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EVALUATING THE LEVEL OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) ADOPTION IN IZMIR AGRICULTURAL COOPERATIVES

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DECLARATION

I hereby declare that this master's thesis/non-thesis master's term project titled as "Evaluating The Level of Information and Communicaton Technology (ICT) Adoption in İzmir Agricultural Cooperatives" has been written by myself in accordance with the academic rules and ethical conduct. I also declare that all materials benefited in this thesis consist of the mentioned resourses in the reference list. I verify all these with my honour.

Date

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ABSTRACT

Master's Thesis

Evaluating The Level of Information and Communicaton Technology (ICT) Adoption in İzmir Agricultural Cooperatives

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Agricultural cooperatives play an active role in maintaining the agricultural activities. They support farmers with technological infrastructure in terms of market information and equipment assistance in growing and selling their products. The adoption and use of information and communication technologies (ICT) in the cooperatives enable them to provide more beneficial services to farmers and accelerate their orientation to e-commerce. The adoption level of cooperative members and employees to technology is a determining factor in the effective execution of cooperative activities and strengthening of the farmer-cooperative connection. This study evaluates the level of ICT usage of employees in agricultural cooperatives and determines the effects of technology on their commercial activities. We will examine e-commerce connections, product scales, ICT usage competencies, and demographic structures of the cooperatives with a sample obtained from İzmir agricultural cooperatives. In this study, an ICT usage index was created to reveal the impact of ICT usage on agricultural earnings and access to markets in agricultural cooperatives. The results indicate that the transition to e-commerce by enhancing ICT usage provides significant economic advantages for agricultural cooperatives. The adoption of ICT usage should be considered in agricultural activities in terms of sustainable agriculture and increasing the effectiveness of cooperatives on the farmers.

Keywords: Agricultural cooperatives, ICT adoption, technology, e-commerce

ÖZET

Yüksek Lisans Tezi

İzmir Tarım Kooperatiflerinde Bilgi ve İletişim Teknolojileri (BİT) Özümseme Düzeyinin Değerlendirilmesi

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Tarımsal kooperatifler tarımda faaliyetlerin sürdürülmesinde aktif bir rol oynamaktadır. Kooperatifler çiftçilere ürünlerini yetiştirme ve satma konusunda pazar bilgisi ve ekipman yardımı açısından teknolojik altyapı ile destek sağlamaktadır. Kooperatiflerin bilgi ve iletişim teknolojilerini (BİT) kullanımı ve benimsenmesi, çiftçilere daha faydalı hizmetler sunmalarını sağlamakta ve e-ticarete yönelimlerini hızlandırmaktadır. Kooperatif çalışanlarının teknolojiye adaptasyon düzeyleri kooperatif faaliyetlerinin etkin yürütülmesinde ve çiftçi-kooperatif bağının güçlenmesinde belirleyici bir faktördür. Bu çalışma tarımsal kooperatiflerde çalışanların BİT kullanım düzeylerini değerlendirerek çiftçilerin ticari faaliyetleri üzerindeki etkilerini araştırmaktadır. İzmir'de bulunan tarımsal kooperatiflerden elde edilen bir örneklemle kooperatiflerin e-ticaret bağlantıları, ürün ölçekleri, BİT kullanım yeterlilikleri ve demografik yapıları incelenmiştir. Çalışmada, tarımsal kooperatiflerde BİT kullanımının tarımsal kazançlar ve pazarlara erişim üzerindeki etkisini ortaya koymak için BİT kullanımı endeksi oluşturulmuştur. Sonuçlar etkin BİT kullanımı ile beraber artan e-ticarete yönelimlerin ekonomik açıdan önemli avantajlar sağladığına işaret etmektedir. Teknolojiye adaptasyonun tarımsal faaliyetlerde ve kooperatiflerle bağlantıları güçlendirmede ayrıştırıcı unsurları tarımsal politikalarda dikkate alınmalıdır.

Anahtar Kelimeler: Tarımsal kooperatifler, BİT özümsemesi, teknoloji, e-ticaret

EVALUATING THE LEVEL OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) ADOPTION IN IZMIR AGRICULTURAL COOPERATIVES

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CHAPTER TWO

EMPIRICAL ANALYSIS

ABBREVATIONS

EU	European Union
ICT	Information Communication Technology
İZKA	İzmir Kalkınma Ajansı
KOY-KOOP	İzmir Agricultural Development and Other Agricultural Cooperatives Association
WHO	World Health Organization

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INTRODUCTION

The agricultural sector is a crucial element of the countries in determining the economies (Makri et al., 2011). The need for food has affected the tendency of agricultural production and the use of new techniques with the changing population ratio and economic structure of countries (Aydın and Atılgan Yaşa, 2019). It provides food products to consumers, which is one of the fundamental sources of food supply (Praburaj et al., 2018). It contributes to society regarding food access which is a necessary element for the continuation of life (Murad et al., 2008). Agriculture affects economic development by many indicators. The development of agriculture affects not only its own sector but also many other sectors in terms of raw materials, employment, and market expansion (Kuznets, 1964). It provides priorities to societies in economic development with agricultural production (Sinabell, 2009). At this point, increasing food demand plays a significant role in expanding market share and improving the economic indicators of countries (Johnston and Mellor, 1961).

The use of technology in agriculture has started to become an important element that enables to differ within the sector in terms of competing and obtaining earnings for farmers. Farmers follow the path of increasing agricultural output by incorporating information and communication technologies (ICT) equipment and techniques into their production process (Daum, 2020). Technology offers solutions for eliminating the obstacles to some geographical and financial problems in agriculture and helps to increase soil fertility (Anh et al., 2019).The usage of mobile technology devices to follow innovations and developments in agriculture accessing from many different sources provides an advantage to farmers (Aker, 2011). Nowadays, including new-generation ICT equipment in agricultural activities leads to improvementsin the economic indicators of countries (Saidu et al., 2017). It acts as a bridge between the buyer and the seller with the ease of information flow provided to the supply chain.

In general terms, cooperatives can be defined as institutions that provide economic and social benefits to their members and provide services under their roof

(USDA, 2002). Cooperatives offer market opportunities to its members by reducing costs through public and private collaboration in economic activities (Iliopoulos and Cook, 1999).

Agricultural activities differ in each country in terms of the role of economic growth. Therefore, agriculture improvements determine the economic policies and priorities. There are also many public and private institutions to enhance agricultural activities. One of these institutions is the agricultural cooperatives which constitute a strong supporter of the sector to supply food products efficiently from producers to consumers (Makri et al., 2011). It also refers to a community of people who have come together to support agricultural progress and conduct beneficial organizations (Abarghani et al., 2013). Cooperatives undertake the task of maintaining and balancing the agriculture-farmer bond (Sykuta and Cook, 2001). The reflections of cooperatives on the agricultural sector have made it a tool used in economic indicators (Semou et al., 2022). They strengthen economic interactions in agriculture, providing an information flow to their members and protecting their interests in agricultural activities. Farmers, who join cooperatives gain access, not only to the producer but also to consumer rights in the community to which they belong (Levay, 1983; Cook, 1995). Besides, they enable to decrease the costs in the food supply chain by providing better accessibility to markets (Tortia et al., 2013). Policymakers consider agricultural cooperatives as an important factor in strengthening economic activities at different country levels and the development of farmers in agriculture (Wang et al., 2019).

Agriculture cooperatives help farmers increase their visibility and product value in the market by providing more convenient access to production resources (Ševarlić and Nikolić, 2013). They enable productivity increases by supplying inputs to farmers (Chambo, 2009). Moreover, cooperatives play a crucial role in having a say in agriculture, decision-making processes, and providing equipment at a lower cost, especially for small-scale farmers who cannot provide adequate access to the market and resources. Small-scale farmers gain much easier access to markets as cooperatives eliminate risks (Ahmed and Mesfin, 2017). In other words, they are described as institutions of family farms that help to maintain economic activities

(Tortia et al., 2013). Agricultural cooperatives prioritize the needs of farmers and support them in their farming activities in terms of products and equipment, thereby contributing to their transition to sustainable agriculture (Candemir and Duvaleix, 2021).

Agricultural cooperatives provide market opportunities that increase the economic welfare of farmers and also they play a prominent role in introducing new technologies to farmers that boost agricultural production and productivity. On the other hand, effective use of technology and equipment needs specialized individuals, organizations, and investments (Madhava and Surendran, 2016). Especially in rural areas, farmers have difficulty in accessing these opportunities and actively using technology in their activities. At this point, cooperatives gain importance in bringing farmers together with technology (Quang et al., 2021). Farmers not only make progress by prioritizing inputs related to food production but also they provide by adapting information technology to their activities (Rodrigues and Rodíguez, 2012). The adoption of farmers to technology eases access to information in the changing world and moreover enables information flow to accelerate through the use of technological devices (Aldosari et al., 2017). Therefore, information and communication technologies matter for gathering more information in sustainable agriculture (Kante et al., 2016). Especially farmers need ICTs to find the best techniques for their agricultural activities (Ali, 2012). Technological developments in agriculture positively affect both the increase in value at every step of production and the power to compete in the market (Pignatti et al., 2015). The adoption of ICT equipment using the internet, and mobile applications by the farmers in their commercial activities enables them to follow the developments in the sector and take quick actions on issues such as price, marketing, and productivity increase (Nadarajan and Ismail, 2011). ICT adoption in agriculture helps to develop farmers about strategies for growing crops, to follow current sectoral changes more accessible, and to sell their products to the broad market, resulting in to increase in their income and productivity (Angello, 2017; Jiriko et al., 2015). Besides, integrating technology into activities creates opportunities to start e-commerce and reduces expenses by providing sales without being needed for intermediary sales channels (Abebaw and Yared, 2019).

Agricultural cooperatives help to emphasize the importance of the agricultural sector by providing the necessary support to agriculture with their equipment and technological infrastructures and by reducing the reflection of financial impossibilities in agriculture to farmers and consumers (Manda et al., 2020). The basis of this approach is the thought that the unifying power of cooperatives plays a more active role in accessing resources (Verhofstadt and Maertens, 2015). Moreover, cooperatives are one of the tools for building a community that has important elements in raising the awareness of its members about the use and dissemination of technology in agriculture (Chagwiza et al., 2016).

As information technologies are adopted in cooperatives, it becomes easier to follow current sectoral movements and develop training programs and agricultural techniques, thus opening new potential trade doors. On the other hand, digitalization steps in cooperatives reduce the transaction costs of agricultural processes thanks to providing easy access to information, helping to expand the product range with the opportunity to benefit from financial support such as loans (Fu, 2013). ICT equipment in commerce creates new sales channels through websites and provides access to useful content and information from online sectoral platforms to manage these sales channels (Patel, 2019). Technological progress gives better opportunities to agricultural cooperatives in the supply chain regarding the production, packaging, storing, and transportation of goods (Briggeman et al., 2016)

Especially, COVID-19 and the following process have shown that are significant changes in buying habits of people. As in all sectors, digitalization tendencies have gained importance that aims to keep up with these changes and reach the consumer easily in agriculture in this new period.

Most of the studies were mentioned the role of the agricultural cooperatives and economic growth. This study differs from previous studies by revealing the effects of the widespread use of the e-commerce platform in cooperatives, in which technology is used as a sales channel, and by examining whether the cooperatives are structurally suitable for the e-commerce infrastructure. Based on the importance of digitalization in agriculture, the study aims to investigate the effects of the transition to e-commerce on cooperatives. It was obtained information about e-commerce activities in İzmir Agriculture cooperatives and the survey were applied to the selected participants and Likert Scale was also used for analysis method. In this paper, it was addressed the following main research question and hypotheses:

Research Question: What is the impact of ICT usage in the development of e-commerce activities of agricultural cooperatives in Izmir?

H1: There is a significant relationship between the effective use of technology in agricultural cooperatives and the increase in e-commerce activities.

H2: There are many factors that affect the transition to e-commerce activities such as the education level of the members, their gender, the size of the cooperative, and the technological infrastructure.

The results revealed that the digitalization process was affected by different indicators and they needed some policies for developing online business taking into consideration each cooperative’s structure.

The thesis is organized as follows: Chapter One includes a general overview of the agricultural cooperatives and digitalization process in the literature review. It is presented with the empirical results how is the impact of adopting ICT equipment and applications in agriculture cooperatives for farmers and the agriculture sector. Following this, Chapter Two introduces data and methodology. The empirical results of the study are displayed in this chapter. Finally, the conclusion summarizes the survey results and is interpreted the role of the agriculture cooperatives.

CHAPTER ONE

LITERATURE REVIEW

1.1. THE ROLE OF AGRICULTURAL COOPERATIVES ON FARMERS' PERFORMANCE

Cooperatives have historically become an increasingly important factor in the advancement of agriculture, helping to improve agricultural economic activities. Several studies have been revealed on the functions of agricultural cooperatives on economic growth and contribution to the farmers (Ahmed & Mesfin, 2017; Chagwiza et al., 2016; Getnet & Anullo, 2012; Ma & Abdulai, 2017; Sebhatu et al., 2021). According to the matching analysis, cooperatives support farmers' income by providing knowledge of production and decreasing costs with aids to sustain farming activities (Getnet & Anullo, 2012: 194). When evaluating the benefits of being a member of a cooperative, it has observed provides more advantages to farmers in terms of earnings and productivity compared to non-members (Ma & Abdulai, 2017: 538).

Agricultural cooperatives have also played a role in improving economic performance and making small-scale farmers more visible in the market. In a study of coffee producers, the regression results showed that producers participating in the cooperative provided more returns by selling coffee at a higher price in the market (Wollni & Zeller, 2007: 247). Similarly, it was revealed that cereal producers benefited from being cooperative members by selling at higher prices than the others (Bernard et al. 2008: 155). This situation also reveals the function of cooperatives in increasing the income level. The analysis conducted with cooperatives and farmers selected from rural areas in Ethiopia supports this situation. The results emphasized that agricultural cooperatives had a positive impact on the economic welfare of farmers who joined the organization (Mojo et al., 2017: 92). Besides, it was found in the sample analysis of Chinese farmers that cooperative members performed more successful commercial activities in earning more income from their products with the social and economic support provided by the cooperative compared to non-members (Ito et al., 2012: 703).

While participation in cooperatives has enhanced the sales prices of their products, gained more profits, and got efficiency for farmers who operate in some production areas, it has not made a difference for some farming activities. As a result of research consisting of 384 farmers producing milk and dairy products and operating with agricultural cooperatives or alone, it has been determined that cooperative membership did not provide any additional contribution to the farmers in terms of income (Chagwiza et al., 2016: 170). Indeed, some studies revealed that cooperatives were insufficient to support farmers in social and economic contexts when evaluated to use specific variables and methods (Banerjee et al., 2001; Carletti et al., 2018; Francisconi & Heerink, 2011). For example, the commercialization index was used for a group of cooperative and non-cooperative members, and the results indicated that there was no difference between the groups in terms of prominence in trade elements (Francisconi & Heerink, 2011: 15).

On the other hand, the functions of cooperatives have differed depending on various variables such as size, education level, and age. This situation has also affected the participation in cooperatives and the economic opportunities it provides to its members. The size of the production activities carried out by the farmers affected their willingness to participate in cooperatives depending on cost, and the related study showed that small-scale farmers were more willing to act as a part of organizations such as cooperatives in order not to be negatively affected by the market competition (Hoken & Su, 2018: 843). Besides, it was deduced survey results in studies that farmers, who are cooperatives members, had better education levels than non-members of cooperatives (Liu et al., 2019: 274; Verhofstadt & Maertens, 2015: 95). When evaluating the relations between age and cooperative membership, younger farmers tended to participate in cooperatives more than older ones (Abebaw et al., 2010: 289; Bernard & Spielman, 2009: 63). Farmers' access to the market is also another factor that affects their decision to be cooperative members. One of the studies showed that farmers, who have more difficult access to the market in terms of sale of agricultural products in rural, preferred to participate in cooperatives to increase income level more than others (Fischer & Qaim, 2012: 1261).

The effects of cooperatives on product quality has been also indicated significant results regarding the contributions to their members. According to the survey results obtained from producers in Brazil, econometric analysis emphasized that they had a higher product quality and economic performance getting services from cooperatives (Cechin et al., 2013: 241). Moreover, one study revealed that as well as the establishment of supportive organizations such as cooperatives helped to get more efficiency from the products and contributed to quality improvement, they increased in the sales price of the products grown in the region (Jardine et al., 2014: 1064). On the other hand, researchers evaluated cooperatives structurally, and it was found using regression analysis for Chinese apple cooperatives that while the member size variable had a positive impact on product quality up to a certain number, it became a factor in reducing the quality after a certain number (Cai et al., 2016: 866).

1.2. GENERAL OVERVIEW OF THE COOPERATIVES

Agricultural developments play a key role in the economic and social empowerment of countries. At this point, agricultural cooperatives constitute a determining factor in terms of development by providing input and productivity.Being a member of an organization in agricultural activities helps to increase the welfare level of countries in production and sales, as well as contributing to farmers (Semerci, 2015: 67). Agricultural organizations such as cooperatives undertake tasks in supporting the farmer economically and in getting more efficiency by gaining technical skills in their activities (Özgirgin et al., 2021; 43). The concept of cooperation reposes upon the phenomenon of unification, and this is of greater importance for small-scale agricultural activities in order to increase the income level (Erdoğan, 2012: 52). Besides, cooperatives increase farmers' market share by providing interactions with other sectors and presenting more visibility in marketing.

The main objectives of agricultural cooperatives are to take a stronger place in the sector by looking out for the rights and benefits of farmers and to reach the products to a wider consumer mass resulting from labor-intensive production (Taşan, 2019: 79).

1.2.1. Agriculture Cooperatives in Developed Countries

The structure and scope of activities of cooperatives reveal important findings in obtaining an idea about the development level of countries. Considering the developed and European Union (EU) countries, which consist of high living standards and income levels, it is seen that cooperatives have a more developed working principle. A study shows that cooperatives contribute to the economy by creating a market share of over 50% with the opportunities offered in agriculture from production to marketing (Özcan, 2002). The structure of agricultural cooperatives is generally based on acting independently in the EU countries and this increases benefits from agriculture with cooperatives' movements (İnan, 2008). They have multi-organizational modals which complete each other in terms of fulfilling the their responsibilities (Can and Sakarya, 2012: 31). Such developed countries try to determine the best organization types for themselves and to create working areas for sustainable agriculture, without sticking to only one strategy.

Agricultural and livestock activities differ in each region depending on the season, soil structure, and land conditions. Looking at the product portfolio of the developed countries, it is observed that the fields of cooperatives' activities also focus on the sales and marketing of the products in which they have a stronger position in the market compared to other countries. While agricultural cooperatives in Northern countries have a bigger market share effect in dairy products, they come to the fore with olive and olive oil in Mediterranean countries (Karlı et al., 2019: 203). On the other hand, according to the statistical data obtained from some countries in terms of sales volume, it has been revealed that sugar products in France, cultivation or harvesting of agricultural commodities in Germany, and vegetable products in Italy make significant contributions to the country's income with cooperative's activities (Karlı et al., 2019: 206).

As well as agricultural cooperatives take sides with the producer in ensuring market dominance and increasing competitiveness, cooperatives also take important responsibilities in the development of rural areas in terms of education level, technical skill acquisition and especially women's employment (Özdemir et al., 2011: 108).

1.2.2. Agriculture Cooperatives in Türkiye

Agriculture in Türkiye has important potential that gives economic and social opportunities by providing the livelihood of a significant part of the population, creating employment, and supplying food for other sectors. Especially considering the competitiveness with other developing countries, every factor is remarkable that contributes to the development of agriculture. Although significant yields are obtained from agriculture in Türkiye, previous studies have drawn attention to the existence of many small regional activities and a dispersed structure. For this reason, cooperatives, have a great role for developing countries such as Türkiye with their unifying factor, in making the rural sector announce themselves to large markets and in increasing the production capacity by providing financial support (Duymaz, 1986; Çıkın, 1992). Agricultural cooperatives have an active role in development of agriculture and farmers' activities in Türkiye.

They have a significant potential to contribute to economic growth but still, it has been stated by researchers that they have not reached their performance what it wanted in the food supply chain when compared to other developed countries (Taşan, 2019: 80; Özgirgin et al., 2021: 43; Yıldırım, 2001). It is evaluated that agricultural organizations are generally heterogenous structures and adopted an inconvenient model for Türkiye's agriculture sector. Findings from a regional survey showed that there is a greater need for external sources in terms of financial resources in Türkiye (İZKA, 2022: 170).

1.3. THE USE OF TECHNOLOGY IN FARMING ACTIVITIES

As in other sectors, technology has played a role in maintaining agricultural activities and has become an important factor in providing digital transformations from production to marketing. The adoption of technology in agriculture has helped to increase productivity by using new production techniques. The study including a sample of small-scale farmers, pointed out that prioritizing technological developments increased farmers' agricultural productivity (Olagunju & Salimonu, 2010: 28). Likewise, the findings obtained from a different study revealed that the use of technological tools contributed to the producer in terms of income and production efficiency (Mekonen, 2017: 14).

In particular, ICT usage has allowed different applications to be tried in production and supply chains, bringing a new perspective to traditional methods. For example, smartphones enable to facilitate agricultural activities and some studies has proved this idea (Aker, 2011; Baumüller, 2012; Mittal & Mehar, 2012; Sife et al., 2010). The study revealed that using mobile phone services affected income level, providing information on how to sell agricultural products with more profit (Baumüller, 2012: 9). Besides, another study results used the Likert scale observed farmers who use mobile phones effectively in agricultural activities have made important improvements in their agricultural outputs, with the advantage of accessing information and performing their transactions quickly (Sife et al., 2010: 8). In a survey study conducted in China, it was concluded that the effective use of smartphones contributed to income-enhancing agricultural transformations in growing crops, creating employment in subsidiary branches as well as agriculture (Min et al., 2020: 8). When looking the advantages of mobile applications, especially in Africa, indicated that smart devices and applications helped to increase the farmers' interaction among themselves and acted as a media organ on weather, prices, and new developments for them (Munyua, 2007: 18). Another study tested a special mobile application on Indian farmers that aims to support access to information in agricultural activities, the results allowed participants who manage their activities through the application to access the information they need in the production chain faster and make more accurate decisions (Singh et al., 2019: 78).

On the other hand, there are many factors that affect the adoption of technology and the implementation of digital transformations in agricultural activities (Asfaw & Admassie, 2004; Carletto et al., 2007; Deininger & Ali, 2008; De Janvry et al., 2011; Foster & Rosenzweig, 2010; Kijima et al., 2011; Minot & Daniels, 2005). Studies highlight that certain factors such as market competition, land size, gender, and financial structure play a role in technology adoption among farmers. For example, when it was a comparison according to the land sizes for selected countries, it was seen that the producers who relatively owned larger land tended to use technology more in their activities (De Janvry & Sadoulet, 2002; 18). Furthermore, the financial possibility of farmers was also evaluated as a determining factor in movements toward digitalization steps in agriculture. This criterion was examined in a study of African countries that experienced financial difficulties and emphasized the contributions of technological aids in reducing the impact of financial impossibilities and increasing soil fertility.

Gender differences are another factor influencing rural households' access to technology and their ability to use online services. In a panel data study on this subject, it was revealed that females living in rural areas and engaged in agricultural activities had lower skills in the use of technology than males due to educational inequalities (Mishra et al., 2020: 866). While some researchers believed that females were in males' shadow because the technological equipment used in agriculture was more suitable for the use of men, others concluded that this gender difference stems from the stereotypical thinking from the past (Alex et al., 2013; Fischer et al., 2018; Huyer 2016; Kawarazuka et al., 2018; Peterman et al., 2010). In a study including potato producers, it was observed that cutting machines were not suitable for use by females due to the intense manpower required, and therefore, it posed an obstacle for females to learn how to use machines and caused less female employment (Kawarazuka et al. 2018: 2). On the other hand, according to the evaluations obtained from a study, the prejudices between men and women in society included that agricultural activities were a sector where mostly men were involved, that the economic and social opportunities provided in agricultural activities should be primarily provided to males, and that females were kept in the background compared to male household members in terms of education (Peterman et al., 2014: 10).

In addition, there is a significant relationship between education level and technology adoption in agricultural practises. The results of the data analysis using the regression model showed that as the education level increased, the farmers were more open to digital changes in their activities (Challa et al., 2014: 70). In another study, it was concluded that farmers who were highly educated were more likely to try new applications in production and marketing and acted more consciously in the steps to be taken, as a result, they carried out more profitable activities than others (Knight et al., 2003: 6). On the contrary, some studies argue that well-educated farmers benefit less than others from the economic and social incentives provided for technology adoption (Uematsu & Mishra, 2010: 18). However, these studies contain limited information and from a general perspective, it is clear that education has a reinforcing effect on the connection with technology in rural areas.

1.4. TECHNOLOGY ADOPTION IN AGRICULTURE COOPERATIVES

Agricultural cooperatives act as an organization that observes the rights of farmers and provides support in maintaining agricultural activities effectively. In today's changing conditions, cooperatives have started to contribute to their members by giving more priority to digital technologies in their activities. Previous studies have investigated the effect of cooperative membership on technology adoption (Abebaw & Haile, 2012; Kolade & Harpham, 2014; Ma & Abdulai, 2019; Verhofstadt & Maertens, 2014; Wainaina et al. 2018). As an example, the survey results of producers in China showed that cooperative members are more willing to use agricultural technologies that improve production stages (Ma & Abdulai, 2019: 225). In a sample consisting of cooperative members and non-cooperative members, the answers given about the advantages of technology were mostly observed by the members who got more efficiency from production with the use of new-generation raw materials and irrigation systems (Kolade & Harpham, 2014: 345).

Cooperatives have been seen as an institution that has been more open to new applications brought by technology and has offered the opportunity for farmers to carry out activities in production that they were afraid of taking risks alone (Wossen et al., 2017: 228). Therefore, being a member of an agricultural cooperative provides the opportunity to reflect this not only in economic terms, but also in its activities by having technological knowledge that will serve economic developments. For instance, technology was used as a sub-variable in a study examining the effects of cooperatives in terms of economic performance, and according to the results, it was observed that maintaining conscious agricultural activities via technological tools made a significant difference on the product output (Chagwiza et al., 2016: 170). Likewise, a study conducted with wheat producers revealed significant increases in income for those who both received cooperative support and kept up with technological innovations (Khan et al. 2022: 8). On the other hand, the answers given to the evaluation criteria of a study in China indicated that cooperative membership contributed to farmers making more progress in sustainable agriculture by leaving the traditional methods they were accustomed to (Dong et al., 2023; 13).

The spread of e-commerce applications in cooperatives has also strengthened the relations between producers and technology in rural areas. As well as the advantages of technology adoption in production, cooperatives have played an important role in reaching consumers through online services in sales and marketing. A study conducted with the participants including the presidents of Morocco's agricultural cooperatives observed that the stronger the ties of the cooperatives with the technological elements, the more successful they were in the e-commerce activities they started (Jabbouri et al., 2022: 11). Another study showed that e-commerce provided opportunities for cooperatives to have a wider range of sales and to reach maximum sales capacity by minimizing costs (Yang & Wang, 2014: 43).

There are many positive and negative factors that have affected the transition to e-commerce activites in agricultural cooperatives. For example, it was demonstrated that government incentives had an important role in the establishment of e-commerce infrastructure in cooperatives and in providing an effective service to their members (Liu et al., 2021: 4). Moreover, a study concluded that the approach of cooperative managers to conduct economic activities through online sales channels had a significant impact on the development of e-commerce in cooperatives (Tang & Zhou, 2018: 77). It had been seen that the branding of a product is supported in increasing sales activities by making a positive contribution to the orientation of cooperatives to e-commerce (Liu et al., 2020: 4; Dorr, 2009: 137). On the other hand, cooperatives have been faced by some factors that hindered for e-commerce activities. In a study related to this subject, it was seen that the cooperative caused disruptions in the transition to e-commerce platforms due to its economic and social structure, such as deficiencies in marketing strategies, logistics problems in delivering products to consumers and falling behind market competition (Wu & Qui, 2015: 199).

According to the literature, many studies have been revealed on technology and agriculture. While some studies has been emphasized on agricultural technologies to crop production, others has been evaluated the contribution of smart farming technologies to the farmers' activities and income. Agricultural cooperatives have mostly been investigated in terms of supporting farm sustainability. Nowadays, e-commerce activities has gained importance in agriculture. Agricultural institutions have started to give priority to new studies on how to improve farming activities and increase the profit share with technology and e-commerce. The present paper contributes to the growing literature on the role of agricultural cooperatives in three major directions. Firstly, it explains the effects of the ICT adoption on activities of agricultural cooperatives. Secondly, it reveals main indicators to accelarate the transition to e-commerce in cooperatives. Lastly, it offers suggestion how can increase benefits from e-commerce according to the results.

CHAPTER TWO

EMPIRICAL ANALYSIS

2.1. DATA AND METHODOLOGY

This study covers İzmir Agricultural Cooperatives which are members of the İzmir Agricultural Development and Other Agricultural Cooperatives Association (Köy-Koop, hereafter). Köy-koop carries out its activities with 116 associated members within the organization. Depending on the purpose of the study, the cooperatives gathered under this institution were determined according to their adaptation to technology and e-commerce activities, and 10 cooperatives were included in the research. These cooperatives were examined to what extent the use of ICT is common in their business activities and its impact on agricultural earnings. A survey was conducted to the selected cooperatives in order to reveal the contribution of digital transformation to agriculture and farmers through the initiation of cooperatives. 15 decisive questions were asked in order to reveal the use of ICT and benefits of e-commerce in the cooperatives. The respondents vary according to their position in the cooperative, age, educational backgroundsand gender in the sample. Likert scale was conducted in this thesis to evaluate affecting factors to transition to e-commerce in cooperatives. Likert (1932) developed a Likert Scale to measure attitudes, which usually consisted of 5- or 7-point ordinal scale by respondents to rate the degree. It was used 5-or 7- point scale ranging from least important to the most important. Besides, the study was supported by conducting separate interviews about the cooperative structure and functioning on face-to-face and through online platforms (Zoom, Whatsapp).

Table 1: Izmir Agricultural Cooperatives Covered in The Study

Cooperative	Foundation Year	Product Catalog
Bademler Agricultural Cooperative	1962	Dairy products, olive and olive oil, fruits, dried products and canned foods

Bademli Arboriculture Cooperative	1968	Dairy products, olive and olive oil, grenhouse growing
Bergama Agricultural Cooperative	2014	Olive and olive oil
Doğanbey Agricultural Cooperative	2015	Olive and olive oil, dried products and canned foods
Gereli Agricultural Cooperative	2005	Dairy products
Gödence Agricultural Cooperative	1972	Olive and olive oil, fruits, dried products and canned foods
Hıdırlık Agricultural Cooperative	2011	Vegetables, fruits, dried products and canned foods
İğdeli Agricultural Cooperative	1987	Dairy products
Karateke Irrigation Cooperative	1994	Dried products and canned foods

Table 1 includes the list of cooperatives included in the study and information about their product scale. These cooperatives sell the products cultivated by their members through e-commerce and generate income.Information was obtained from one representative of each cooperative about conducting e-commerce activities. They were asked to evaluate the digitalization processes in the cooperative. According to the answers given to the evaluation criteria in the questionnaire, detailed inferences are given in the empirical results section.

Table 2: Descriptive Statistics of Participants

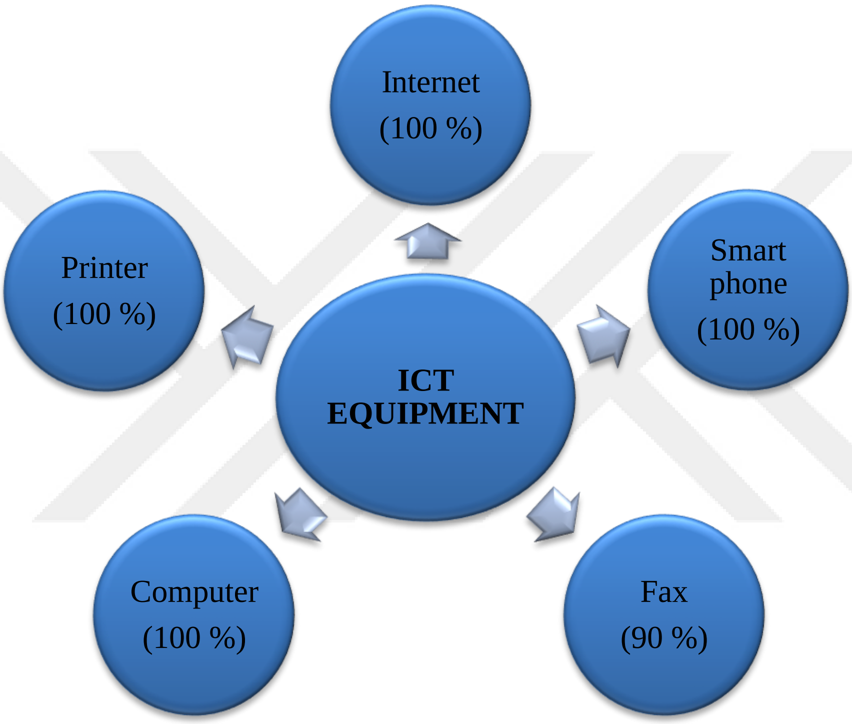
	Total	Percentage (%)
Gender		
Female	4	40
Male	6	60
Age Classification		
18-65 years	9	90
66-79 years	1	10
Education Level		

Primary School	2	20
High School	3	30
University	5	50
Job / Profession		
President	2	20
Member of Board	1	10
Cooperative Manager	1	10
General Manager	2	20
Assistant General Manager	1	10
Sales Representative	1	10
E-commerce Management	1	10
Technician	1	10
Cooperative Size (Members)		
1-49	1	10
50-249	4	40
250 +	5	50
Work Experience (year)		
0-5 year	2	20
6-10 year	4	40
11-15 year	1	10
16-20 year	2	20
20 + year	1	10

As shown in Table 2, the questionnaire was conducted by interviewing a member from each cooperative, which was selected from managers and employees. The survey consisted of 6 male and 4 female participants and participants were mostly in 18-65 age group which is considered as young population according to the

World Health Organization (WHO) age classification. Considering the profession they take part in the cooperative, it can be said that there is a direct proportion between their educational status and job descriptions, even though there are fewer female participants.

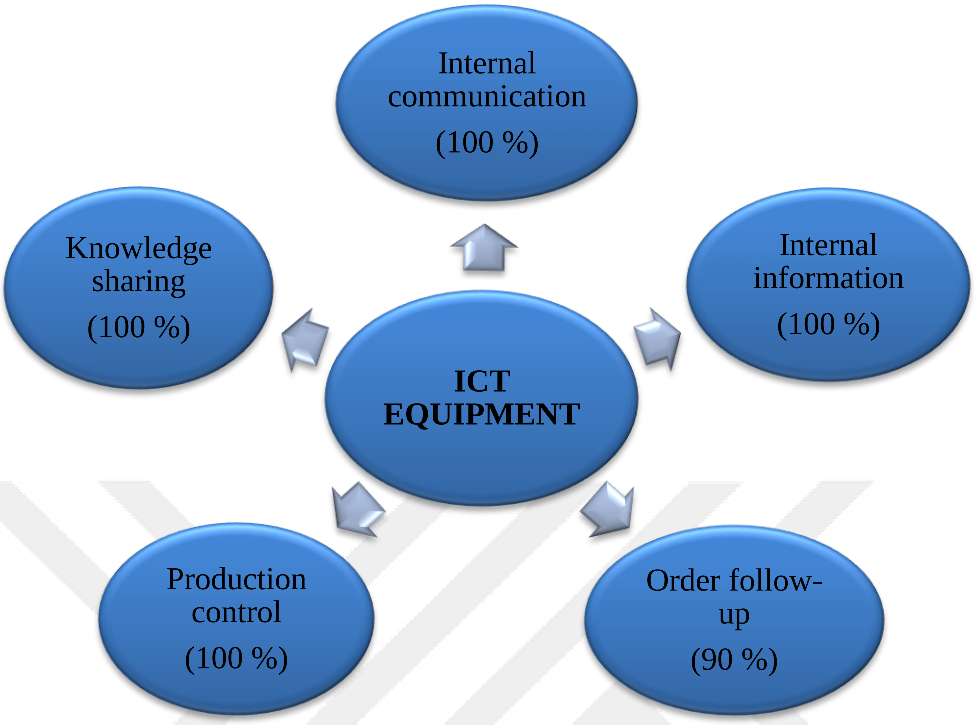
Figure 1: Main ICT Equipment Used in Cooperatives



Source: Own calculations obtained from 10 participants

According to the Figure 1, cooperatives mostly use ICT equipments in their activities. Participants emphasized that ICT equipments played an active role in various fields of activity in terms of the tendency of farmers and organizations to digitalize and follow sectoral developments. In Figures 2, 3, and 4, the purpose of using these types of equipment was explained in more detail.

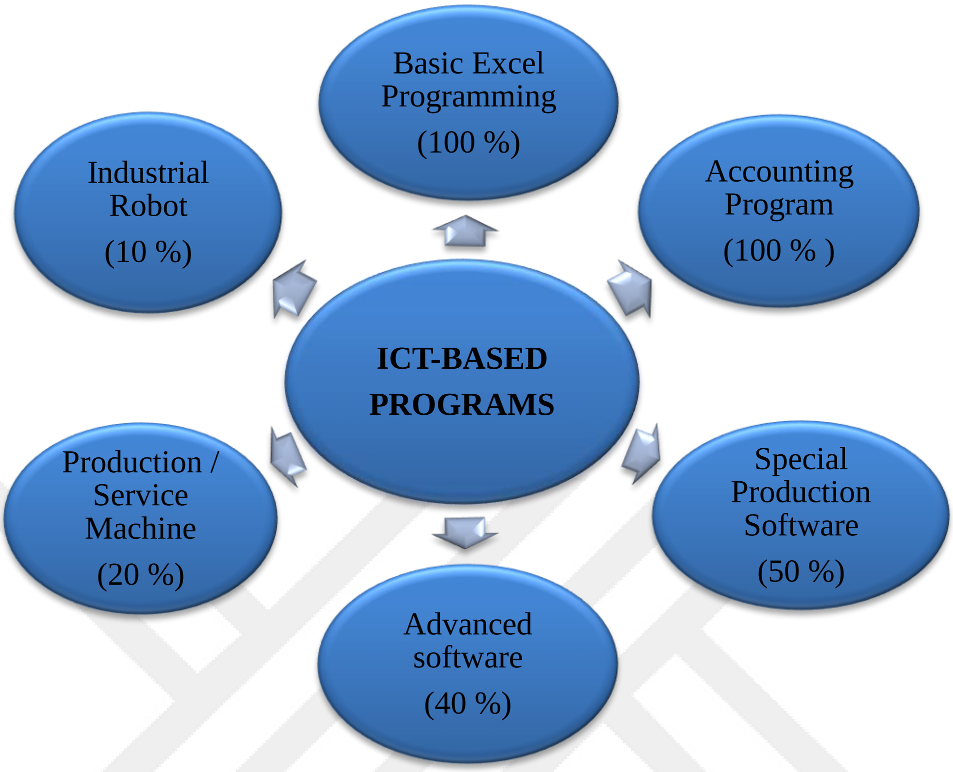
Figure 2: The Use of ICT Equipment in The Workflow



Source: Own calculations obtained from 10 participants

Figure 2 shows that the use of technology in the cooperatives is a significant factor in the realization of many activities providing commercial and social power. Internal communication and information refer to the preferences of the members to carry out e-commerce businesses with each other through different channels, to follow the market situation, and to determine strategies. Members also emphasized via the survey that ICT helps them to control the production stages easily for farmers and carry out online orders in cooperatives. As seen in Figure 1, especially the internet and smartphones constitute an information disseminating platform for cooperatives to advance in e-commerce as well as to provide additional commercial gains.

Figure 3: The Main Use of ICT-based Programs



Source: Own calculations obtained from 10 participants

Figure 3 indicates that all cooperatives use basic Excel and accounting programs in their business transactions and supply chain management. Half of the cooperatives use other special programs like special production software. Depending on the product types, which is grown and sold, the technological requirements of the cooperatives also differ. For this reason, they track commercial transactions by adapting some unique programs and electronic devices to their activities, such as barcode readers and stock tracking systems. On the other hand, there is a percentage decrease in the purchase and implementation of customized systems in relation to the cost.

Figure 4: The Main Digital Sales & Marketing Channels

Source: Own calculations obtained from 10 participants

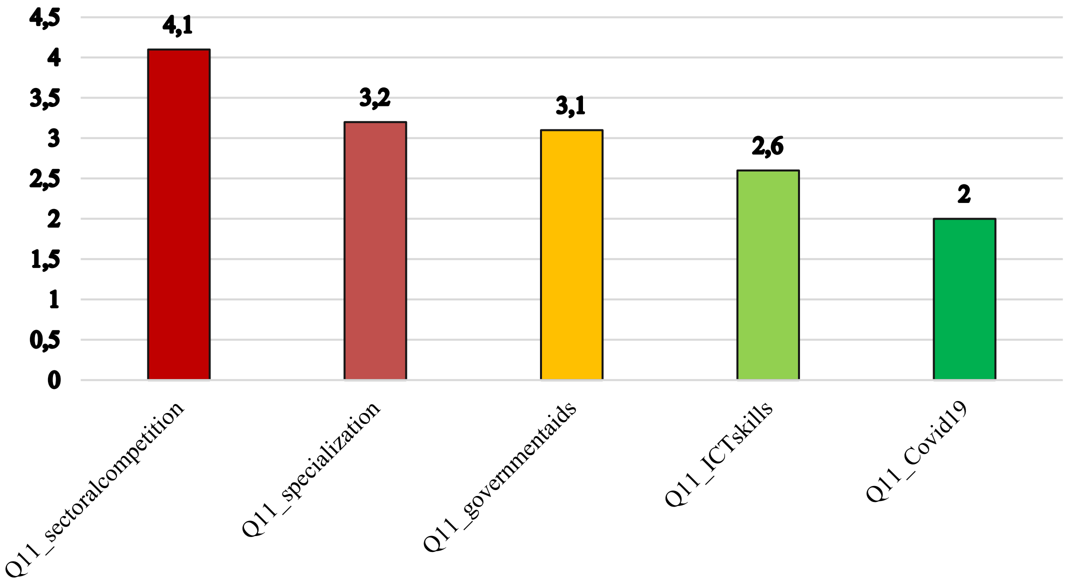
Figure 4 demonstrates that the cooperatives mostly use websites and social media tools to maintain e-commerce activities among their members. Farmers, who are cooperative members, find the opportunity to deliver and sell their products to increased number of consumers through the websites created. The percentage of online sales channels indicates that, in addition to their websites, products are also sold through other sales channels such as Halkın Bakkalı, which is supported by İzmir Metropolitan Municipality, Trendyol, and Hepsiburada. The participants stated that the product variety changes according to the season and customer supply and that they provide more quickly online responses to the demands. Besides, external marketing tools such as e-catalog are preferred in less than half of the cooperatives (see Figure 4).

2.2. EMPIRICAL RESULTS

2.2.1. Evaluation of Encouraging Factors

Starting from the 11th question in the survey, the participants were asked to rank their answers from the most important to the least important in line with the perception of cooperative on these issues. According to the information, the following graphs are drawn that demonstrate the participants ordering between 1 to 5, referring from least important to most important. The averages of the answers given are interpreted, taking into account different evaluation criteria and perspectives.

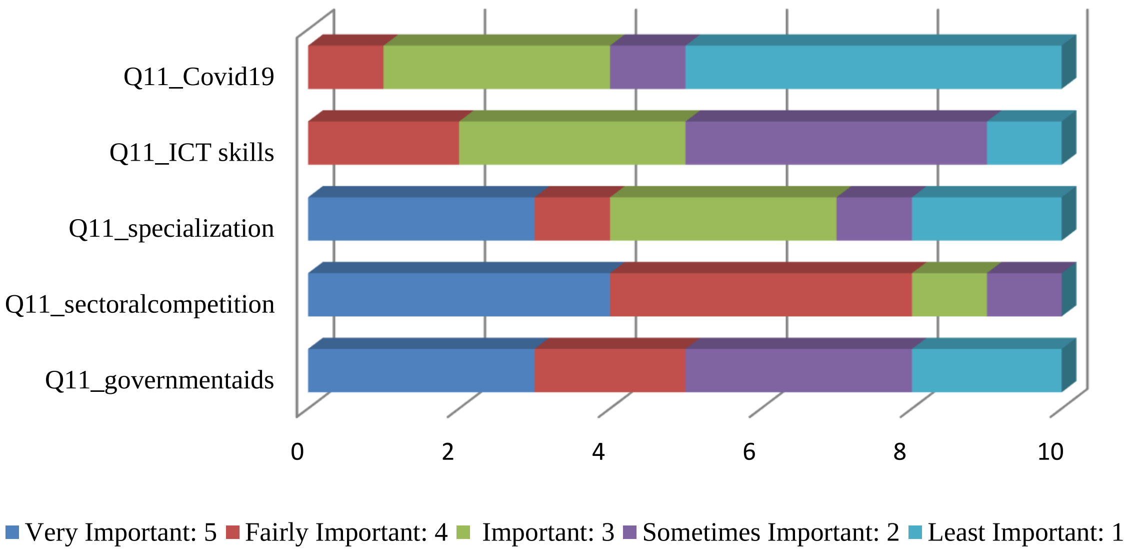
Figure 5: Factors that Encourage Digitalization (Average)



Source: Own calculations obtained from 10 participants

As shown in Figure 5, the most important factor encouraging cooperatives in terms of digitalization is the sectoral competitive environment, with an average of 4.1. The development of other cooperatives in digitalization encourages cooperatives to invest in this area in order to commercialize and sell their products.Since they serve as regional cooperatives, they emphasize the importance of being the consumer's preferred seller among cooperatives that grow the same products to earn income for member farmers and the institution. The factors that follow the sectoral competition are respectively specialization and government aids. The transition to digitalization brings infrastructural changes and it is necessary to allocate funds from the budget to set up a new trade system. Most of the participants state that the budget they allocate for such infrastructure changes is limited, and they need government aid. As it can be deduced from the graph, contrary to expectations, the least important factor in digitalization has been the Covid-19 process, with an average of 2 out of 5.

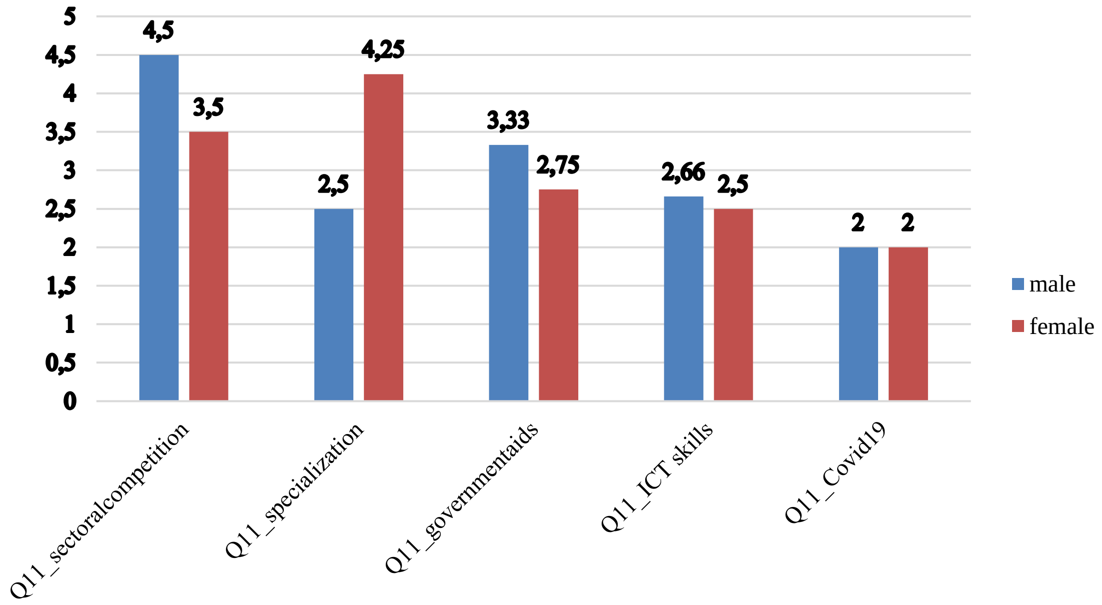
Figure 6: Factors that Encourage Digitalization (Number of Participants)



Source: Own calculations obtained from 10 participants

It is also shown in detail the answers given by the participants to the factors that encourage digitalization in Figure 6. While sectoral competition was described as an important factor, the factor that was thought to have the less impact was Covid-19. Besides, participants have stated that the labor force has sufficient knowledge about the use of ICT and evaluated encouragement to increase their skills as less important.

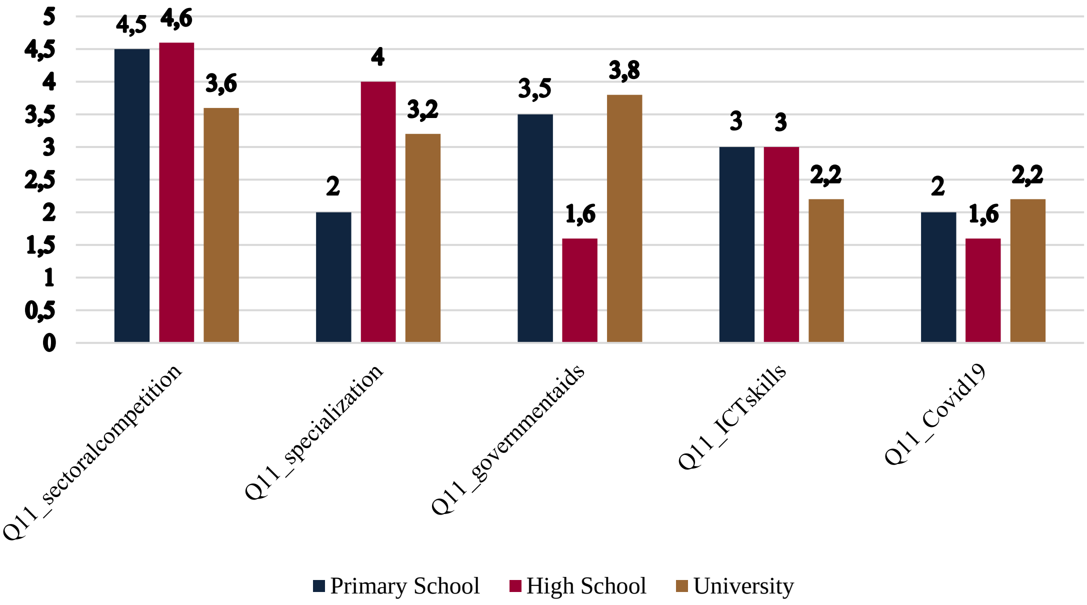
Figure 7: Factors that Encourage Digitalization by Gender (Average)



Source: Own calculations obtained from 10 participants

When the responses of male and female participants to the factors that encourage digitalization are evaluated separately, it is seen that the most important factor in promoting digitalization for males is sectoral competition with 4.5 out of 5. However, female participants attribute more importance to specialization with 4.25 out of 5. This result shows that males approach digitalization as more commercial racing. Females especially emphasized the role of managers in the tendency to e-commerce in cooperatives and the maintenance of activities online. While males and females consider that Covid-19 is less important encouraging factor to digitalize than others, it is seen in the graph that government incentives and the development of digital skills are at close averages.

Figure 8: Factors that Encourage Digitalization by Education Level (Average)

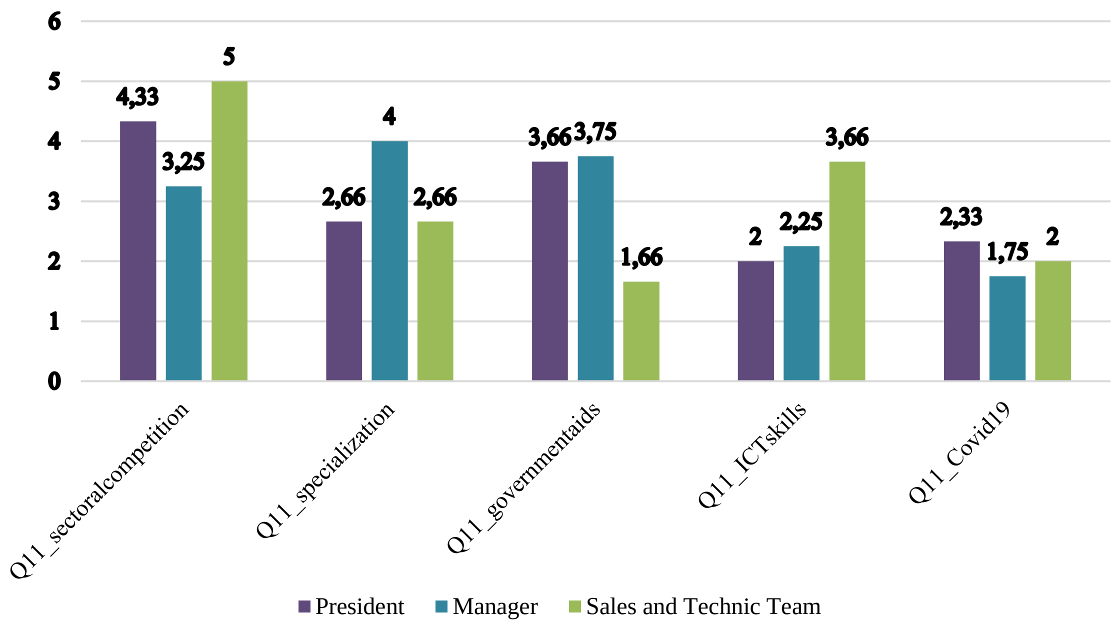


Source: Own calculations obtained from 10 participants

The cooperative members, who participated in the survey, were grouped in terms of their educational attainment, and the level of importance attached to the factors promoting digitalization was evaluated. The aim here is to reveal what digitalization means for participants with high education levels and those with low education levels. Participants, who graduated from primary and high school, give importance to sectoral competition as an encouraging factor to digitalize more than those who graduated from university. One reason is that cooperative members generally consist of farmers, who have a lower educational attainment. Therefore, one of the important points for the farmer is the increase in sales platforms where they can sell the products they grow to more consumers and make their name known in the sector. Digitalization (like e-commerce activities) also means a tool that serves this situation for them. The increase in government aid was considered the most important factor that encourages digitalization among university graduates, with an average of 3.8. They consider that government aid is the main motivator to build online sales channels such as e-commerce in these institutions. The development of

ICT skills in the cooperative is important for the groupwith a lower educational attainment after the level of importance attached to financial issues. According to the results, it can be stated that university graduates need less encouragement to enhance digitalization because they already are more conscious of using ICT.

Figure 9: Factors that Encourage Digitalization by Profession (Average)



Source: Own calculations obtained from 10 participants

Participants are grouped according to their professional status and the importance that they attached to different factors encouraging digitalization in their cooperatives are shown in Figure 9. As it is expected, sectoral competition is the most important encouraging factor for digitalization for sales representatives and IT teams because it is directly related to increasing income and productivity. The creation of a labor force with ICT skills is another crucial factor for ICT-related groups due to the need for technological equipment and a labor requirement that can use them due to their work. When survey results are evaluated from the point of view of the president and cooperative managers, it is also remarked that sectoral competition and government aid are important start-up supporters of digitalization activities. The interesting point is that those who have a say in management find it unimportant to increase the digital skills of the labor force employed in the cooperative. The reason for this is mostly their thought that there are employees who have sufficient ICT knowledge in the cooperative.

Figure 10: Factors that Encourage Digitalization by Cooperative Size (Average)

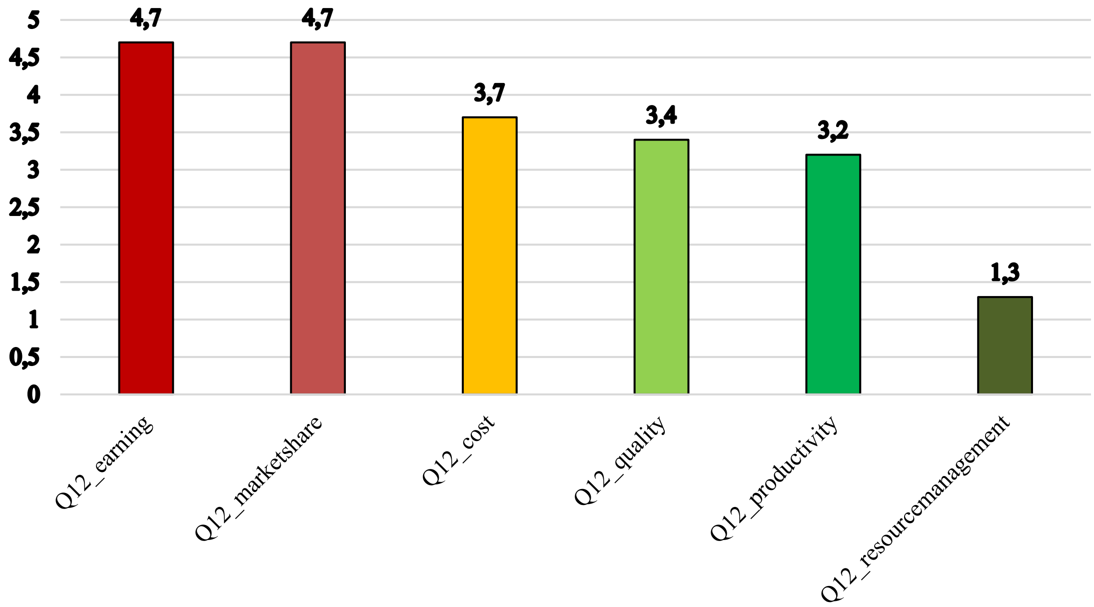
Source: Own calculations obtained from 10 participants

The evaluation of factors that encourage digitalization of the cooperatives according to the total number of members is shown in Figure 10. Regardless of large or small cooperatives in terms of the number of members, it is seen that sectoral competition for attaining a place in the market is an encouraging factor in the development of digitalization. On the other hand, the importance of government aid increases as the number of members decreases because of the limited resources and budget for ICT investment.

2.2.2. Evaluation of Promoting Factors to Digitalization

Another question in the survey aims to evaluate the expected effects that the widespread of e-commerce activities may have on cooperatives. Participants ordered the importance level of expected effects from 1 to 6, which refers to the least important to the most important in line with their cooperatives'priorities. Results are shown in the below figures.

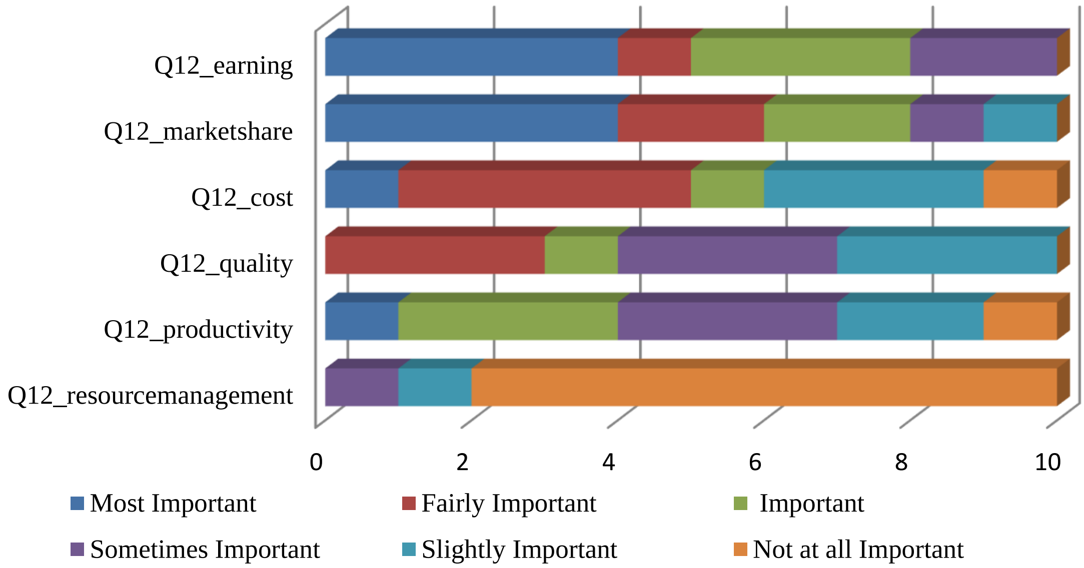
Figure 11: The Expected Effects of The Spread of E-commerce on Cooperatives (Average)



Source: Own calculations obtained from 10 participants

Participants stated that as e-commerce activities become widespread in cooperatives, the most important expected effectis to have an increase in the market share and earnings with an average of 4.7 in Figure 11. These results are predictable because online sales give an opportunity to market their products to the whole consumer removing the limitations of regionalism. Farmers get a chance to sell theirproducts they grow in a broader market through the online sales channels of the cooperatives. This brings an increase in earnings for both cooperatives and farmers. The transition from traditional sales channels to online sales and the increase in earnings is also reflected through a decrease in costs. Cooperative members stated that because the products produced are generally in a certain number and season, even if it provides a change in productivity, it will not have a strong impact compared to other effects. It can be seen from the figure that the least expected effect is to have an improvement of resource and waste management with the spread of e-commerce.

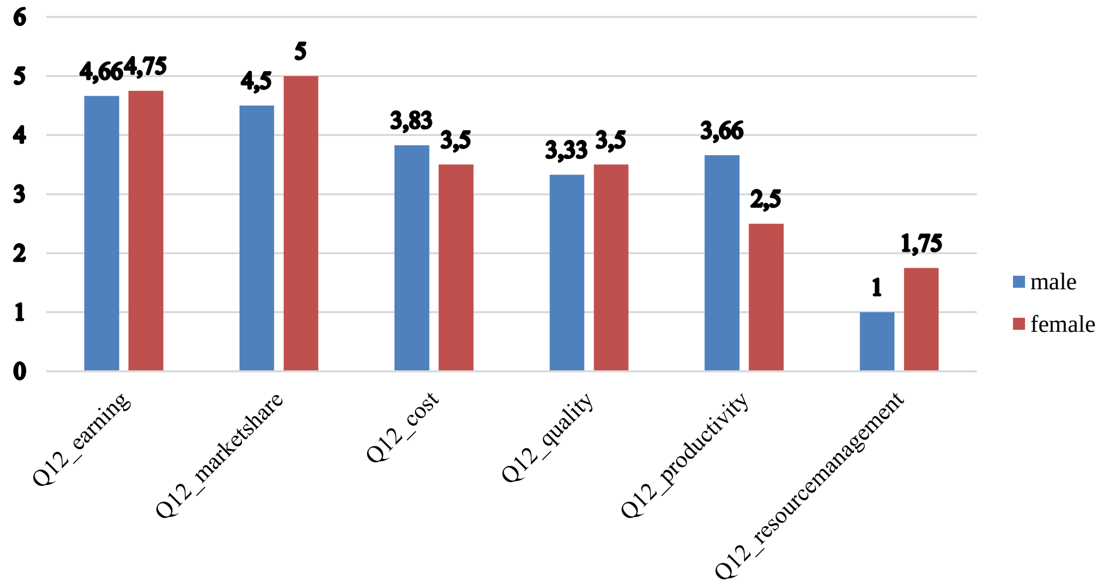
Figure 12: The Expected Effects of the Spread of E-commerce on Cooperatives (Number of Participants)



Source: Own calculations obtained from 10 participants

As it is emphasized in Figure 12, 4 out of 10 participants stated the most important expected effect with the widespread of e-commerce is to have an increase in earnings and market share. Moreover, it was evaluated as fairly important that adaptation to e-commerce is expected to reduce costs. It canbe stated that the steps taken in the spread of e-commerce are first expected to createa financial improvement in cooperatives. Although 4 out of 10 of the participants stated that there would be an increase in the quality of services offered to customers with online transactions that provide a wide network, the other 6 participants emphasized the economic insufficiencies and stated that financial support is needed to use e-commerce. On the other hand, resource management was evaluated as the least important by 8 out of 10 cooperatives in terms of the opportunity offered by digitalization of activities.

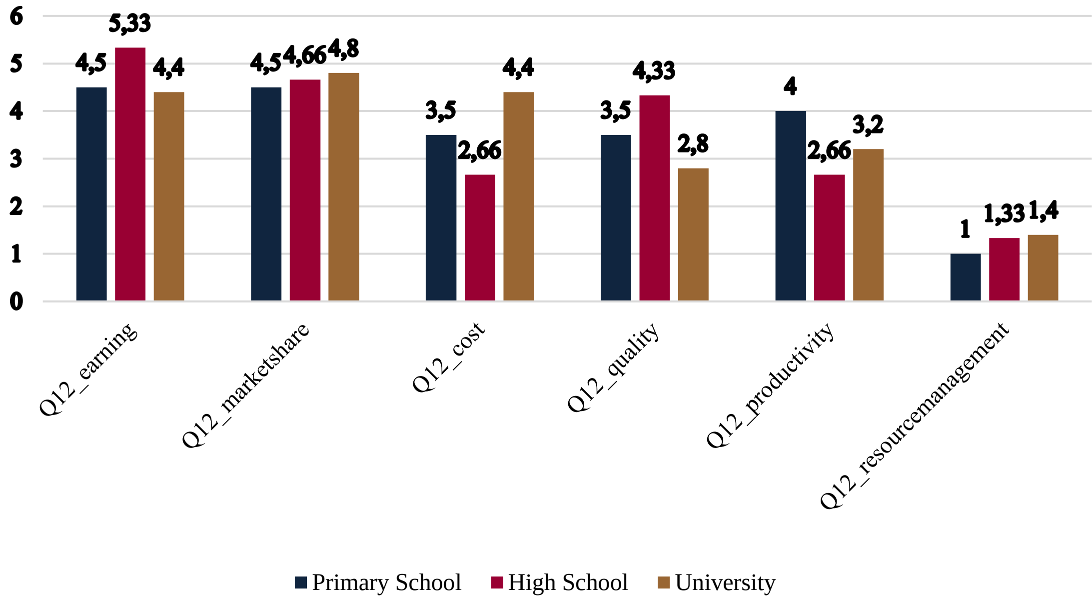
Figure 13: The Expected Effects of the Spread of E-commerce on Cooperatives by Gender (Average)



Source: Own calculations obtained from 10 participants

It is observed in Figure 13 that there are no big differences in the participants' expectations about the benefits of the spread of e-commerce on cooperatives according to gender. However, male participants highlight the expectation to have an increase in productivity with the spread of e-commerce. In general, it can be said that male and female participants agree on most of the benefits that e-commerce will bring along to the cooperative. Considering results specific to this graph, it can be inferred that females have a say as males in the steps to be taken, especially in financial matters in cooperatives according to the averages. Male and female respondents who participated in the survey indicated the expectation of higher earnings and market share with close and high averages to each other. Even if the ratio of females in agricultural activities is also high, males evaluate productivity increase expected through the spread of e-commerce more important than females.On the contrary, females seem to be more sensitive to the benefits of e-commerce regarding resource management.

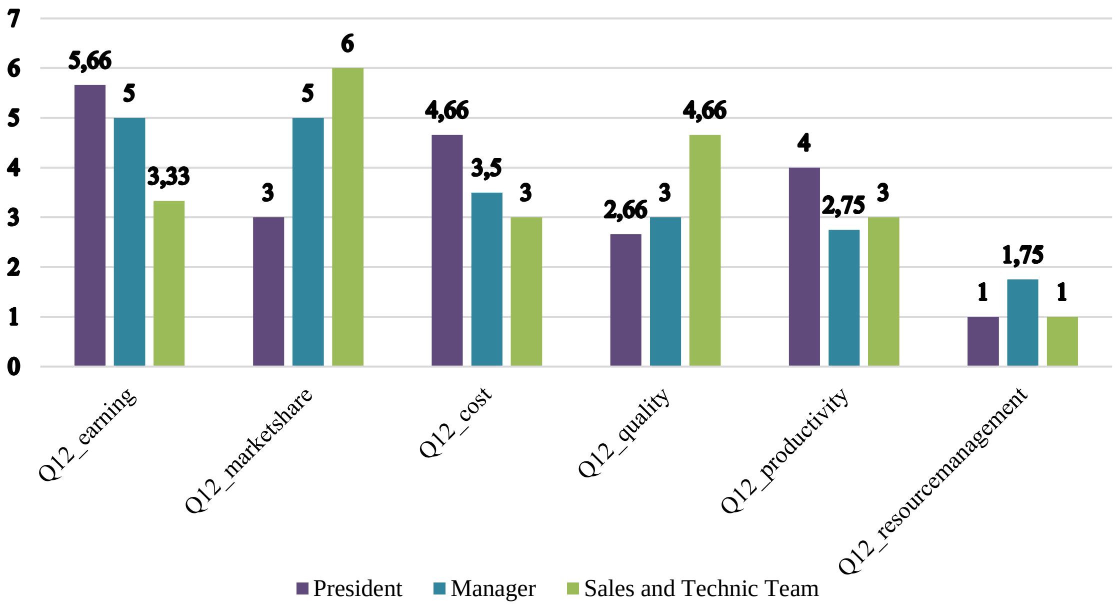
Figure 14: The Expected Effects of the Spread of E-commerce Activities on Cooperatives by Education Levels (Average)



Source: Own calculations obtained from 10 participants

The participants agree that effective e-commerce activities in cooperatives will have positive contributions to their earnings and market shares regardless of their education level (see Figure 14). According to the information also obtained from the interviews with the members of the cooperatives, since university graduates generally work in departments such as sales and accounting, it is expected that the impact of e-commerce actives on reducing costs is more important for them than those who graduated from primary and high school. Although the average of participants that expects to have an improvement in resource management is very low, the application of online transactions in commercial activities is expected to improve the efficient use of resourcesas the educational attainmentof participant increases.

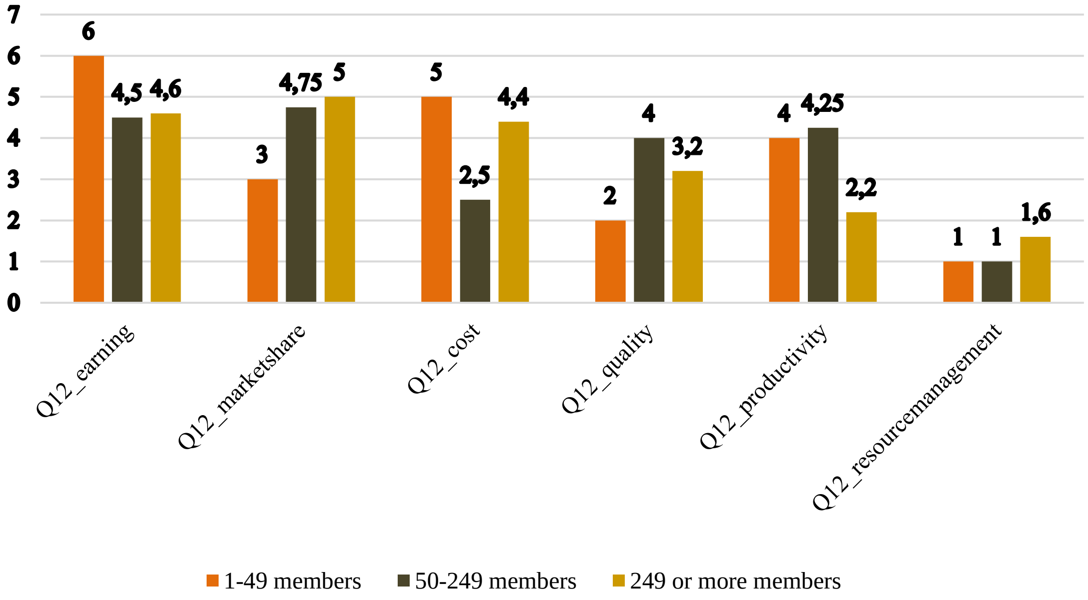
Figure 15: The Expected Effects of the Spread of E-commerce Activities on Cooperatives by Profession (Average)



Source: Own calculations obtained from 10 participants

The factors on which the increase in e-commerce activities in cooperatives is expected to be more effective are examined in Figure 15 according to occupational situations. As the professional responsibilities in the cooperative increase, the importance given to the expectation of higher earnings from e-commerce sales increases. This outcome is in line with the expectations since one of the duties of the presidents and managers of the cooperative is to provide maximum value to the institution and its members. The same evaluation is valid for the importance level attached to the expectation of reducing costs through the spread of e-commerce. For executive team, any cost-reducing effect brings along a greater share of revenue from sales. On the other hand, the answers given for market shares show the opposite result. Sales and technical team have stated that the main contribution of e-commerce willbe to increase market share of cooperatives. This result is also predictable because addressing a broader market to achieve sales targets means supplying products to more consumers for them.Since the sales team gives importance to customer satisfaction, they state that online channels will increase the quality of the service provided by enabling customers to access products more easily.

Figure 16: The Expected Effects of the Spread of E-commerce Activities on Cooperatives by Cooperative Size (Average)



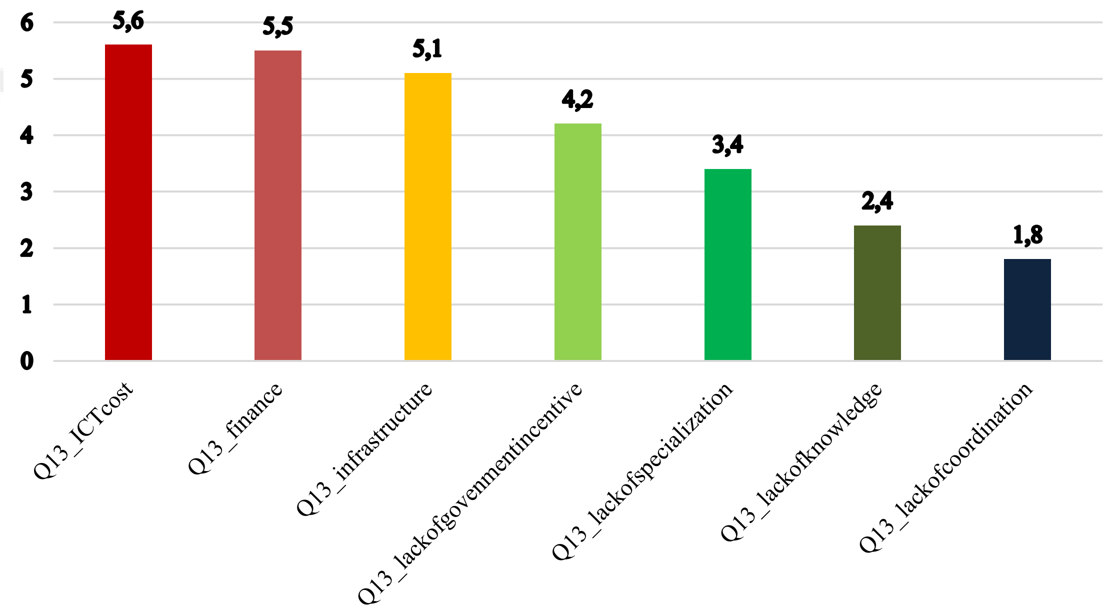
Source: Own calculations obtained from 10 participants

The expectations of the participants from the widespread of e-commerce according to cooperative size are explained in Figure 16. Results showed that small-scale cooperatives principally give importance to the earnings they get from e-commerce. Such cooperatives consist of farmersthatgive importanceto achieving an increasein their profit from the production and carrying out smaller-scale activities in rural areas. Minimizing the costs incurred in the production process and increasing their earnings are their primary priorities. Therefore, e-commerce activities are mostly a revenue-increasing factor for them. Besides, as the size of the cooperative increases, the desire to increase their market share through digitalization increases. The reason for this can be explained as follows. There are more than large-scale cooperatives that sell the same product group in the same region. The preferred one among these cooperatives is to eliminate the regional sales effect and take advantage in terms of marketing their products to a larger consumer group.

2.2.3. Evaluation of The Barriers to Digitalization

Another issue analyzed in the survey is to find out which factors hinder the digitalization process for cooperatives. Participants indicated the importance level of barriers to digital transformation according to their cooperatives' priorities. The results highlight the points which are insufficient and need improvement in the adoption of digitalization.

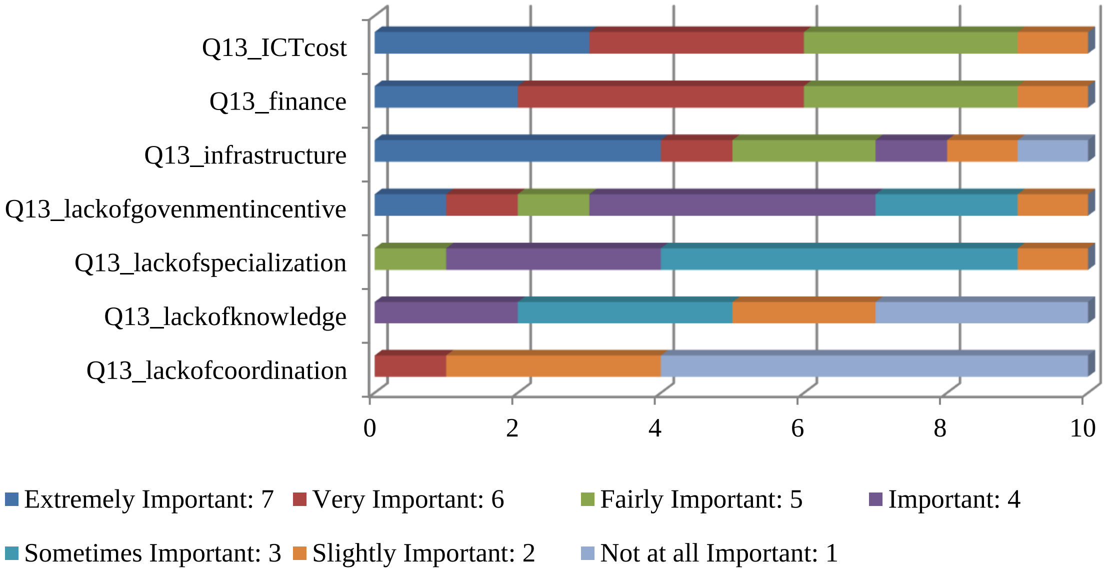
Figure 17: The Barriers to Digital Transformation (Average)



Source: Own calculations obtained from 10 participants

As shown in Figure 17, participants stated that high ICT costs and financial insufficiency are among the most important problems in the implementation of digital technologies in cooperatives. The purchase of technological equipment and applications include a costly process for these institutions. For example, it requires organizational innovations such as establishing a website for online sales, employing specialists who follow this business, and purchasing new accounting programs for financial analysis. A budget must be allocated for this change. Cooperatives, which use online sales channels, emphasized the difficulties of allocating a budget for this commercial change. As well as financial problems, infrastructure insufficiency also strikes in the adoption of digitalization. The transition from traditional sales methods to digitalization brings some fundamental changes to the farmers and the institution.It is clearly understood that infrastructure and financial problems connect to each other because more investment needs more financial budget. On the other hand, participants think that accessing information, coordinating, and using ICT skills do not act as barriers to digital transformation in cooperatives.

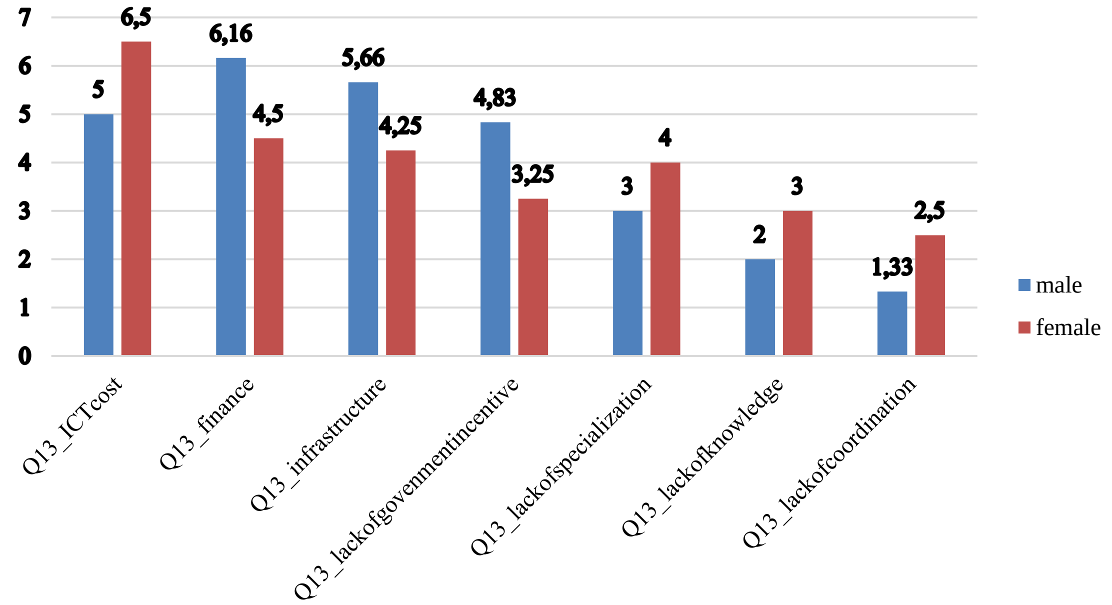
Figure 18: The Barriers to Digital Transformation (Average)



Source: Own calculations obtained from 10 participants

Considering Figure 18, 9 out of 10 participantsemphasize the high importance of the cost and financial situation of cooperatives acting as a barrier to digitalization. Besides, 4 out of 10 participantsstated that it is extremely important that the structural deficiencies of cooperatives in the transition to new technologies affect their transition to digitalization. Interestingly, they think that the insufficiency of government incentives did not affect the adoption of digitalization as much as financial difficulties. More than half of the participants remarked in the survey that there have been good communication and information flow between the cooperatives and their members and lack of coordinationdoes not act as a barrier to digital transformation.

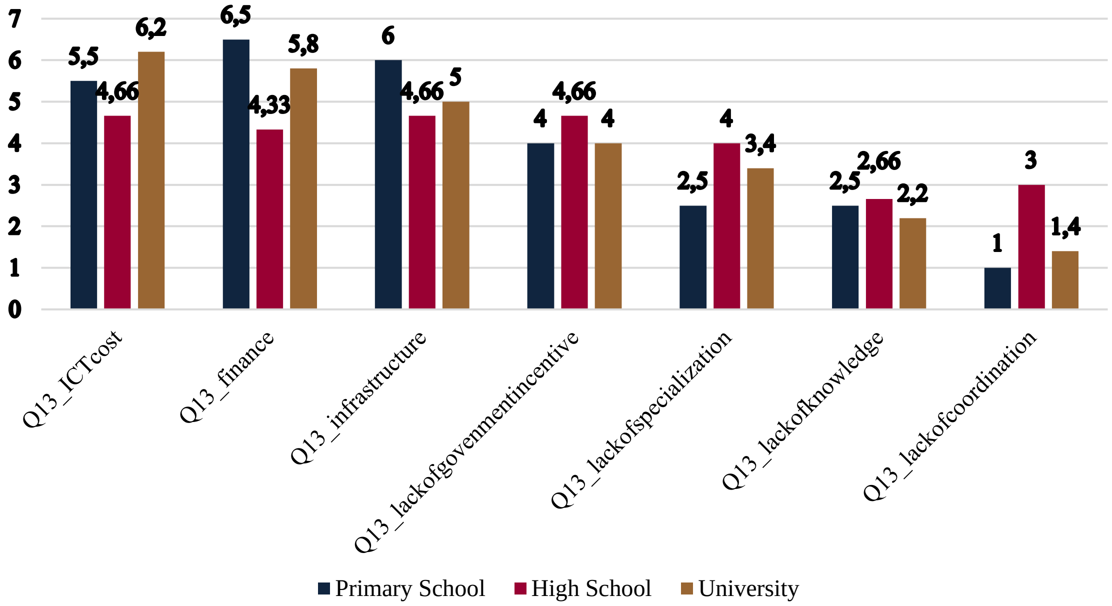
Figure 19: The Barriers to Digital Transformation by Gender (Average)



Source: Own calculations obtained from 10 participants

When the difficulties faced in the transformationto digitalization are evaluated in terms of gender (Figure 19), female participants stated that the costs of ICT put the most pressure on the cooperatives. As female participants have played more roles in the sales and running of online businesses, they are more conscious about the technological investments required for digital transformation in cooperatives. The lack of guidance on specialization in human resources and the use of ICT also have been evaluated by females as a barrier to the digitalization movements of cooperatives. The male participants, who generally work in managerial positions, defined the general financial inadequacy of cooperatives as an obstacle to digitalization. They stated that if more funds could be allocated for investments in online applications in cooperatives, they could increase their field of activity by increasing online sales.

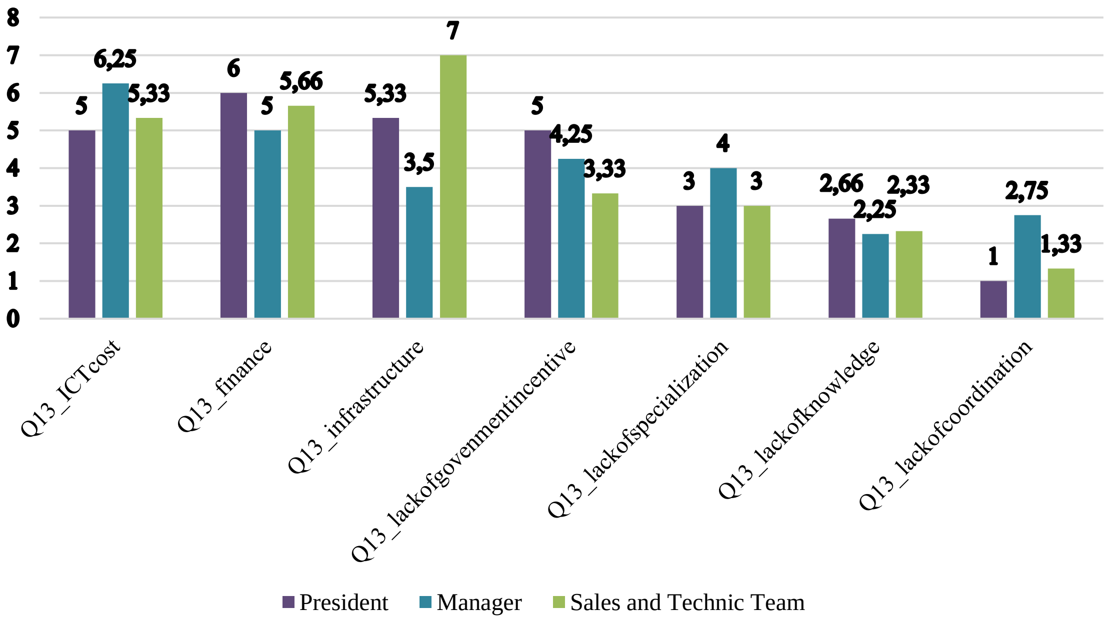
Figure 20: The Barriers to Digital Transformation by Education Level (Average)



Source: Own calculations obtained from 10 participants

As shown in Figure 20, the evaluation of the barriers to digitalization in cooperatives is not interpreted much differently in terms of participants with different education levels. That means the results can not be generalized that as the level of education increases, awareness of some issues increases. While cost of ICT is the main obstacle to digitalization for participants who graduated from university, financial problems and lack of infrastructure are the main barriers for improving e-commerce activities according to the ones who have a lower level of educational attainment. It can be inferred that financial support related to ICT is needed for digital transformation in cooperatives according to well-educated participants. Others emphasize that any financial improvement in the cycle, which covers the production process to marketing, will be beneficial to the orientation towards digitalization in cooperatives. They stated that investments are the most necessary in these fields to continue e-commerce activities in cooperatives.

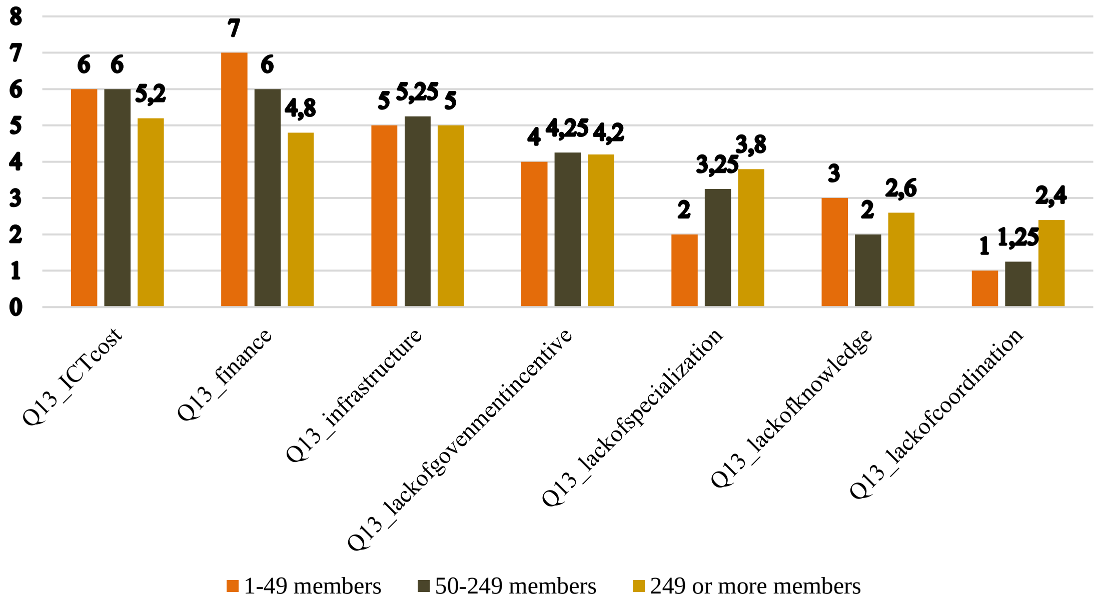
Figure 21: The Barriers to Digital Transformation by Profession (Average)



Source: Own calculations obtained from 10 participants

The participants that are affliated in sales department stated that infrastructural problems create the most crucial challenge in digital transformation, with the highest average in Figure 21. According to the information obtained from the participants, these problems are mostly related to the structure of cooperatives before they start an online business. Extending sales across Türkiye while working with a small capacity requires operational innovations. Employees, who have a role in ICT-related works such as IT support, system analysis, and design, constitute the team that strives to keep up with the new sales system in cooperatives. Therefore, any insufficiencies in this area are considered as a barrier to running the system properly for them. As observed in questions 11 and 12, managers stated that the most important problem facing the development of e-commerce arises from the financial budget of cooperatives. Besides, the results reveal that participants, who have a say in the administration, have more expectations from the state to gain more from digital transformation.

Figure 22: The Barriers to Digital Transformation by Cooperative Size (Average)



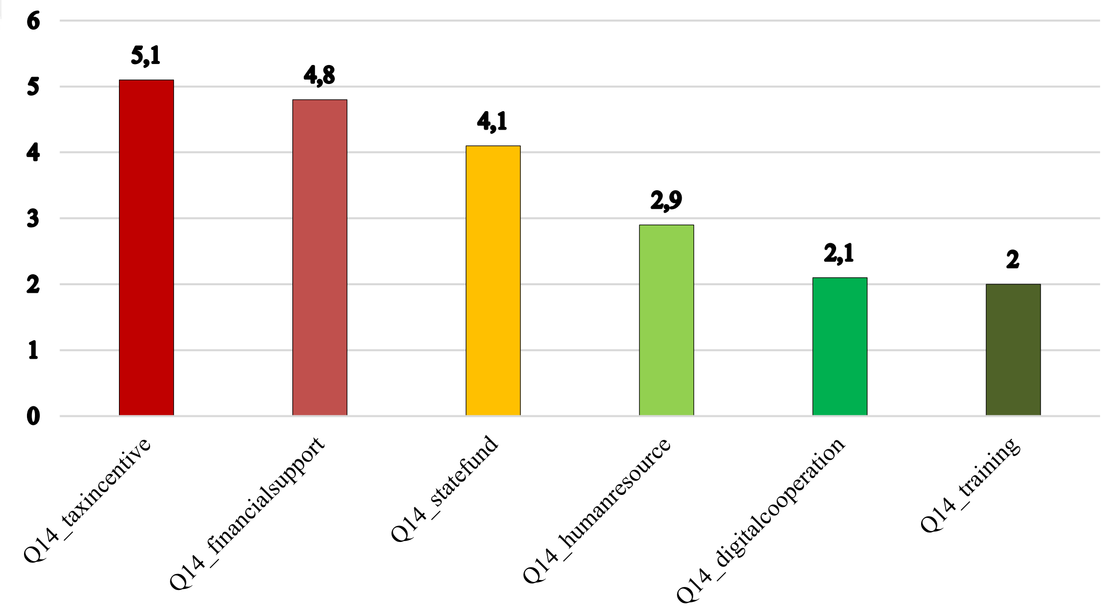
Source: Own calculations obtained from 10 participants

According to Figure 22, as the size of the cooperative increases, financial problems have not been as much of a barrier to digital transformation as in small cooperatives. Ensuring the financial balance in these cooperatives is one of the most important factors due to their field of activity. A new investment carries out greater financial risks for them. Therefore, participants stated that more support is needed in the transition to new applications in small-scale structures. Large-scale cooperatives have the opportunity to allocate more budget for e-commerce activities, which increase sales and supply their products to more consumers in the market. It can be interpreted from the results that lack of government incentives, infrastructure, and high ICT costs almost act as barriers to digital transformation for all sizes of cooperatives. The specialization of the employees in ICT and the coordination in the cooperatives become more important obstacles as the number of members in the cooperatives increases. These large-scale cooperatives stated that any impediment in this matter constitutes a barrier to maintaining e-commerce activities efficiently.

2.2.4. Evaluation of The Policies

The participants also evaluated the policies which need to be applied in cooperatives in order to develop e-commerce activities by taking into consideration cooperatives'priorities. The participants were asked to rank the listed policies that should be applied for facilitating digital transformation from most important to least important. The results have revealed what kind of regulations cooperatives need in their digital transformation process.

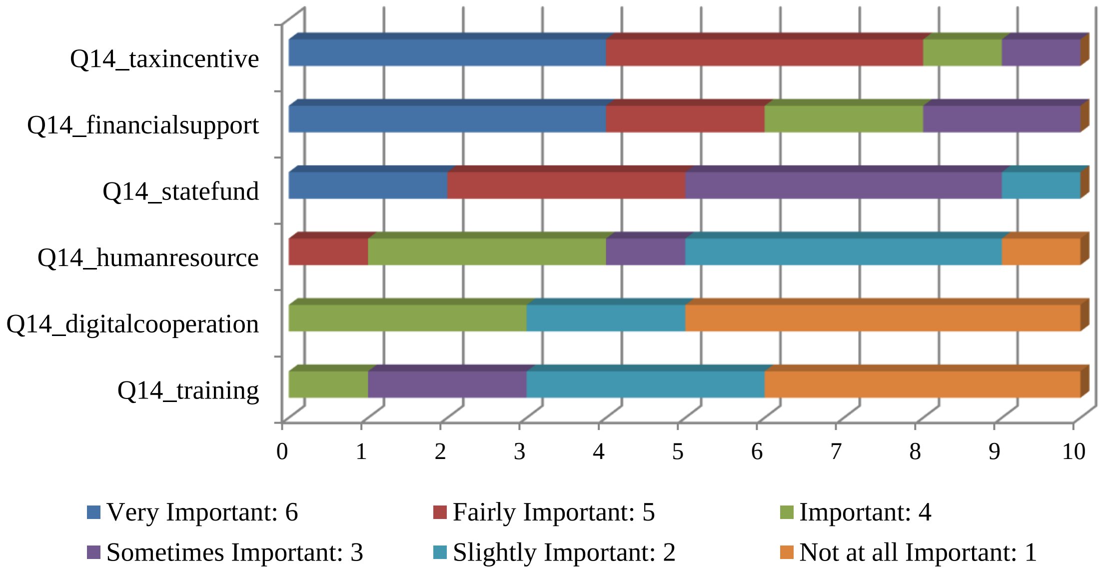
Figure 23: Evaluation of the Policies for Digital Transformation (Average)



Source: Own calculations obtained from 10 participants

Figure 23 shows that cooperatives mostly expect regulations on tax incentives to invest in digital technologies. Participants have stated that e-commerce activities have not been developed enough due to the high cost of technological expenses. In addition, results show that policies to provide financial support helps members of cooperatives to increase their investments in online transactions. Such supports enable cooperatives to be more powerful in e-commerce by increasing their earnings and accelerating the adoption of new systems. Besides, the participants stated that establishing a government fund would be an important policy to increase the cooperatives' tendency to e-commerce. Looking at the other criteria, the participants evaluated providing education to increase digital skills as the least important policy action to be taken by government comparedto others. We can conclude that developing policies for facilitating financial supports have been prioritized by participants.

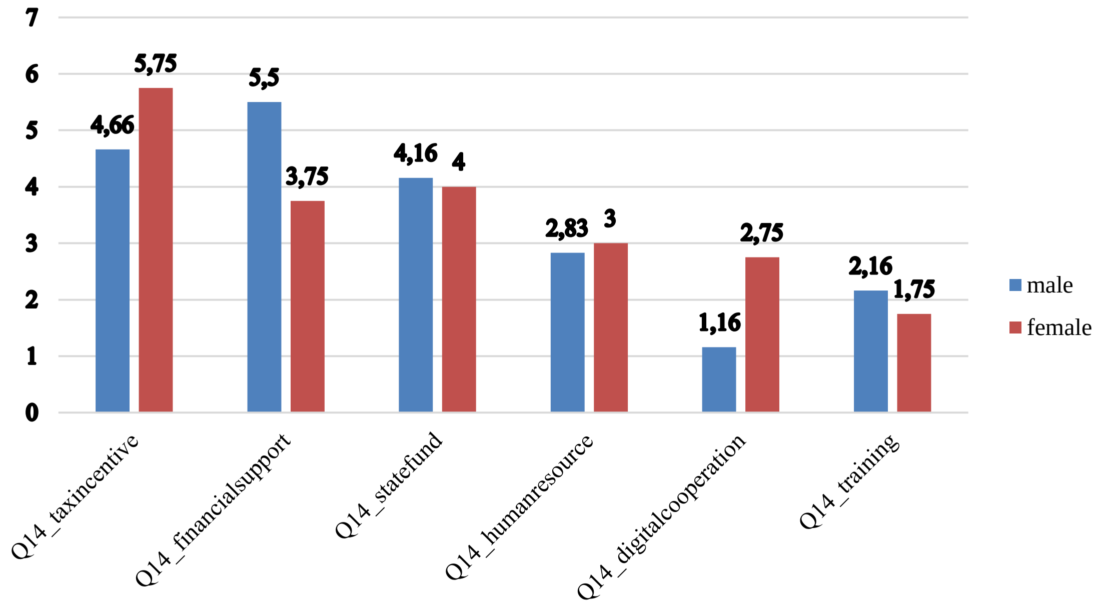
Figure 24: Evaluation of the Policies for Digital Transformation (Number of Participants)



Source: Own calculations obtained from 10 participants

When the policy actions to be taken by government are evaluated according to importance attached to them by participants in Figure 24, it is seen that 8 out of 10 participants underline the need for improvements in tax incentives as an important policy tool. Furthermore, 6 out of 10 participants stated that supportive financial regulations are another important motivator for digitalization/e-commerce activities in cooperatives. Participants considered their cooperatives as sufficient compared to other financial issues in terms of human resources support, which have the knowledge to use ICT equipment and systems. The effect of the new associations to spread the digitalization elements among cooperatives seems limited in terms of increasing online sales. Moreover, the importance of taking action on fundamental issues such as finance and taxation has been highlighted by the participants.

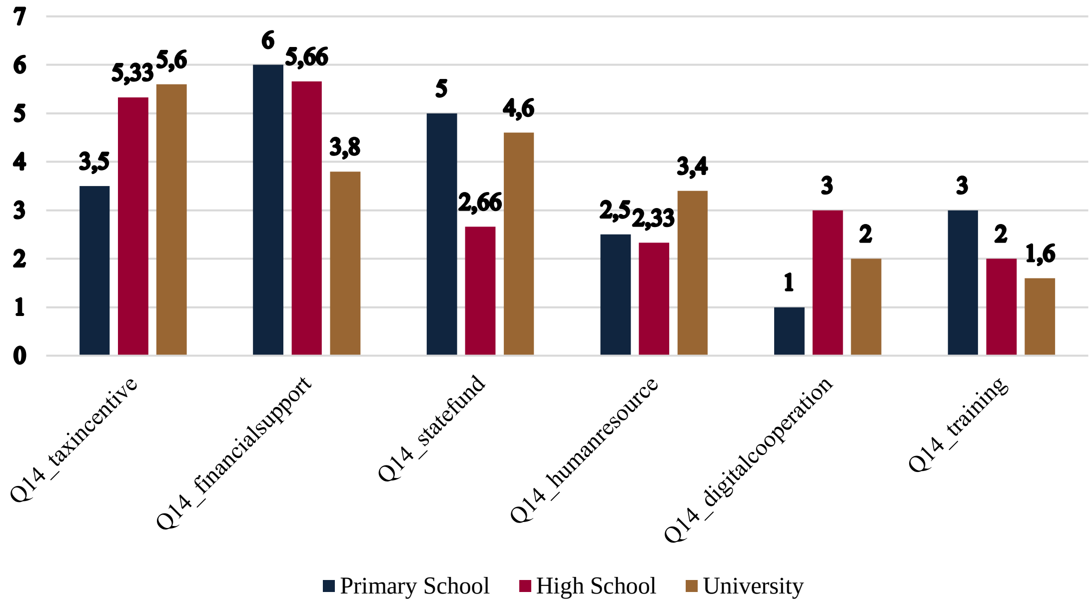
Figure 25: Evaluation of the Policies for Digital Transformation by Gender (Average)



Source: Own calculations obtained from 10 participants

Figure 25 compares the stated policypriorites of participants for facilitating digital transformation by gender. It is seen that an improvement in commercial policies could be more effective. According to the results, while females give importance to tax regulations, males draw attention to financial support in facilitating digital transformation. On the other hand, there are differences in perceptions about the benefits of digital cooperation between male and female participants. Providing training opportunities to increase digital skills is stated to be important in order to act more consciously on online sales and cooperative activities from the males' perspective.

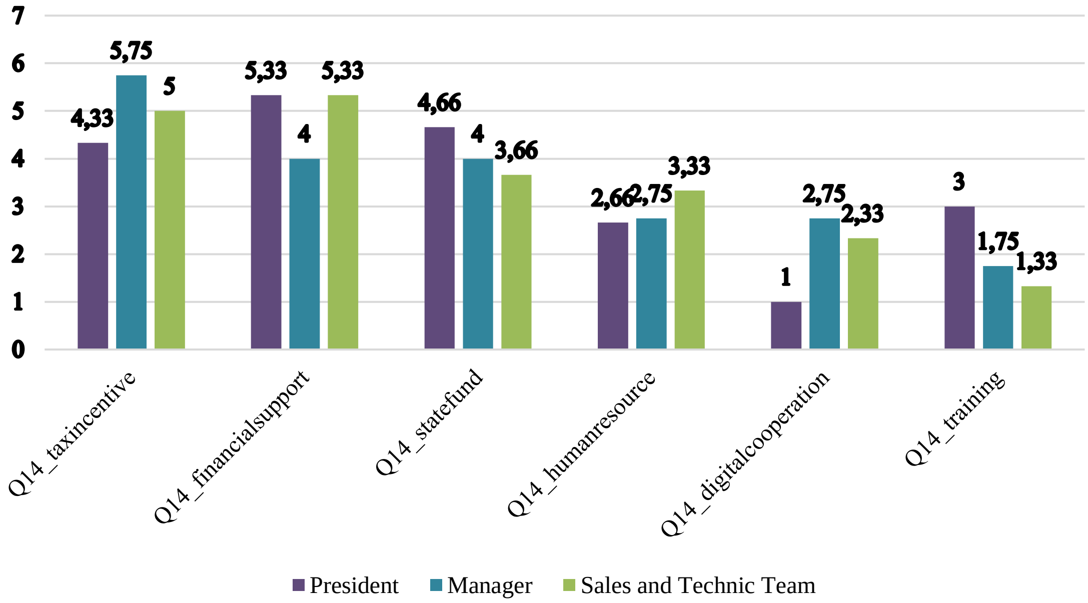
Figure 26: Evaluation of the Policies for Digital Transformation by Education Level (Average)



Source: Own calculations obtained from 10 participants

The level of educationof the participants also gives an idea in the evaluation of the policy tools which need to be applied in the digitalization process of cooperatives. Figure 26 shows that as the level of educationincreases, the participants state that policies regarding tax regulations will contribute more to investments done by cooperatives in e-commerce. The importance of exemptions from tax for the protection of farmers' rights is emphasized by participants with higher level of education. There is an opposite point of view in terms of the effect of financial support on digitalization. Participants with low level of educational attainment emphasized the importance of financial aid in the adoption of new applications for the ICT system. They stated that policies, which reduce expenditures and increase income, are beneficial by associating e-commerce with financial elements. While university graduates thought that more investment should be needed in improving human resources, others focused on training to increase digital skills and remove lack of knowledge as more important policy tool.

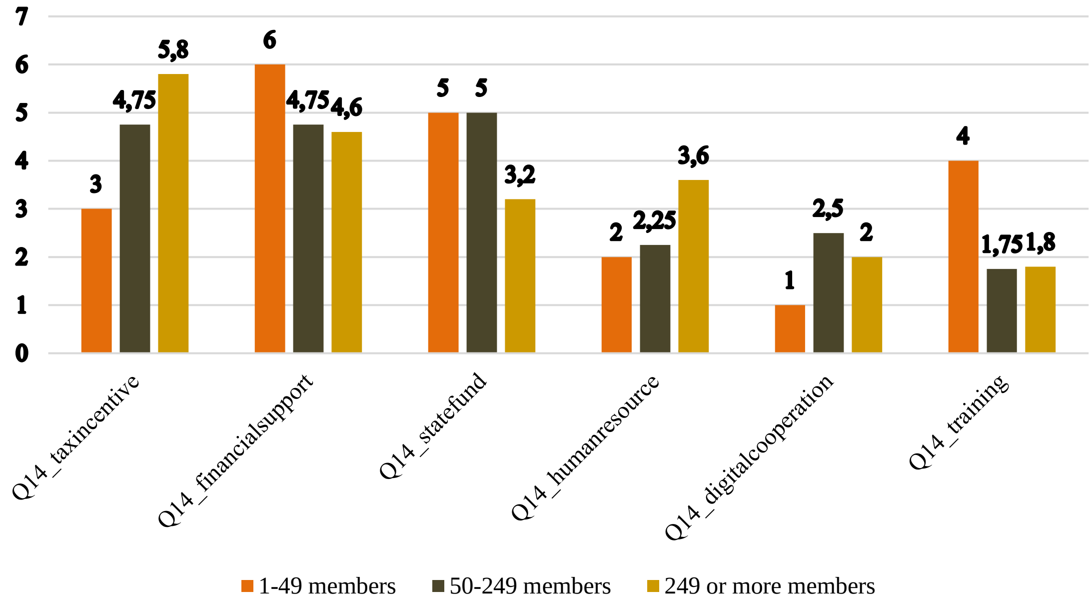
Figure 27: Evaluation of the Policies for Digital Transformation by Profession (Average)



Source: Own calculations obtained from 10 participants

When results are interpreted according to the profession of the participant, regulations on tax incentives and financial support have stated as the most important requirements in facilitating digital transformation by the president and managers of cooperatives. At the same time, Figure 27 shows that providing more financial support is also evaluated as an essential factor for sales representatives. Establishing a state fund, which helps the digitalization process, gains more importance for the executive team of cooperatives rather than the sales team. This result can be expected since the developing policies aimed at protecting the profits of both the institution and the farmers is necessary in regard to managers. On the other hand, policies designed for supporting cooperatives in human resources is more important for the sales and IT teams, who mostly play a role in developing e-commerce and technological infrastructures. Getting training on the management of e-commerce activities is stated as an important policy tool by managers.

Figure 28: Evaluation of the Policies for Digital Transformation by Cooperetive Size (Average)



Source: Own calculations obtained from 10 participants

According to Figure 28, as cooperative size increases, tax incentives become a more important policy tool for facilitating digital transformation. Small-scale cooperatives emphasized the requirement of financial policies. While the importance attributed to policies supporting investments in human resources increases as the size of the cooperative increases, it is a matter of the opposite situation for training policies. Participants in small-scale cooperatives think that governments should carry out more educational policies in order to improve skills needed for digital adaptation.

In additon to all survey results, variables have been evaluated in terms of level of digitalization. According to the formulation which was previously mentioned in the methodology part, variables have been calculated based on some evaluation criteria. The results are shown in the below tables.

2.3. ICT USAGE INDEX

Digitalization process becomes common in the agricultural development cooperatives. The study aims to analyze the effects of ICT usage in cooperatives and which factors play a role in maintaining e-commerce activities efficiently. The study covers the analyzes obtained from the agricultural development cooperatives in the districts of İzmir. Interviews and surveys are carried out with the participants to reveal the contributions of digitalization in cooperatives. A survey is conducted by each cooperative to observe and interpret the e-commerce activities of cooperatives. According to the scope of the research, 10 cooperatives, which can integrate their trade activities with technology, were included in the survey. A group of participants, which consists of presidents, managers, sales, and IT teams, evaluated the importance of factors for cooperatives.

The study is also supported by the method of analysis based on previous research on this topic. Jorge-Vázquez et al. (2021) created a formulation about the features and quality of the websites where e-commerce is carried out. Some categories were determined, and they were subclassified with some variables. They benefited from the index of digital transformation which was constituted by Eurostat for cooperatives. Based on this, they constituted the variables to measure level of digitalization which was called as B and C in the analysis.

According to the research, we constituted 13 variables to determine the factors that affect the e-commerce activities in İzmir agricultural cooperatives. To measure the digitalization, index was described as belows;

$$\sum_{i=1}^{4}\sum_{j=1}^{9} BiCj$$

where B referred to the use of the internet, and C is related to the quality of the website.

Table 3: Definition of The Variables

Variable	Definition
B1	Cooperatives where the website offers

	opportunities to costumers through online ordering or booking
B2	Cooperatives where the website offers opportunities to costumers the description of goods or services and price lists
B3	Cooperatives where the website offers opportunities for visitors to customize or design the products(webctm)
B4	Cooperatives where the website offers opportunities to costumers to order tracking available online
C1	Cooperatives that have a website for online shopping
C2	Cooperatives which include the corporate presentation of the organization on their website
C3	Cooperatives that offer personalized content for regular customers on the website (webper)
C4	Cooperatives where the website had links or references to the organization’s social media profiles
C5	Cooperatives where the website offers the security of customer information with the special safety programs
C6	Cooperatives that offer the opportunities to apply for a job through the website
C7	Cooperatives that offer the opportunity to share suggestions and complaints on the website
C8	Cooperatives where the website provided

	information on mail, online ordering forms
C9	Cooperatives where the website provided e-catalog, news and events information

Source: Own definitions based on Jorge-Vázquez et al. (2021)

Table 3 shows the meaning of the variables in the study. In detail, while from B1 to B4 provide information on how e-commerce activities are carried out on websites, variables from C1 to C9 help to analysis on the features of websites.Variables were evaluated as 1 and 0. The variable evaluated as 1 indicates that the cooperative has features related to e-commerce, while value 0 indicates that it did not. The results measure the degree of digitalization in cooperatives, and some interpretations were also made by blending them with the survey results.

Table 4: Determinations of The E-Commerce Channels In Agricultural Cooperatives

	B1: Cooperatives where the website provided online ordering or reservation or booking, e.g., shopping cart				
Name of Agri-food Cooperative	**e-commerce through own website**	**e-commerce through Halkınbakkalı**	**e-commerce through other web sites (Trendyol, Hepsiburada etc.)**	**ordering through phone/mail**	**ordering through social media**
Bademler	1	0	1	1	1
Bademli	1	1	0	1	0
Bergama	1	1	0	1	0
Doğanbey	1	1	0	1	1
Gereli	1	1	0	1	1
Gödence	1	0	0	1	1
Hıdırlık	1	1	0	1	1
Iğdeli	0	1	0	1	1
Karateke Irrigation	1	1	1	1	0

Table 4 explains online sale channels of the agricultural cooperatives which actively used. It can be observed that except for Iğdeli, all cooperatives have own websites to sale products. Besides, ICT equipments are used for selling and following the ordering. On the other hand, agricultural cooperatives are not prefer as an online sale channels such as Trendyol and Hepsiburada. Instead, they use Halkınbakkalı which is the sales channel established by the Izmir Metropolitan Municipality to deliver healthy, cheap, and reliable agricultural products to consumers.

Table 5: Level of Digitalization Index: E-commerce

Agri-food cooperatives producing	EC1	EC2	EC3	EC4	EC5	Average	Total
olive oil	0	0	2	2	0	3,5	4
dairy products	0	0	1	1	0	3,5	2
horticultural industry	0	0	1	2	0	3,7	3
ALL	0	0	4	5	0	3,6	9

Source: Own calculation

When agricultural cooperatives are distinguished according to the production sectors in Table 5, it is seen that the digitalization index concentrates on EC3 and EC4, which respectively refer to other websites and ordering through ICT equipment. That means the level of digitalization is higher for ordering through ICT equipments than others.

Table 6: Level of Digitalization for Agricultural Cooperatives In Terms of Product Groups

Agri-food cooperatives	1	2	3	4	5	6	7	8	9	10	11	12	13	Average	Total
olive oil	0	0	0	0	0	0	0	0	1	0	1	2	0	**11**	4
dairy products	0	0	0	0	0	0	1	0	0	1	0	0	0	**8.5**	2
horticultural industry	0	1	1	0	0	0	0	0	0	0	0	1	0	**5.7**	3
ALL	0	1	1	0	0	0	1	0	1	1	1	3	0	**8.7**	9

Source: Own calculation

Table 6 shows the values about the level of digitalization in cooperatives. While it is referred to as variable B from 1 to 4, it is defined as variables C from 5 to 13. They have been evaluated on the values of 1 and 0. According to the level of digitalization, which constitutes to sum of the variables, the highest score is observed in olive oil cooperatives. It has been emphasized with the results that this cooperative group uses websites and e-commerce tools more actively.

Table 7: Level of Digitalization for Agricultural Cooperatives In Terms of Cooperative Size

Agri-food cooperatives	1	2	3	4	5	6	7	8	9	10	11	12	13	Average	Total
1-9	0	1	0	0	0	0	0	0	0	0	0	1	0	**7**	2
10-49	0	0	0	0	0	0	0	0	1	0	1	1	0	**10.7**	3
50-249	0	0	1	0	0	0	1	0	0	1	0	1	0	**8**	4
ALL	0	1	1	0	0	0	1	0	1	1	1	3	0	**8.7**	9

Source: Own calculation

When results are evaluated regarding to cooperative size, Table 5 shows that large-scale cooperatives have the total highest score based on e-commerce activities. This can be a predictable result because these cooperatives allocate more funds to invest in online applications and programs. Financial restrictions are less than the other cooperative groups when it is evaluated before in Figure 28.

CONCLUSION

Technology enables the maintenance of commercial activities efficiently in many sectors. Recently, it has become a remarkable factor in the agricultural sector with developing fields of activity. The digitalization process has contributed to an increase in farmers’ income and agricultural productivity. At this point, many institutions and organizations have taken on a task in the adoption of technology in agriculture. Agricultural development cooperatives are the leading of these institutions. Cooperatives, which aim to protect the interests of farmers, have recently started to focus on e-commerce. Based on this, this study investigates the role of cooperatives in agricultural development using technological systems and equipment in the sales and marketing of agricultural products. Agricultural development cooperatives in İzmir have been used as data for the study. 10 cooperatives were chosen, which operate through e-commerce, and a questionnaire was applied to the participants.

The results have made important contributions to evaluating the factors that are effective in maintaining e-commerce activities of cooperatives. We addressed questions to participants related to ICT equipment and its commercial usage areas, and information was obtained about which tools are preferred in e-commerce. According to the answers given by the participants, it has been observed that almost all ICT equipment, such as computers, telephones, and the Internet, which has included in the evaluation criteria, has been widely used in cooperatives. These equipments are used for purposes such as internal-external communication, order and production follow-up. While some cooperatives use special software programs to follow the workflow in production, marketing and accounting, most of them work with basic Excel programs. It has been stated that one of the most important reasons for this is ICT costs. On the other hand, it is observed that own websites and social media tools, such as Instagram and Facebook, have been mostly preferred in terms of online sales channels.

Participants have also evaluated promotive factors of e-commerce activities based on characteristics of cooperatives, and the results have shed light on the aim of the study about which factors were important in development. Findings have also been interpreted considering gender, education level, and profession. In general, the results show that sectoral competition, specialization, and government incentives are leading factors that motivate the adoption of e-commerce. While specialization in human resources and knowledge of ICT provides to be active in online business for female participants, male participants give priority to increasing the market share of products by reaching more consumers with e-commerce. On the other hand, participants, who work in the sales department, aim to find channels where more sales can be made in order to reach the targets. E-commerce enables them to have a say in the market and to promote their products. Therefore, competitiveness becomes an important factor. In addition, cooperative sizes affect the investment share allocated to the development of e-commerce. Results have revealed that small-scale cooperatives need more government incentives to carry out their activities. Developments in this issue will help cooperatives to make more extensive investment decisions by reducing the impact of financial constraints in the digitalization process.

The effect of the spread of online transactions in commercial activities has been evaluated in the survey as well. The most significant effects are expected in earnings and an increase in market share. E-commerce offers the chance to reach a wider consumer group, and this is reflected in the increase in product sales. As the level of educational attainment increases, it is understood that digitalization is an important tool to keep up with the industry. Participants, who have high-education levels, usually work in sales departments. They emphasize that the quality of services offered to customers can increase through e-commerce activities.

On the other hand, cooperatives face some problems with their digital transformation. Participants have stated that the most important obstacle is high ICT costs. The transition to e-commerce means building a new sales world for such cooperatives that apply traditional sales methods. When considering the earnings rate of the cooperatives, the applications purchased during the transition to the new system, the creation of a website, and control of the website include high costs. Most of the cooperatives have emphasized financial insufficiency and infrastructural problems in the interview. Especially presidents and managers find government incentives insufficient in this regard.

Agricultural cooperatives need some regulation to improve their e-commerce activities. Considering the general situation and evaluations, the implementation of supportive policies on taxes is one of the most important factors required in the digital transformation of cooperatives. The results show that financial constraints constitute a barrier to maintaining e-commerce activities efficiently rather than lack of human resources, education, and knowledge. Cooperatives should be supported by tax incentives since increased taxes cause a decrease in their investment rates. Some tax exemptions should be entitled, or tax deductions should be made. On the other hand, high ICT costs should be prevented with financial aid. Especially small-scale cooperatives have difficulties in allocating funds for investments, and this causes e-commerce activities to be carried out with limited opportunities. To give a better service and to exist in the market, financial support is needed in this regard. Government should establish a committee of experts in each province to follow up on this issue, and the factors needed in the digitalization should be determined by taking into account the financial situations and geographical characteristics of each cooperative. Since the cooperatives represent the farmers, the developments will also be reflected in productivity and earnings. It also helps to strengthen relations between farmers and technology. In the general framework, the agricultural sector will contribute to economic growth by having a bigger market share on the basis of region and country with the ICT adoption of cooperatives.

When the results of the study are evaluated in general, it is striking that Izmir agricultural cooperatives have not yet been able to carry out e-commerce activities at a sufficient level. It is seen that this is caused by many infrastructural, economic, and social factors. There is an inequality in terms of technological transformation opportunities of cooperatives. While there are cooperatives that are very convenient in terms of carrying out e-commerce activities, it is seen that there are cooperatives that try to use online sales services with few resources. In addition, since Doğanbey Cooperative received more municipal support compared to other cooperatives, it has shown rapid development despite being a young established cooperative. It also had positive effects on the transition to e-commerce activities. However, the effort to keep up with the developing world conditions in agriculture and to adopt technological elements that will enable farmers to gain more profit and efficiency through sustainable agriculture continues increasingly.

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APPENDIX

APPENDIX

QUESTIONS IN THE SURVEY

1) What is your gender?
   - Female
   - Male
2) What is your age range?
   - 0-17
   - 18-65
   - 66-79
   - 80-99
3) What is your education level?
   - Primary School Graduate
   - Secondary School Graduate
   - High School Graduate
   - University Graduate
   - Postgraduate Education
4) What is your job in the Agricultural Development and Other Agricultural Cooperatives that you represent?
   - President
   - Member of Board
   - Production Supervisor
   - Marketing/Sales Specialist
   - Other (................................)
5) What is the number of members of the Agricultural Development and Other Agricultural Cooperatives that you represent? (Please specify with numbers)

   ....

6) When did you start working in the Agricultural Development and Other Agricultural Purpose Cooperative that you represent? (Please specify year)

....

7) What are the Information and Communication Technologies tools you use in the cooperative that you represent? (You can mark more than one option)

- o Internet
- o Smartphone
- o Fax
- o Computer
- o Printer

8) If you are communicating via WhatsApp / e-mail among the employees of the cooperative you represent, at what stage of the workflow do you use these technologies? (You can mark more than one option)

- o Internal Communication
- o Internal Information
- o Order Follow-up
- o Production Control
- o Knowledge sharing

9) What are the technological tools/equipment used in production/marketing/sales/accounting in the cooperative you represent? (You can mark more than one option)

- o Basic Excel Programming (customer registration, word, excel, etc.)
- o Advanced Software (data editing and analysis, etc.)
- o Special Production Software
- o Production/Service Machine (involved in production/service by physical effort)
- o Industrial Robot (The machine, where the employee does not intervene, only performs technical, technological or software updates)
- o Accounting Programs

10) What are the digitalization tools used in marketing/sales in the cooperative you represent? (You can mark more than one option)

- Digital/online Marketing
- Websites
- Social Media Tools (Facebook, Twitter, Instagram, etc.)
- Other Online Sales Channels
- E-catalog

11) Canyou rank the factors that will encourage digitalization in Agricultural Development and Other Agricultural Cooperatives in order of importance? (The most important 5, the least important 1)

Government aids (   )

Sectoral competition (   )

Specialization and knowledge of managers in new technologies and digitalization (   )

Increasing the digital skills of the workforce employed in the cooperative (   )

Covid-19 (   )

12) If digitalization/e-commerce becomes widespread in Agricultural Development and Other Agricultural-Purpose Cooperatives, can you list the effects you expect in order of importance? (The most important 6, the least important 1)

Reduction in costs (   )

An increase in productivity (   )

An increase in earnings (   )

An increase in the quality of services offered to customers (   )

Strengthening the position and market share of the cooperative in the sector (   )

Improving resource and waste management (   )

13) Can you list the factors that hinder digitalization in Agricultural Development and Other Agricultural Cooperatives in order of importance? (The most important 7, the least important 1)

Lack of infrastructure (   )

Financial insufficiency (   )

High cost of purchasing and maintaining digital technologies and applications(   )

Difficulty in accessing information and lack of guidance (   )

Lack of specialization and skills in human resources (   )

Lack of government aids (   )

Lack of coordination between cooperatives (   )

14) Can you rank the policies that should be followed in order of importance to assist the digitalization of Agricultural Development and Other Agricultural Cooperatives? (The most important 6, the least important 1)

Establishment of a government fund to help digitization (   )

Tax incentives for cooperatives that invest/want to invest in digital Technologies (   )

Human resources support for cooperatives that invest/want to invest in digital technologies (   )

Providing trainings to increase digital skills (   )

Establishment of digital collaborations between cooperatives or other institutions (   )

Providing financial support to cooperatives' e-commerce applications (   )