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TECHNOLOGICAL CHANGES AND SKILLS NEEDS IN THE AGRI FOOD SECTOR IN KOSOVO*: DIGITALISATION FOR AGRI-FOOD

SUMMARY REPORT

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INTRODUCTION

This summary report[1] forms part of a broader study on the technological changes and skills needs of the Western Balkan agri-food sector, conducted by the European Training Foundation (ETF). The aim of this summary report is to examine the potential of digitalisation for agri-food in Kosovo from the perspective of skills supply and demand.

The study aims to inform a foresight exercise on technological changes and skills needs in the digitalisation for agri-food sector in Kosovo[2]. The purpose of the foresight exercise is to identify concrete skills related measures to support the accelerated development of the sector in preparation for the single market.

OVERVIEW

Across the globe, information and communication technologies applied to the agri-food sector have improved productivity, supply chains, cut costs and improved the quality of agricultural products. The speed of technology adoption is correlated with farmers' ability to purchase and operate new technologies.

Digitalisation for agri-food is at a very initial stage in Kosovo, and growth is slow partly due to the cost of digitalisation and therefore lack of demand from the agricultural holdings. While the food processing sector has seen some application of automation (e.g. automatised confectionery machines, used by an interviewed agricultural holding), the processes in agriculture are mainly handled by physical labour and old mechanised systems. According to interview data, only around seven agricultural holdings that applied some sort of digitalisation of their farms are known – only three of which financed it themselves. Their digitalisation solutions mainly focused on farm surveillance, temperature management and irrigation.

Digitalisation of agri-food in Kosovo comes with significant challenges regarding technology adoption in the sector, as well as the skills supply. The research team was able to identify only two digital technology producers for agri-food in the country, which are driving the shift to using more digital tools and other advanced technologies in the sector. Some of the most visible digital technologies being introduced in Kosovo's agri-food ecosystem are the rather basic technologies in marketing and sales, such as e-commerce, other types of online platforms that connect agri-food producers and consumers, and the development of broadband internet connections. Nevertheless, providers exist in the country offering more sophisticated solutions as well, such as the Internet of Things (IoT) technologies for greenhouse digitalisation and irrigation systems.

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[2] * This designation is without prejudice to positions on status, and is in line with UNSCR 1244/1999 and the ICJ Opinion on the Kosovo declaration of independence - hereinafter 'Kosovo'.

SME support services in Kosovo have not kept up with the developments, and more needs to be done in terms of SME training support, technology adoption and technology transfer. Similarly, career development support to attract skilled professionals to the agri-food sector is lagging behind. Digitalisation is changing the sector, and new attractive occupations and interesting job profiles are emerging, in particular at the cross-section of agri-food with other sectors, for both young people and experienced professionals.

The analysis of the area of digitalisation for agri-food focuses on the businesses developing and producing the digital innovations for agri-food under the following NACE sectors:

- Manufacture of agricultural and forestry machinery (C28.3);
- Manufacture of machinery for food, beverage and tobacco processing (C28.9.3);
- Computer programming, consultancy and related activities (J62);
- Information and service activities (J63);
- Research and experimental development on natural sciences and engineering (M72.1).

Generally, the ICT sector in Kosovo is characterised by a large share of small and medium-sized companies with limited capacities for large-scale projects and internationalisation. The majority of companies in the ICT industry are micro and small businesses: 84.5% are micro businesses, 12.7% small, 2.4% medium, and 0.4% are large enterprises[3]. The Kosovo Agency of Statistics estimates that the number of employees in the ICT sector in 2022 was 13 893, constituting 4% of total employees in Kosovo[4].

The Ministry of Industry, Entrepreneurship and Trade of Kosovo (MIET) estimates that there are 220 registered companies in the ICT sector, among which 120 are active. According to MIET's study on the 'Present state and future potential of the information and communications technology (ICT) sector in Kosovo', software development is the main activity in the portfolio of ICT companies, followed by mobile application development, web development / web design and digital marketing[5]. According to the same study, around 91% of ICT companies in Kosovo export their services/products[6]. The Central Bank of Kosovo estimates that the export of ICT services in 2021 reached EUR 98.8 million. However, only a miniscule part of these activities has been oriented to the agri-food sector digitalisation.

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[3] Ministry of Industry, Entrepreneurship and Trade, *Present state and future potential of the Information and Communications Technology (ICT) sector in Kosovo*, 2022, p. 9. Online version: https://mint.rks-gov.net/desk/inc/media/FF9CE417-1C30-4B7C-8D35-A91C0FF69F8C.pdf, accessed in December 2022.

[4] Unfortunately, no trends data is available in the official statistics. The statistics are provided in statistical yearbooks, available here.

[5] Digital marketing is increasingly used by all business-to-consumer (B2C) sectors in Kosovo. The popularity of this tool was especially evident during the COVID-19 pandemic, when there was a huge turnover to the online purchase of goods.

[6] Ministry of Industry, Entrepreneurship and Trade, *Present state and future potential of the Information and Communications Technology (ICT) sector in Kosovo*, 2022, p. 9. Online version: https://mint.rks-gov.net/desk/inc/media/FF9CE417-1C30-4B7C-8D35-A91C0FF69F8C.pdf, accessed in December 2022.

Skills demand

The most in-demand profiles companies are looking for, according to various sources[7], are specialised technical skills such as software engineering and testing, work with free and open-source software (FOSS); cybersecurity, cloud computing, big data & analytics and mobile computing and technologies relating to industry 4.0 (such as embedded software and automation).

The two companies interviewed (FARA and Biotech Agriculture) emphasised that they had no specialised training prior to moving into the niche market. They emphasised the need for profiles combining specialist digital skills with agri-food sector specific knowledge. The demand for specific skills is increasing. However, education and training providers are still equipping students with general skills relevant to the niche (e.g. general information and communications technology (ICT) skills). The lack of specialisation in advanced digital and technological solutions in the agri-food sector was emphasised by all interviewees, and especially SMEs, as a major problem. Such occupational profiles and skills, at the intersection of ICT and agriculture, are not yet described in the ESCO skills and occupation database.

TABLE 1. RELEVANT TECHNICAL OCCUPATIONS IDENTIFIED BY COMPANIES

Digital technologies	
• 2512 - software developers • 2511.3 - data analyst • 2511.4 - data scientist • 2514.3 - industrial mobile devices software developer • 2514.2.1 - embedded systems software developer • 2529.3 - embedded systems security engineer	• 3111.13 - remote sensing technician • 3114.1.10 - sensor engineering technician • 3115.1.11 - mechatronics engineering technician • 8211.3 - mechatronics assembler • 8211.5 - motor vehicle assembler • 8212.3 - electronic equipment assembler
Agronomy, agriculture and food processing	
• agricultural scientist (ESCO 2132.1) • agronomist (2132.2)	• agricultural technician (3142.1)

The occupations for which there is a growing demand require different skill levels. For instance, the post of mechatronics engineer, robotics engineering technician, sensor engineering technician, embedded systems software developer or mobile application developer require at least ISCED[8] level 5.

In terms of business services and related occupations, company interviews reveal the importance of market development skills. To remain competitive and scale up locally, regionally, and internationally, companies highlighted the need for skills in agile project management and internationalisation.

TABLE 2. RELEVANT BUSINESS SUPPORT OCCUPATIONS IDENTIFIED BY COMPANIES

Business support occupations

[7] Including: Ministry of Industry, Entrepreneurship and Trade, *Present state and future potential of the Information and Communications Technology (ICT) sector in Kosovo*, 2022, p. 9. Online version: https://mint.rks-gov.net/desk/inc/media/FF9CE417-1C30-4B7C-8D35-A91C0FF69F8C.pdf, accessed in December 2022.

[8] International Standard Classification of Education, ISCED

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• 1324.3.2 - import export manager, e.g.: 1324.3.2.1 - import export manager in agricultural machinery and equipment 1324.3.2.11 - import export manager in electronic and telecommunications equipment 1324.3.2.8 - import export manager in computers, peripheral equipment and software	• 3331.2.1 - import export specialist, e.g.: 3331.2.1.11 - import export specialist in electronic and telecommunications equipment 3331.2.1.8 - import export specialist in computers, peripheral equipment and software 3331.2.1.1 - import export specialist in agricultural machinery and equipment • 1219.6 - project manager

Skills supply

Vocational education and training

As new skills needs are emerging, different from those traditionally sought by the agri-food sector, the shift needs to be reflected in an increase in training provision across the occupational profiles of the value chains – and not just for IT occupations.

At VET level, there are numerous vocational schools with educational programmes relevant to digitalisation in general, without a special focus on agri-food. Continuing vocational education and training (CVET) is offered by eight vocational training centres operating under the administration of the Kosovo Employment Agency (EARK). Seven of these centres offer basic training in IT such as Microsoft Office or the European Computer Driving Licence (ECDL). Vocational training relevant to agri-food is offered only in one of the centres, in the Peja/Pec municipality (one specialising in milk products and one in fruit/vegetable conservation), but interest is low. Overall, there were 1 702 students in adult education programmes in Kosovo in 2020/2021.

To help the scale-up, interviewed companies emphasised the importance of training in the converging areas of agri-food, digitalisation and technological development. Employers have reported difficulties in finding workers with the right skills to immediately perform in their jobs. Companies are addressing the skills shortages by providing on-the-job training. According to interviews, ICT graduates need to spend at least one year in a role until they become skilled to work independently. This presents a major challenge for companies due to both time and costs. Furthermore, trainees frequently leave their jobs to work outside Kosovo as soon as they get the necessary skills. As for experienced IT engineers, companies reported difficulties hiring and retaining professionals, who are mostly engaged in providing services for companies abroad. Finally, as companies are growing increasingly reliant on technology in order to stay competitive, skilled emigration poses a serious problem.

Intermediary organisations

The ambition to meet the challenges of competitiveness, digitalisation and sustainability poses many challenges to the primarily micro and small agri-food companies. Business intermediary bodies are critical for providing access to relevant and timely informal and non-formal training to agri-food companies who generally find having relevant skills to perform far more important than training recognition. Intermediary organisations have an important role in creating value in a fragmented context, by connecting agri-food companies with organisations and networks with whom they can collaborate, co-create, troubleshoot, or co-innovate with. Their role is particularly heightened in the field of agri-food where agriculture, digitalisation and technological development are converging.

Here are some examples of relevant intermediary organisations:

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BOX 1. EXAMPLES OF INTERMEDIARY ORGANISATIONS' SUPPORT

The **Kosovo ICT Association's (STIKK)** mission is to help create a better ICT business environment by improving standards and educational opportunities. It focuses on strengthening the ICT sector in the country and provides paid training on a wide range of relevant IT subjects, including programming languages. STIKK also supports businesses with a range of services, including networking, consultancy, competition calls and project funding. Key initiatives include TechPark Prishtina, KosICT Tech Festival (KOSICT) and Outsource2Kosovo Platform, which promote outsourcing opportunities between Kosovo and international companies.

The **Innovation Centre Kosovo (ICK)** focuses on research and development to create job opportunities in new technologies. Their incubator programme provides pre-incubation and incubation services in the field of business development and commercialisation. These services include consultancy, business-to-business (B2B), mentoring, hosting services, matchmaking, fundraising and grants.

The **Ministry of Agriculture Forestry and Rural Development (MAFRD)** funds rural development to increase competitiveness, which includes a focus on modern technologies. The support has not focused as of yet on developers of innovative solutions for tech, as is primarily focused on farmers as users. An example of MAFRD's activities is the AgromarketKS e-commerce platform, launched in 2021 to promote the competitiveness of agricultural production in Kosovo. Developed together with the Japan International Cooperation Agency (JICA), it was implemented by the Kosovo Women's Chamber of Commerce and Sigma BMC, a consulting company. It enables registered farmers to sell their goods online.

The **agricultural advisory services** in Kosovo provide counselling and training for companies operating in the agri-food sector.

The **Kosovo Investment and Enterprise Support Agency (KIESA)** is a state agency mandated to promote and support investments, exports, tourism, SMEs and economic zones in Kosovo. For example, they provide vouchers for consultancy to help subsidise SMEs that need consultancy services to operate. They also provide information for foreign investors on which sectors to invest in (including ICT and food processing and packaging) as well as information on business zones and parks.

The **Jakova Innovation Center (JIC)** is a non-profit organisation and a business incubator established by the Ministry of Trade and Industry in cooperation with the municipality of Gjakova. It provides consultancy and training in areas such as business management, market research, finance, marketing and many other areas which are important in the process of doing business.

The **Association of Fruits and Vegetable Processors (PePeKo)** provides support to the fruit and vegetable processing industry.

The **Initiative for Agricultural Development in Kosovo (IADK)** is an NGO that focuses on facilitating rural development by reducing unemployment and import dependency on agri-food. The initiative also promotes the sustainable use of natural resources and environmental protection – as empowerment of women and young people in rural areas.

From the interviews it emerged that a number of intermediary organisations, from large institutions to non-governmental organisations, act as catalysts for digitalisation for agri-food and seek to create

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value to companies in the sector. Their support in informal and non-formal training, networking, coaching and guidance is invaluable. With collaboration and co-creation at the core of innovation and competitiveness, there is still untapped potential for intermediary organisations to make connections across converging sectors at national, regional and EU level.

Higher education and research

Universities play a fundamental role in fostering digital transformation of the agri-food sector. They have a role in teaching, but also in research in the agri-food sector. Their research departments play a key role in innovation.

Higher education in agricultural sciences in Kosovo is provided by the Faculty of Agriculture and Veterinary Medicine of the University of Pristina. It is the only university specialised in undergraduate and graduate studies, scientific research, training and extension services in agriculture and food processing. The university covers agriculture, livestock, forestry, veterinarian medicine and the agrarian economy. It offers programmes that include courses such as:

- Fundamentals of Technology;
- Processing techniques, measurements and automation;
- Technology of fruit and vegetables, alcoholic and non-alcoholic beverages, milk and milk products;
- Information science and communication[9].

The decrease in the agri-food sector's contribution to GDP over the years has been matched by the decreasing enrolment of students in agri-food-related programmes. The number of students opting for either ICT or engineering, manufacturing and construction is significantly higher.

TABLE 31. NUMBER OF STUDENTS IN BACHELOR AND MASTER STUDIES IN 2021/2022

Programme type	Bachelor			Master		
	Female	Male	Total	Female	Male	Total
Information and Communication Technology (ICT)	2 195	5 439	7 634	178	291	469
Engineering, manufacturing and construction	2 964	4 345	7 309	702	830	1 532
Agriculture, forestry, fisheries and veterinary medicine	802	793	1 595	200	113	313
Services	807	1948	2 755	116	174	290

Source: Kosovo Agency of Statistics, Higher Education Statistics by Fields of Study 2021/2022.

According to interviews, most of those employed in digitalisation for the agri-food industry are initially trained in ICT. Such profiles are prepared by six universities in Kosovo, with approximately 600 graduates (from undergraduate and graduate programmes) per year. However, there are currently no courses in the converging areas of agri-food, digitalisation and technological development.

[9] https://fbv.uni-pr.edu/desk/inc/media/50B7B93C-9B76-4CFA-9066-1A7EF48202BA.pdf, https://fbv.unipr.edu/desk/inc/media/00B43FEF-B5C1-4078-B776-3005FF95F0DA.pdf

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