Republic of Macedonia for 2007-2013 (in Kg/ha)



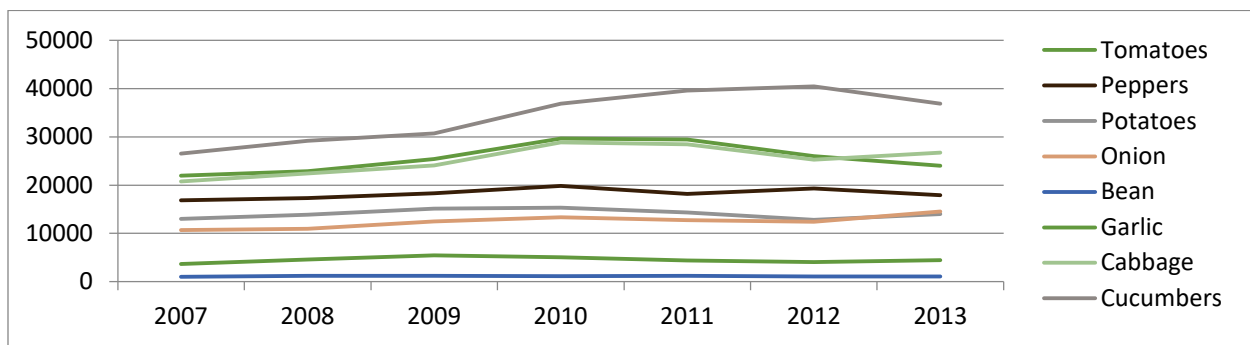
Source: SSO, 2015.

Figure 3. Average vegetables yield production in Republic of Macedonia 2007-2013 (in Kg/ha)



Source: SSO, 2015.

Figure 4. Average orchards production in R. of Macedonia 2007-2013 (in Kg/tree)



Source: SSO, 2015.

Total agricultural output value in million denars in 2005 is 63,986 and in 2015 was 79,692. Therefore, farm net income per capita gross €4347 in 2005 and €6438 in 2015 (SSO, 2015).

1.3 STATE OF ICT INFRASTRUCTURE IN MACEDONIA AND SOME WESTERN BALKAN COUNTRIES

Telecommunication services have developed very fast over the past two decades. This growth was primarily driven by wireless technologies and liberalization of telecommunications markets, which have enabled faster and less costly network rollout. No other technology has ever spread faster around the world.

With the rapid development of mobile telephony and the global expansion of the Internet, information and communication technologies are increasingly recognized as essential tools of development, contributing to global integration and enhancing public sector effectiveness, efficiency, and transparency.

Mobile communications have a particularly important impact in rural areas. The mobility, ease of use, flexible deployment, and relatively low and declining rollout costs of wireless technologies enable them to reach rural populations with low levels of income and literacy.

Mobile cellular telephone subscriptions are subscriptions to a public mobile telephone service using cellular technology, which provide access to the public switched telephone network (PSTN) using cellular technology. It includes post-paid and pre-paid subscriptions and includes analogue and digital cellular systems.

Table 2. Mobile cellular subscription in Western Balkans

WB Countries	2005	2016
Albania	1530244	3369756
Bosnia and Herzegovina	1594367	3404043
Croatia	3649700	4414347
Macedonia, FYR	1131006	2124225
Montenegro	543220	1040747
Serbia	5510690	9094447
Slovenia	1759232	2385757
Kosovo	562000	..

Source: World Bank, World Development Indicators, 2017.

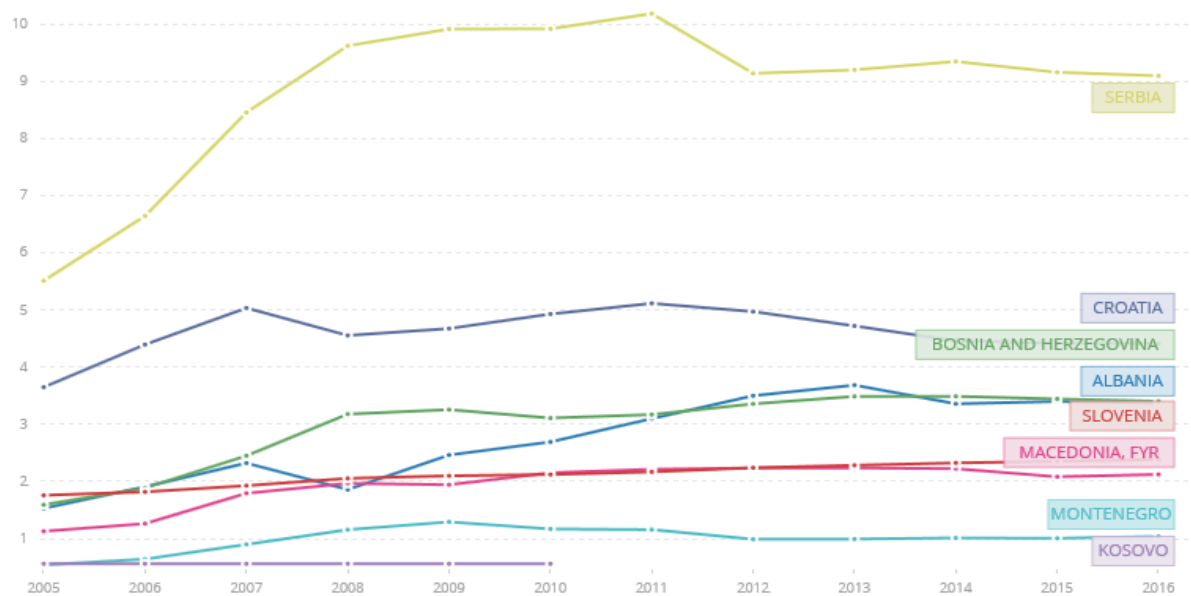
According to the World Bank data for mobile cellular subscriptions and internet coverage, there is an indication for solid ICT infrastructure in the WBCs. Generally, there are more mobile subscriptions in WBCs than inhabitants.

In Montenegro there are 67% more mobile subscriptions than the total number of population. Serbia has 28% more mobile subscriptions than the total number of population, Albania 17% and Slovenia 15% more mobile subscriptions than the total number of population. The number of mobile subscriptions compared to the total number of population in Croatia is 5% larger, and in Macedonia 2% larger. Bosnia and

Hercegovina is the only west Balkan country where mobile subscriptions are 3% less than the total number of population.

This analysis can indicate that mobile phones are widely used in WBCs and can be good base to approach farmers in rural areas. Farmers can easily use mobile applications in agriculture, gain fast and relevant information through social media or internet via smart phones.

Figure 5. Mobile subscription in Western Balkans

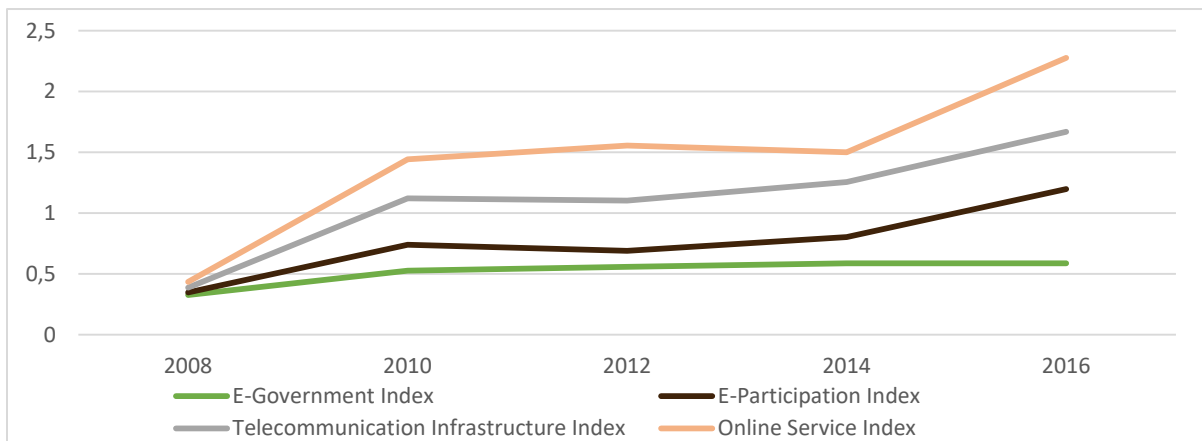


Source: World Bank, World Development Indicators, 2017.

The analysis of time-scale data from 2005 to 2016 shows that mobile subscriptions in WBCs have augmented 20-60%. In Albania mobile subscriptions have increased 54% and in Bosnia and Herzegovina 53%. Montenegro has mobile subscriptions growth of 47% and Macedonia of 46%. Smaller augmentation of mobile subscriptions in this time scale is noted in Serbia 39%, Slovenia 26% and finally in Croatia 17%.

Fixed broadband subscriptions refers to fixed subscriptions to high-speed access to the public Internet (a TCP/IP connection), at downstream speeds equal to, or greater than, 256 Kbit/s. This includes cable modem, DSL, fiber-to-the-home/building, other fixed (wired)-broadband subscriptions, satellite broadband and terrestrial fixed wireless broadband. This total is measured irrespective of the method of payment. It excludes subscriptions that have access to data communications (including the Internet) via mobile-cellular networks. It should include fixed WiMAX and any other fixed wireless technologies. It includes both residential subscriptions and subscriptions for organizations. Compared to mobile subscriptions, fixed broadband subscriptions in WBCs are secondary.

Figure 6. Current statement of some ICT indexes for Macedonia

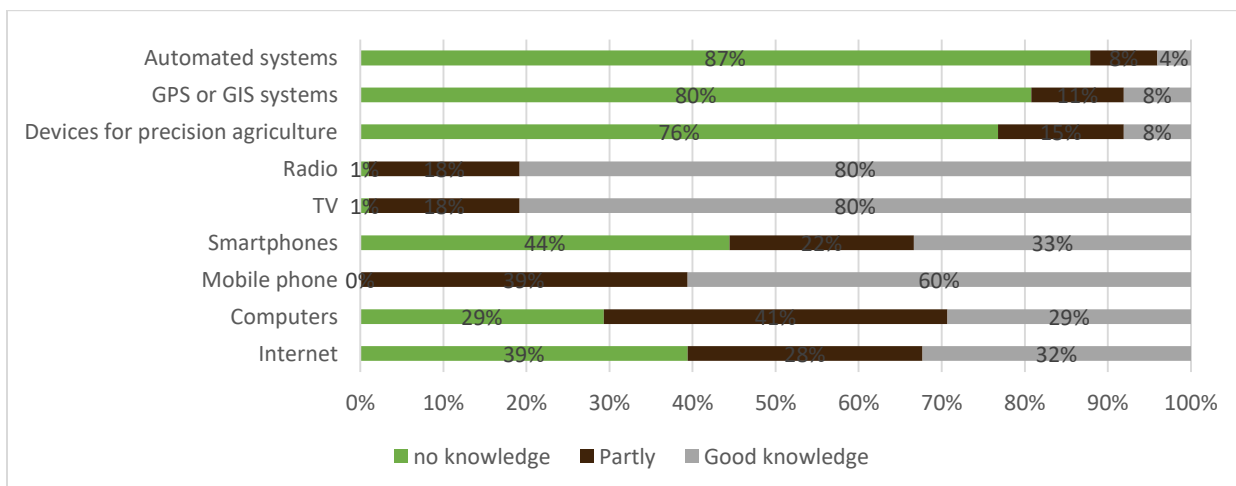


Source: WEF, 2017

1.4 CURRENT TRENDS IN PRECISION AGRICULTURE IN MACEDONIA

The survey results from Macedonia (FACE, 2017) showed that, beside the conventional and broadly accepted ICT tools such as radio and TV (98%), farmers have shown significant knowledge in using ICT tools such as smartphones (55%), computers (70%), and internet (60%). This can be considered as noteworthy indication that there is an essential base for introduction of agricultural technologies based on ICT. In addition, farmers in Macedonia have very little awareness and knowledge about more advanced technologies based on ICT such as automated systems, GPS or GIS systems and devices for precision agriculture.

Figure 7. Farmers knowledge for ICT in the Republic of Macedonia



Source: AEWB-ICT project, 2017.

Old fashion technologies used in the primary agricultural production are resulting with low yields and quality. As a result of it, 70% of total agri-food export belongs to primary agricultural products and raw materials (MAFWE, 2014).

With introduction of precision agriculture production will increase, quantity and quality too. Also, by applying such tools Macedonian agriculture will become modern, competitive and export oriented. Currently in Macedonia 150 farms are using farm management software, which costs depends on the services and farm's size, costs not more than €172.¹

1.4.1 SKILLED WORKFORCES AND PRECISION AGRICULTURE

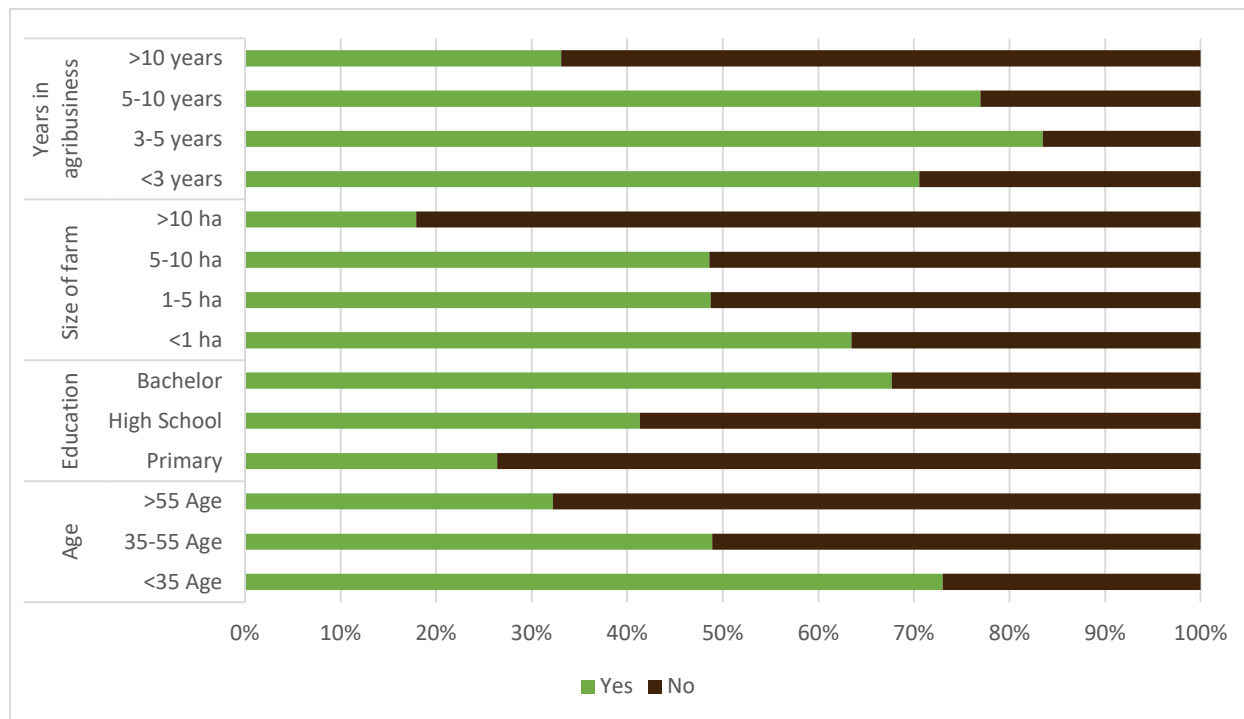
It seems that for many farmers, the digital revolution does not live up to its promises. The reasons for this uptake gap are well-known: a lacking broadband internet in many rural areas, high purchase costs of technologies such as variable-rate systems and low generational renewal in farming. But more crucially, many farmers feel they lack the skills to make the most of digital technologies and write off purchase costs. While the uptake of guidance systems on tractors has been satisfying, smart systems performing variable-rate input applications are still a far cry from going mainstream, as they are more complex to use.

Teachers of agricultural techniques in the western world are thus faced with the dual challenges of accommodating students with lower farming literacy, while allowing them to catch up with the digital revolution. This requires new methods, and, possibly, stronger public support. In Macedonia currently are operating 11 agricultural-veterinary schools, 5 agro-food processing and 8 for forestry management and wood processing. However, the number of enrolled students dramatically decreased from year to year and students' interest in this fields in general is very weak. In the academic 2013/2014 then number of enrolled students is 2450 which is almost half of the number of students enrolled in the academic 2011/2012 year.

In addition, the level of investments in R&D in general is much lower than the level of EU28. Costs for R&D on the national educational institutions is 0.09% of the total GDP, on the other hand, the costs for governmental operation is same and private investment in R&D contribute only with 0.04 from the GDP (World Bank, 2013a). Nowadays, the statement of R&D in agriculture is difficult and assets are limited, even those for maintaining of the existing centers and infrastructure.

¹ <http://vecer.mk/ekonomija/razvoj-na-precizno-zemjodelstvo-za-pogolemi-prinosi-i-kvalitet-na-proizvodstvoto>

Figure 8. Education/training on ICT among farmers in Macedonia



Source: AEWB-ICT, 2017.

Younger generation of farmers are more agile and eager to gain more knowledge about farming. Younger farmers are frequently attending trainings or educational events to gain knowledge. Also, those that are more educated are better informed and are willing to learn more and have higher awareness of the importance of continuous education. Usually, those farmers that have small-scale or family farms attend educational trainings more frequently because of their motive to extend and modernize their farms.

In Macedonia, best way of knowledge transfer is through convincing of the involved parties that applied new technologies and methods of productions are functional in the sector they are involved in (FACE, 2017). The best way of convincement is through pilot/demonstration sites/fields where latest modern achievements in the agri-food sector will be presented. Such events have to be organised by the universities, extension services and companies providing solutions through precision farming technologies.

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