The Need of Electronic-Agriculture Policy to Develop Electronic Agricultural Advisory & Extension Services in Jordan

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Abstract

The agricultural sector is considered one of the most important economic sectors in Jordan, the Ministry of Agriculture of Jordan cares about the development of the Jordanian agricultural sector through the offering of different services, and one is the agricultural advisory and extension services. Since early 2020, an outbreak of the coronavirus disease 2019 (COVID-19) has started to spread in Jordan challenging the sustainability of Jordan's economic sectors and the agricultural sector, the government starts to employ electronic services, such as; e-government, e-education, e-commerce, e-industry, and e-society, with the absence of e-agricultural policy which has a positive effect in developing of the agricultural sector in Jordan, the present study was conducted to highlight the need of electronic agriculture policy to shift from traditional to electronic agricultural advisory and extension services to activate and develop the Jordanian agricultural sector; a scientific questionnaire was distributed to 100 Jordanian agricultural advisory agents working at the Ministry of Agriculture. The study results emphasized the need of e-agriculture policy to improve and develop the agricultural advisory and extension services through shifting towards electronic services to reduce the challenges that was suffer from traditional process, the study also found that, the importance of electronic services to transfer of modern technologies at the right time and place, regulate the agricultural production, encouraging innovation and creativity among advisory agents and farmers, strengthening of agricultural knowledge and the need for more specialized information, the electronic agricultural advisory and extension is characterized as fast, modern, cheap advisory system, reduce time and efforts , support farmers abilities and increase of the farmers connection with different important aspects also can facilitate of integration with agricultural agencies, also requires an expensive infrastructure and maintenance, training and capacity building of agricultural advisory agents and farmers, the study mention the target group opinion to integrate of traditional agricultural advisory & extension with e-agricultural advisory & extension process until the process became familiar to the farmers and agricultural advisory agents.

Keywords: Jordan, Policies, traditional, e-agriculture, advisory and extension, services,

1. Introduction

E-Agriculture is one of the policies called “Smart Agriculture” (Dhuwasatakul, 2011); e-agriculture is seen as an emerging field focusing on the enhancement of agricultural and rural development through improved information and communication processes. More specifically, e-agriculture involves the conceptualization, design, development, evaluation, and application of innovative ways to use ICTs in the rural domain, with a primary focus on agriculture (FAO, 2016). The Food and Agriculture Organization of the United Nations (FAO), 2005, proposes the following definition, “e-Agriculture” is an emerging field in the intersection of agricultural informatics, agricultural development, and entrepreneurship, referring to agricultural services, technology dissemination, and information

delivered or enhanced through the Internet and related technologies, also, it involves the conceptualization, design, development, evaluation, and application of new (innovative) ways to use existing or emerging information and communication technologies (ICTs). Information and Communication Technology (ICT) is defined by the World Bank as "[…] any device, tool, or application that permits the exchange or collection of data through interaction or transmission." It "includes anything ranging from radio to satellite imagery to mobile phones or electronic money transfers." The application of ICTs in agriculture is often referred to as e-agriculture (FAO,2017) and m-Agriculture refers to the provision of agricultural services and information, using mobile devices such as cell phones, Personal Digital Assistants (PDAs), tablets and other handheld communication or computing devices, short Message Service (SMS) is also a widely used application of mobile technology in agriculture, farmers can interact with experts and systems via SMS e.g. to receive weather updates and information on best practices on various sectors of agriculture, an SMS service that brings information on demand and supply to farmers and extension workers (Gichamba et al.,2012), Mcnamara et al., 2011 define the information and Communication Technologies (ICT) as "any device, tool, or application that permits the exchange or collection of data through interaction or transmission", also, Loevinsohn et al. (2013), define the agricultural technologies as; 'The means and methods of producing goods and services, including methods of organization as well as physical technique. New technology is 'new' to a particular place or group of farmers, or represents a 'new' use of technology that is already in use within a particular place or amongst a group of farmers, Furthermore, 'Agricultural information flows' refers to the exchange of information within the agriculture sector, and the provision of agricultural services through electronic channels. Exploring a strategic goal or challenge from this perspective helps determine how these flows may need to be improved to enable a goal to be met or a challenge to be overcome (FAO, 2016). Agricultural extension systems were created by governments to disseminate knowledge on agricultural management practices amongst farming communities. The nature of these services has changed dramatically over the last 20 to 30 years. There has been a huge decline in investments by governments in several countries, thus seriously affecting the availability and quality of services. Globally, there is now a growing realization that the simple delivery or dissemination of information is no longer sufficient. Instead, service providers today are looking to create new platforms for the co-construction of knowledge specific to the farming context, with an emphasis on the use of local knowledge and on farmer-to-farmer learning (FAO,2016), Awuor et al., 2016, documented that, farmers make critical decisions throughout the year, these decisions include those based on the choice of inputs (crop varieties and seeds, water, power, fertilizers, and pesticides) and market transactions related to them, farm operations (tillage, sowing, water management, fertilizer management, pest management, harvest), post-harvest operations and transactions (including storage, transport, marketing, and processing) and others. Typically, farmers rely on accumulated experience, try to find information related to both farm and non-farm decisions, information received from radio and television broadcasts by experts and professionals from more distant sources. Together, these form the local knowledge system accessible to a small farmer for making decisions, often, this system is inadequate and many decisions are made with limited information, ICT (e-agriculture) provides timely information, increase choice, reduce transaction costs, and contribute to improving the efficiency of decision making to raise rural incomes and improve the quality of life of the rural populations (Rao N.H., 2007).

FAO, 2017, reported that traditional extension services face several challenges in developing countries that limit their efficiency. Poor infrastructure makes it harder and more costly to visit remote areas. For this reason, often extension programmes provide only one-time information to farmers, lessening their long-term impact. In addition, traditional extension is plagued by principal-agent and institutional problems, including a lack of accountability. Agriculture is increasingly becoming knowledge-intensive and millions of smallholder farmers around the world are confronted by constraints such as poor access to markets and financial services, low levels of human and physical capital, poor access to education, and weak information flows. With missing markets, low skills, and weak capacity, agriculture across the developing world will have to overcome several challenges in the future (FAO, 2017), Okediran & Ganiyu, 2019, indicated that agriculture is an information-intensive industry that is spatial. To be successful, farmers must be generalists who are not only well versed in the latest farming technologies but also astute entrepreneurs who are technologically savvy, also Glendenning and Ficarelli, 2012, reported that, aside from informal sources like farmers, friends, and private input dealers, the public-sector agricultural extension has been the traditional formal channel by which farmers have gained access to information related to their farming activities. Communicating information to farmers is one of the key roles that agricultural extension is expected to fulfill. In developed countries large agribusiness, through their digital platforms, provides a wealth of private information to their client's on-farm technologies (Barber, et al., 2016), much of the extension information is out of date, irrelevant, and not applicable to small farmers' needs, leaving such farmers with very little information or resources to improve their productivity. ICT helps the extension system in re-orienting itself towards the overall agricultural development of small production

systems. With the appropriate knowledge, small-scale producers can even have a competitive edge over larger operations (Meera, 2004)

Many challenges are facing the Jordanian agricultural sector and the agricultural advisory and extension process; Jordan has diverse geographical settings such as high lands, Jordan valley, deserts, and Badia areas. Diversity of soil and climatic conditions are existing in Jordan. A variety of crops can thus be grown and various agricultural technologies can be adopted and adapted to the specific needs. Both the advanced and primitive kinds of agricultural technologies are practiced in Jordan. On the other hand, there are most modern agricultural implements such as tractors and harvesting combines, there are farmers who used smartphones and communicate through email and social media. Agriculture plays a vital role in Jordan's economy from the perspective of poverty alleviation and employment generation, with continuing population growth and a fixed land base, small farms are getting smaller, small farm holdings are one of the barriers to modernization and automation of agricultural farms, much of the small farms are perhaps too small to be productive and supportive of sufficient livelihood for the families that they support. The constantly growing cost of agricultural inputs is affecting the small farmers and their families, Small landholdings, growing cost of production, increasing debt, low prices of some agricultural commodities in the international market is aggravating the problems of small farmers in Jordan, and thus, Jordanian farmers need timely expert advice to make them more productive and competitive. The other challenge appears during COVID-19 spread and the Jordanian government measures to reduce the virus effect, the Corona pandemic has caused human suffering and economic devastation all over the world, as the pandemic has greatly disrupted food chains in the world and raised concerns about global food security and food supply chains in economic sectors, the most important of which is the agricultural sector. The basic supply to preparation, trade, logistical systems, national and international, and also affected the markets for production inputs, labor, and capital linked directly and indirectly to food and agriculture through various channels. All countries in the world have taken precautionary measures to limit the spread of this pandemic and its effects on economic sectors, including social distancing measures and the use of epidemiological prevention methods, which negatively affected direct communication processes, as in the agricultural sector, and the weak communication between farmers, which restricted agricultural advisory and extension. Therefore, it was necessary to work to find appropriate means to re-communicate with farmers by shifting toward electronic agricultural advisory and extension. The successive and rapid changes include the freedom of global trade and the information technology revolution, which combined with the problems associated with traditional agricultural advisory and extension from the weakness of advisory and extension activities, the delay in the flow of information and modern agricultural techniques from their sources to farmers, which led to the weakness of traditional agricultural extension. According to target group direct meeting, one of the most important issues to shift towards electronic agricultural advisory and extension is what the Corona pandemic imposed on Jordan by governmental measures of preventing gatherings and social distancing, in addition to some geographical, social, and economic obstacles that limit access to information quickly and easily to farmers. The traditional agricultural advisory & extension process consumed time as the agricultural advisory agent spends a great deal of time answering farmers' questions, and customers feel dissatisfied because of the long time to get an answer to their inquiries, in addition to wasting time in preparing and training volunteers to help them in planning and implementing extension programs in various agricultural fields, the increasing use of the Internet, electronic communication technology and information systems has provided a new vision to reconsider the ways of providing modern electronic agricultural advisory & extension, farmers' interaction. Information and Communication Technology (ICT) is generating possibilities to solve the problems of different categories of Jordanian farmers.

This paper summarizes evaluate challenges and lessons derived from literature, case studies, and practice concerning the role of e-agriculture / ICT in agricultural advisory and extension systems and the importance to draw and develop new e-agricultural policies and strategies in Jordan which will answer the questions of "why, need and roles" of e-agriculture/ICT in agriculture, what are the effect of e-agriculture policies to develop of electronic agricultural advisory and extension services, mention the recent challenges faces the implementation of electronic agricultural advisory and extension services in Jordan.

2. Literature Review

Agriculture is a sector that holds great promise for pro-poor economic growth, agriculture also has significant linkage in its operations with other related sectors such as rural development, natural resource management, banking, insurance, media, governance, transportation, and logistics management (FAO, 2016), agricultural advisory services

generally rely on interpersonal knowledge transfers by agricultural extension agents who visit farmers to provide information. This approach is not always effective and has proved hard to scale sustainably, particularly in highly dispersed smallholder farming systems (Campenhout, et al., 2020), the sector is increasingly becoming knowledge-intensive, and the availability of the right information, at the right time, in the right format, and through the right medium, influences and affects the livelihoods of many stakeholders involved in agriculture and related fields. It has been amply demonstrated that enhancing the ability to farm communities to connect with knowledge banks, networks, and institutions via ICTs can improve their productivity, profitability, food security, and employment opportunities substantially (FAO, 2016). Insufficient extension services and poor access to information widen the gap in the adoption of new technologies and can lead to lower long-term productivity (Miller, Saroja. and Linder, 2013). As the agriculture scenario has become more complex, farmers 'access to a reliable, timely, and relevant information source has become increasingly important. Farmers require access to more varied, multisource, and context-specific information, related not only to best practices and technologies for crop production and weather but also to information about postharvest aspects, including processing, marketing, storage, and handling (van den Ban 1998). The generation and application of agricultural knowledge are increasingly important, especially for small and marginal farmers, who need relevant information to improve, sustain, and diversify their farm enterprises. Agriculture can require substantial knowledge transfer to and among farmers, including information about successful farming practices, new technologies or controls of pest and disease outbreaks, and new markets, information, and communication technology (ICT) projects support such information flows are rapidly growing, with many initiatives in operation today. ICTs can directly support farmers 'access to timely and relevant information, as well as empower the creation and sharing of knowledge of the farming community itself. The processes that ICT projects use to source and deliver content are important to examine, because public, private, and nongovernmental organization (NGO) extension services may be able to increase their effectiveness by using these tools (Glendenning and Ficarelli, 2012). ICT encompasses the use of existing technology: hardware, software, and telecommunication options, including the Internet and telephony (mobile and landline) systems, many ICT interventions have been developed and tested around the world, with varying degrees of success, to help agriculturists improve their livelihoods through increased agricultural productivity and incomes, and reduction in risks (Okediran & Ganiyu, 2019).

2.1. The importance of ICT to agricultural Sector;

Studies on information and communications technology (ICT) based e-agriculture have shown great improvements in practice, such as access to effective information (Das and Solanki, 2005), support for decision making (Rao, 2007), and increased productivity (Eitzinger et al., 2019). Agricultural advisory systems have changed over the past decades, especially with public extension, as farmers receive information from a wide range of ICT sources. These changes in ICT during the past two decades have been rapid and far-reaching, from the costly, colossal, energy-consuming equipment once available to the very few towards the booming and continuously changing mobile, wireless, and internet industries for the many, the sheer multitude of ICT initiatives in agricultural extension plays an important role in revitalizing the interaction between extension services and farmers by making services more demand-driven, up-to-date and inclusive. ICT-based extension advisory methods are relevant in areas such as preproduction, production, post-harvest and marketing, financial services, and gathering and distributing data. Different tools are suitable for different applications (Saravanan et al., 2015). However, ICT is but one element in the wider transformation towards pluralistic extension services (Barber et al., 2016), ICT can give a new impetus to the social organizations and productive activity of agriculture which, if nurtured effectively, could become transformational factors. The 'knowledge' itself will become a technology for overall agricultural development. Agricultural extension, in the current scenario of a rapidly changing world, has been recognized as an essential mechanism for delivering knowledge (information) and advice as an input for modern farming; it has to escape from the narrow mindset of transferring technology packages to transferring knowledge or information packages. If this can be achieved, with the help of ICT, the extension will become more diversified, more knowledge-intensive, and more demand-driven, and thus more effective in meeting farmers' information needs (Meera , 2004).

Aker, 2011, confirms that information and communication technologies (ICTs) have been advanced as a promising means to overcome many of the problems, such as low-cost effectiveness and limited scalability, ICTs should not be seen as the sole solution to solving the challenges associated with agriculture, as broad access to more sophisticated and integrated ICTs requires organizational capacity. Public sector agricultural extension systems at

present lack this capacity. The private sector could play a key role in changing current communication concepts in agricultural extension. However, this requires a supportive policy and enabling environment to facilitate the development of strong institutions and private sector actors who can drive innovations in ICT-based extension (Barber et al., 2016). Awuor et al., 2016, illustrates that, ICT can contribute to poverty reduction, by providing cheap and efficient media for the exchange of information, ideas and knowledge, ICT can become an enabling tool for wider socio-economic development, the contribution of ICT to food security and sustainable agriculture in developing countries and argues that developing e-Agriculture framework gives farmers access to the much-needed information (for instance, pre-harvest and post-harvest information, pricing and weather conditions) that assist to boost agricultural productivity, ICT in agriculture (e-Agriculture) framework to address farmers' concerns need to be developed by incorporating all the stakeholders in agriculture, specifically, this approach transforms solution to food security problem from less resource and labor intensive to more knowledge-intensive that makes information accessible to the farmers in addition to integrating all the diverse interests of the stakeholders. Over the years, the benefits accruing from the widespread adoption and use of information and communication technologies (ICTs) in agriculture includes increasing people's knowledge and practice of agricultural processes and hence improving agricultural production and linkages to remunerative markets, food security, national economies amongst many other benefits (Okediran & Ganiyu, 2019).

Glendenning and Ficarelli, 2012, recorded that, ICTs in agriculture have the potential to facilitate greater access to information that drives or supports knowledge sharing. ICTs essentially facilitate the creation, management, storage, retrieval, and dissemination of any relevant data, knowledge, and information that may have been already been processed and adapted. The adoption and application of ICT to agriculture can offer a wide range of solutions to many agricultural challenges (Okediran & Ganiyu, 2019); information and communication have always been essential ingredients of agriculture. Since time immemorial, farmers and other players in the agricultural practice have sought information from one another about market prices, planting strategies, available credit facilities, acquisition of land title, and so on. Farmers in a settlement may have cultivated a particular crop for decades, but in the process of time, weather patterns, soil conditions change, and epidemics of pests and diseases come and go. Updated information allows the farmers to cope with and even benefit from these changes (Mcnamara et al., 2011). ICT can act as a catalyst to facilitate the incorporation some factors into agriculture, these incorporating factors such as policy, legal framework, technology, knowledge, markets and, research (Awuor et al., 2016). Finally, Meera, 2004, indicated that, some of agricultural development services can be provided using ICT, such as; the online services for information, education and training, monitoring and consultation, diagnosis and monitoring, and transaction and processing; e-commerce for direct linkages between local producers, traders, retailers and suppliers; the facilitation of interaction among researchers, extension (knowledge) workers, and farmers; question-and-answer services where experts respond to queries on specialized subjects ICT services to block- and district-level developmental officials for greater efficiency in delivering services for overall agricultural development; up-to-date information, supplied to farmers as early as possible, about subjects such as packages of practices, market information, weather forecasting, input supplies, credit availability, etc.; creation of databases with details of the resources of local villages and villagers, site-specific information systems, expert systems, etc.; provision of early warning systems about disease/ pest problems, information regarding rural development programs and crop insurances, postharvest technology, etc.; facilitation of land records and online registration services; improved marketing of milk and milk products; services providing information to farmers regarding farm business and management; increased efficiency and productivity of cooperative societies through the computer communication network and the latest database technology; tele-education for farmers; websites established by agricultural research institutes, making the latest information available to extension (knowledge) workers and obtaining their feedback.

2.2. The ICT tools used at Electronic Agricultural Advisory and Extension ;

ICTs can increase smallholder's access to timely extension information while addressing many of these challenges by reducing the cost of extension visits, enabling more frequent two-way communication between farmers and agents, and improving agents' accountability, ICTs also enhance access to private information from social networks, thus facilitating learning from one's peers, which is crucial for technology adoption, by increasing communication linkages between farmers, extension agents, and research centers, further, ICTs can improve the flow of relevant information among all these agents. FAO, 2017, added that ICTs encompasses many different types of

technologies, from computers and the Internet to radio and television to mobile phones. ICTs facilitate improvement in information management and dialogue between individuals, groups, communities, etc. It consists of mainly three technologies. They are Computer Technology, Communication Technology, and Information Management Technology (Pradhan & Mohapatra, 2015). Information and communication technologies (ICTs) have been advanced as a promising way to overcome many of the problems associated with conventional agricultural extension (Campenhout et al., 2020); ICT has the potential to respond to several challenges that confront the public extension systems. Public extension systems face difficulty in reaching all farmers due to the lack of financial capacity and staff to physically meet all farmers and communities (Barber et al., 2016), a field of activity related to the use of modern information and communication tools and technologies that increase agricultural productivity and make available information that is relevant to agricultural research, planning, extension, production, monitoring, marketing, and trade is referred to as e-agriculture (Okediran & Ganiyu, 2019). Many of the current limitations of agricultural advisory (agro-advisory) services are due to imperfect information flows between the stakeholders of a complex knowledge system, including farmers, traders, processors, extension agents, and researchers (Faure et al., 2012). ICT is fundamental to the business models of the "infomediaries" and "brokers," public and private - extension agents, consultants, companies contracting farmers, and others - emerging to broker advice, knowledge, collaboration, and interaction among groups and communities throughout the agricultural sector. Numerous electronic tools increase interaction among the actors involved in agriculture. In agricultural extension and education, from universities to farmers' fields, ICT facilitates learning (World Bank, 2011).

To successfully improve extension systems with ICT, some context conditions have to be met. First of all, the success of ICT is dependent on the knowledge of people on how to use devices and navigate the Internet, for example, hosting web portals and e-learning platforms requires advanced technical knowledge and computer skills. The same applies to app development. The tools selected have to match the purpose, content, and clientele. ICT only achieves impact when the mode used corresponds to the interest and capacity of the user group. Web portals, e-learning, and text-based SMS messages are only useful for literate farmers, whereas video, voice-based advisory services and community radio are more suitable for illiterate people. it is important to realize that ICT does not generate content but acts as a vehicle to disseminate it (Barber et al., 2016) ICT innovations can have a significant impact on improving the content for extension and training, and promote technology adoption that can enhance adaptation in both developed and developing countries (FAO, 2017). ICT has introduced new methods of undertaking many activities by electronic means, some examples include e-commerce, e-banking, e-learning, e-government, e-democracy, e-voting, e-health, and so on. Corresponding to this is also the innovative porting of such applications to mobile devices such as smartphones and tablet devices; hence m-commerce, m-banking, m-learning, m-voting, etc. These applications have tremendously changed the way we do many things (Okediran & Ganiyu, 2019), on the demand side, e-commerce platforms directly link the farmer to the food processing and retail stages of the value chain (FAO, 2017).

Okediran & Ganiyu, 2019, reported that tools used by ICT and e-agriculture may include; telephones for an interactive voice response, computers, and websites for agricultural information and markets, broadcasting for expertise sharing, advisory and community, satellite for weather, universal accessibility, and remote sensing, smart mobile devices for advisory sales, banking and networking, internet and broadband for knowledge sharing, social media, e-community, market platform, trading and so on, sensor networks for real-time information, better data quantity and quality, decision making, data storage and analysis for precision agriculture and actionable knowledge. Short message services (SMS), voice messages, short video training, audio messages, social media interventions and virtual extension platforms that can improve peer networks (though online platforms/websites) can effectively enable farmer-to-farmer and farmer to experts information sharing. SMS messages can be effective for simple price or weather information, but to facilitate and revolutionize learning and make knowledge widely accessible, especially in the context of adapting agriculture to climate change, other methods and modes will be necessary (FAO,2017).

Gichamba et al., 2012, indicated that mobile technology can be applied in agriculture to improve the various processes that are involved between the production of products on the farm, buying, and processing. However, mobile devices have several challenges. To start with, despite the high mobile phone penetration in the developing and developed world, there is still a large population that cannot afford a mobile phone or any other mobile device that can be used for m-agriculture. Besides the cost barrier of the penetration of mobile technology in the developing world, other barriers (e.g. social factors) are still common in some markets. Also, in most developing countries, a poor network is prevalent, especially in rural areas. Most mobile operators concentrate on densely populated urban areas before deploying good quality network coverage in rural areas. Usability issues may also be a challenge to most users.

Typically, mobile phones are characterized by small screens, small keypad areas, and limited input and output characters (e.g. per SMS message). These constraints limit the usage of mobile phones in mobile agriculture applications. Furthermore, Pradhan & Mohapatra, 2015, added that the information technologies that can be used in agriculture are Satellite Communication, Geographic Information systems (GIS), computer networks, video, radio, and reprography. Teleconferencing, e-mail, fax, and mobile phones are some other potential technologies that could be used in the effective transfer and dissemination of agricultural information to the farmers. In general TV, radio and video are used for awareness creation and transfer of technology. Mobile phones are mainly utilized for collecting and disseminating advisory and market information, such as prices and location. Web portals provide unique opportunities for information sharing and linking with other stakeholders and e-learning is specifically interesting for educational purposes. Social media integrates all functions; from providing advice and sharing knowledge to creating awareness, linking with other actors, and technology transfer. Community radio, telecasters, videos, virtual communities of practice, and social media enable farmers and others to 'gain a voice.

ICTs such as mobile technology have been harnessed to extend the reach of agricultural extension services by enabling farmers to contact hotlines for technical agricultural advice or to receive market information, such as market locations and prices (Aker and Mbiti, 2010), but widespread access to mobile telephones has created new possibilities to support these information flows, in contrast to traditional mass media (such as radio, television, posters), mobile phones allow farmers to actively engage in more sophisticated information exchange through two-way communication, also, many extension interventions combine ICT channels such as mobile phone services with traditional communication channels like radio (USAID, 2010). A growing body of evidence suggests that in many circumstances ICTs, specifically mobile phones, are thought to increase access to both information and capacity-building opportunities for rural populations in developing countries, this brings tangible benefits, farmers can achieve higher crop yields, as they get access to timelier and better-quality information on products and inputs as well as environmental and market conditions through ICTs (FAO, 2017). The rapid growth of mobile phone ownership globally provides new avenues to share and access information, about half of the world's population owns a mobile phone, the rapid growth of broadband (especially mobile broadband) and its increasing affordability provides a great opportunity for e-agriculture (FAO, 2016). ICT, especially mobile phones, can and do drive participatory communication, including communication from those on the margins of traditional research-extension processes, and they are often the key instruments that organizations use to deliver services to larger numbers of rural people than they could reach before. Gichamba et al., 2012, noted that mobile computing devices have advantages over the use of a Personal Computer (PC), especially in the developing world. The cost of acquisition of a typical mobile phone is lower than that of a PC as is the recurring cost, it is also easy to learn how to use a mobile phone, even for computer-illiterate people, this fact makes a mobile device the most appropriate medium to introduce technology to users who are not computer savvy. Another advantage of mobile phones is the high penetration of mobile phones in the developing world. Compared to the number of PCs, mobile phones have a relatively higher infiltration level; mobile phone-based services have proliferated in recent years, providing new ways to access price and market information, and coordinate input/output resources including transport and logistics, finance, and production techniques (Qiang et al, 2011). Mobile technology covers a broad range of devices and the sub-categories include voice, data, and network and connectivity technologies. The introduction of mobile technology and portable, wireless devices has led to the creation of innovative services and applications that are used within the agricultural value chain in developed and developing countries. In developed markets where mechanization is more advanced and the agricultural labor force is significantly smaller than that of many developing countries, mobile agriculture applications tend to be implemented further up the value chain, for example with processors or consumers. In developing countries where a large proportion of the workforce is employed in agriculture, mobile technology is more commonly used to deliver services for producers and traders (Okediran & Ganiyu, 2019), FAO 2017, indicated that; nearly 40 percent of the global population has access to the Internet, and among the bottom fifth of the poor, 7 out of 10 households have a mobile phone, mobile phones, and other ICTs continue to gain popularity and offer unique opportunities to share information among large numbers of farmers and other stakeholders.

2.3. The importance of Electronic Agricultural policies and strategies to the agricultural advisory and extension services;

E-Agriculture is attempted to support the information needs of the farmers (Awuor et al., 2016) , e-agriculture can play an important role in addressing farmers need to be well informed and well trained in the management of natural resources and production of agricultural commodities (Okediran & Ganiyu, 2019), training in e-agriculture is an important aspect to stakeholders such as vocational teachers, farmers, and researchers. Facilitation, support of standards and norms, technical support, capacity building, education, and extension are all key components to e-Agriculture (FAO, 2005).

Okediran & Ganiyu, 2019, highlighted e-agriculture benefits by; transformation of processes; e-agriculture transforms the way actors in agricultural value chains collect, analyses, store and share agricultural information for their daily decision-making purposes. Investments; e-agriculture development stimulates investment in ICT infrastructure and human capital. Efficient markets; e-agriculture leads to greater efficiencies in rural markets, lower transaction costs, fewer information asymmetries, improved market coordination, and transparent rural markets. E-agriculture reduces wastage in various stages from the field-to-fork value chain. Around one-third of the food in the supply chain is either lost or wasted at the farm, during storage and distribution, or in households, by facilitating real-time information exchange, e-agriculture can improve supply chain efficiency which can significantly reduce such food waste. Improved vertical and horizontal linkages; e-agriculture results in the development of trust-based relationships between value chain actors, in conventional agriculture value chains, intermediaries add to reduced transparency and thus increasing price manipulation resulting in mistrust. E-agriculture can help in reducing the layers of intermediaries and can make transactions unbiased and transparent, thus improving the trust factor. Facilitation of information sharing networks; e-agriculture facilitates the development of networks for agricultural information sharing and knowledge societies. Value-added Services; e-agriculture leads to the development of value-added services for rural farmers and other actors of the agricultural value chains. Reducing individual and institutional risk: E-agriculture can be leveraged to reduce uncertainty and enhance preparedness and response to climate change, disasters, and other agricultural risks. Increased food and nutrition security and safety; e-agriculture can improve food management through efficient information flow, data gathering, and analysis, traceability, transactions, and supply chain management.

Furthermore, FAO, 2016, mentioned that; the e-agricultural benefits are; the e-agriculture transforms the way actors in agricultural value chains collect, analyze, and store and share agricultural information for their daily decision-making purposes. E-agriculture development stimulates investment in ICT infrastructure and human capital. Furthermore, e-agriculture benefits the investment process that, e-agriculture leads to greater efficiencies in rural markets; lower transaction costs, fewer information asymmetries, improved market coordination, and transparent rural markets, reduces wastage in various stages from the field-to-fork value chain. Around one-third of the food in the supply chain is either lost or wasted at the farm, during storage and distribution, or in households, moreover, by facilitating real-time information exchange, e-agriculture can improve supply chain efficiency which can significantly reduce such food waste. The e-agricultural effect on efficient markets that improved vertical and horizontal linkages, e-agriculture results in the development of trust-based relationships between value chain actors. In conventional agri-value chains, intermediaries add to reduced transparency and thus increasing price manipulation resulting in mistrust. E-agriculture can help in reducing the layers of intermediaries and can make transactions unbiased and transparent, thus improving the trust factor, also, e-agriculture facilitates the development of networks for agricultural information sharing and knowledge societies, it leads to the development of value-added services for rural farmers and other actors of the agricultural value chains, e-agriculture can be leveraged to reduce uncertainty and enhance preparedness and response to climate change, disasters and other agricultural risks and finally, e-agriculture can improve food management through efficient information flow, data gathering, and analysis, traceability, transactions and supply chain management.

An e-agriculture strategy and its alignment with other government plans will prevent e-agriculture projects and services from being implemented in isolation thereby increasing the sustainability and scalability of such initiatives. The strategy guide is intended for use by agriculture sector managers/leaders in ministries, departments, and agencies who will manage the development of an e-agriculture strategy in close consultation with other existing and potential stakeholders in the agriculture sector. These entities often may not fall under a single sector. It is therefore important to ensure that relevant stakeholders such as those who deal with ICTs, food processing, rural development, irrigation and water management, land allocation and classification, meteorological services, disaster management, transportation, e-governance, finance, and commerce are involved and consulted as required in developing the country's e-agriculture vision. The successful application of the guide requires a team experienced in strategic

planning, sectorial knowledge, analysis, and communication given the complexity of the agriculture sector, some stakeholders may argue that the best approach to adopt is one focused on adopting an ICT strategy for a specific value chain segment / key agricultural activity (FAO, 2016). Government extension agencies are often bureaucratic and the services they provide may not have the capacity to reach all smallholder farmers nor provide up-to-date and tailored information to meet the needs of the farmers (Bell, 2015).

Nevertheless, FAO, 2017, reported that many aspects of agricultural information constitute a public good and as a policy implication, governments must play some role in its provision, ensuring that is not undersupplied. A promising solution for this shortcoming may be found in the increasing prevalence of ICT in developing and emerging economies, ICT is recognized as a tool for rural development by key ministries, this would lead to the introduction of policies to support the use of ICTs for sharing knowledge, enhancing rural access, and building capacity for information management among government agencies responsible for agriculture (Barber et al., 2016).

FAO,2016, indicated that e-agriculture has the potential to meet the agricultural goals of the country more effectively in the following areas; agricultural extension and advisory services, promoting environmentally sustainable farming practices, disaster management, and early warning system, Enhancing market access, food safety, and traceability, financial inclusion, insurance, and risk management, capacity building and empowerment, regulatory and policy, furthermore, establishing the national e-agriculture vision is the first step towards developing the national e-agriculture strategy. It takes into account the country's agricultural vision and priorities, the ICT sector leverage potential and other inter-sectorial developments (e.g. banking, e-governance) that have a significant impact on agriculture, a national e-agriculture vision emerges from the broader context of a country's agricultural, national and rural development goals, providing the rationale for why e-agriculture is needed.

The importance of e-agriculture in the national context will depend on; the role of agriculture in national and more specifically rural development; the current and likely direction of agriculture, including challenges and opportunities; the structure and linkages of the agricultural system; the national agricultural strategy, goals, and priorities; national social and economic development goals and priorities; and the implications of e-agriculture. In particular, an e-agriculture strategy is developed in the following context; to improve the agricultural system and improve value chain efficiencies; to leverage the growth of ICTs in agriculture and other linked sectors; to accelerate meeting agricultural and sustainable development goals and overcome challenges in a resource-efficient and timely manner; to create new employment opportunities in rural areas through innovative entrepreneurship development using innovative ICT-based service businesses.

The required components that need to be considered include; leadership and governance; strategy and investment; services and applications; infrastructure; standards and interoperability; content, knowledge management and sharing; legislation, policy and compliance; and workforce and capacity development.

3. Study Methodology

A study was conducted in Jordan to highlight the need for electronic agriculture policy to activate and develop the electronic agricultural advisory and extension services in Jordan; a scientific questionnaire was distributed to 100 Jordanian agricultural advisory agents working at the Ministry of Agriculture from of total 108 agricultural advisory agents, the study depend also on the Individual face-to-face interviews and focus group discussions were used for data collection, the agricultural advisory agents selected as the study target group while they had direct contact with the effect of traditional agricultural advisory and they knows the needs of Jordanian farmers an agricultural sector in Jordan. The study summarizes target group opinion using of Triple Likert Scale Questionnaire. Representative results from the questionnaire are reported. A completely randomized design (CRD) was used in this study and calculating the means. Analysis of variance (ANOVA) was performed using the SPSS Systems Computer package, Treatment means were compared by the least significant difference test at P=0.05.

4. Results and discussion

The E-agriculture policy can improve the efficiency of the agricultural value chain by facilitating better access to markets and benefiting farmers by offering transparent, efficient, and dispute-free financial services amongst many other advantages. The choice of selecting a goal depends on the priorities of each country, combining the knowledge

gained through the previous steps to identify the strategic goals and challenges that can best be supported by e-agriculture. The Study results depended on the questionnaire analysis, direct meeting, and notes of the targeted groups, the study tries to evaluate the Opinion of target groups in four topics and discuss their results to show the compatibility between the results gain and the vision of e-agriculture as the following:

4.1. Traditional Agricultural Advisory & Extension Services;

The traditional agricultural advisory & extension is the prevailing system for the current extension process in Jordan, the study tries to express the opinions of the agricultural advisory agents working in the Jordanian Ministry of Agriculture to assess the status of the current agricultural advisory & extension situation as the following:

4.1.1. Traditional Agricultural Advisory & Extension Services Advantages;

Table (1) indicated that; traditional agricultural advisory & extension is well known from agricultural advisory agents & farmers, cannot be dispensed, while it had a low effect to transfer of modern technologies at the right time and place, fail to regulate the agricultural production which causes different challenges for agricultural marketing and prices, the target group shows that the agricultural advisory system must develop to gain more profits to farmers and the Jordanian agricultural sector.

Table (1): Target Group opinion of the traditional Agricultural Extension & Advisory Services Advantages

No.	Item	Disagree	Neutral	Agree	Total	Sig.	LSD
1.	Well known from agricultural advisory agent & farmers , cannot be dispensed	42	11	47	100	*	0.438
2.	Transfer of modern technologies at the right time and place	86	7	7	100	ns	-
3.	Effective to overcome the difficulties faced farmers	54	6	40	100	ns.	-
4.	Regulate agricultural production	68	12	20	100	ns.	-
5.	Old advisory system should be updated	33	7	60	100	*	0.622

* Significant at $P \leq 0.05$.

4.1.2. Traditional Agricultural Extension & Advisory Services Cons;

Results in table (2) shows that; the traditional agricultural advisory & extension Fail to adapt the advisory messages to suit Jordan geographical diversity while Jordan had a different geographical distribution, which makes it difficult for agricultural advisory & extension agents to deliver the extension message at the right time and place, which is commensurate with the different needs of farmers, also it didn't achieve the vision of agricultural advisory & extension in encouraging innovation and creativity among advisory agents and farmers. The results of table (2) were also mentioned by Munyua and Adera, 2009, that, farmers in developing countries often lack adequate information on inputs, markets, credit, improved technologies, commercial farming, and other aspects of rural development, and that the use of ICT to deliver training and information is an essential ingredient for improving access to markets, production and productivity. Farmers need information on trending cropping techniques for pre-harvest, harvest, and post-harvest activities in an integrated and comprehensive platform to assist farmers in making the decision.

Table (2): Target Group opinion of the traditional Agricultural Extension & Advisory Services Cons

No.	Item	Disagree	Neutral	Agree	Total	Sig.	LSD
6.	Lack of ability to communicate farmers problems , needs and interests to decision-makers	4	9	87	100	*	0.331
7.	Failure to adapt the advisory messages to suit Jordan geographical diversity	16	24	60	100	*	0.425

8.	Farmers' lack of conviction in the experiences of agricultural extension agents and the inefficiency of the extension process	61	2	37	100	ns.	-
9.	Requires time , effort and high costs	8	8	84	100	*	0.301
10.	Doesn't encourage innovation and creativity among advisory agents and farmers.	27	2	71	100	*	0.366

* Significant at $P \leq 0.05$.

4.2. Electronic Agricultural Extension & Advisory Services;

Electronic agricultural advisory & extension is one of the proposed solutions to meet the challenges faced by the agricultural sector in Jordan, which emerged especially in the period of the Corona pandemic which affected all economic sectors in the world including the agricultural sector, therefore, it was necessary to investigate the effectiveness of electronic agricultural advisory & extension in Jordan to develop the agricultural advisory process, the targeted group describe the effect of electronic agricultural advisory & extension implementation in Jordan as follows:

4.2.1. Electronic Agricultural Advisory & Extension Services Cons;

According to the results at table (3); the e-agricultural advisory and extension face different implementation obstacles such as technology in Jordan, targeted group indicated that; the e- agricultural advisory need an expensive infrastructure and maintenance, also there are some of the disadvantages that; it Requires training and capacity building of agricultural advisory agents and farmers, the target agents mentioned that this disadvantage could be cover through training of trainers from advisory agents in future, another disadvantage was Agricultural community members are not convinced of the importance and efficiency of e-advisory, this will cover through testing the e-advisory after implementing e-agricultural advisory services from farmers and advisory agents, but it needed to change of the farmers and advisory agents mentality of participation, dialogue and criticism, the agricultural advisory agents believe of the importance of e-agricultural advisory system whom could transfer their conviction to the beneficiaries.

Table (3): Target Group opinion of the Electronic Agricultural Advisory & Extension Services Cons

No.	Item	Disagree	Neutral	Agree	Total	Sig.	LSD
11.	Expensive infrastructure and maintenance	2	0	98	100	*	0.232
12.	Requires training and capacity building of agricultural advisory agents and farmers	0	0	100	100	*	0.11
13.	Requires of users to have a culture of participation, dialogue and criticism	37	19	44	100	*.	0.532
14.	Agricultural community members are not convinced of the importance and efficiency of e-advisory	6	12	82	100	*	0.342
15.	Lack of conviction of agricultural advisory agents of the importance of e-advisory	92	1	7	100	ns.	-

* Significant at $P \leq 0.05$.

4.2.2. Electronic Agricultural Extension & Advisory Services Advantages;

Table (4) shows the target Group opinion of the electronic agricultural advisory & extension services advantages, it's a fact that; the e- agricultural advisory became the only hope to develop the advisory system at the Ministry of Agriculture, according to the target group opinion, the e- agricultural advisory characterized as fast, modern, cheap advisory system, reduce time and efforts, support farmers abilities and increase of the farmer's connection with different important aspects also can facilitate of integration with agricultural agencies, results of table (4) was computable with the results of Okediran & Ganiyu, 2019, they indicated that the roles of ICT in agriculture include; agricultural extension and advisory service; ICTs bridge the gap between agricultural researchers, extension agents and farmers thereby enhancing agricultural production. Promote environmentally sustainable farming practices; ICTs improve access to climate-smart solutions as well as appropriate knowledge to use them. Disaster management and early warning system; ICTs provide actionable information to communities and governments on disaster

prevention in real-time, while also providing advice on risk-mitigation techniques. Enhanced market access; ICTs facilitate market access for inputs as well as product marketing and trade in a variety of ways. Food safety and traceability; ICTs help deliver more efficient and reliable data to comply with international traceability standards. Financial inclusion, insurance, and risk management; ICTs increase access to financial services for rural communities, helping to secure savings, find affordable insurance and tools to better manage risk. Capacity building and empowerment; ICTs widen the reach of local communities and provide newer business opportunities, thereby enhancing livelihoods and regulatory and policy; ICTs assist with implementing regulatory policies, frameworks, and ways to monitor progress. Also, Richardson 2006, reported that information delivered through ICTs can be timelier and can reach a greater number of farmers directly.

Table (4): Target Group opinion of the Electronic Agricultural Advisory & Extension Services Advantages

No.	Item	Disagree	Neutral	Agree	Total	Sig.	LSD
16.	Fast, modern and cheap advisory system	39	0	61	100	*	0.412
17.	Reduce time, effort and cost of farmers access to information on time	0	2	98	100	*	0.112
18.	Supports farmers' abilities to achieve decisions and development goals	26	18	56	100	*.	0.341
19.	Ease of connection farmer-farmer, farmer - markets, farmer - exporters and the private sector, farmer – market prices	4	3	93	100	*	0.201
20.	Facilitate the integration of international and local organizations, universities, agricultural research centers, agricultural institutions and partners to activate their role in advisory system	2	7	91	100	*	0.224

* Significant at $P \leq 0.05$.

4.3. The need of e-agriculture policy to shift towards electronic agricultural advisory and extension services in Jordan;

Through the Jordanian government orientations to shift towards electronic services, and as a result of the effects of the Corona pandemic and its effect on economic sectors in Jordan, the Jordanian government starts to shift services into electronic services, one of these services is the e-agriculture which will affect the development of the electronic agricultural advisory and extension service, following are the opinion of the study target group about shifting towards the electronic agricultural services:

4.3.1. The Importance of Shifting Towards Electronic Agricultural Advisory;

According to the results at table (5); target group stressed the importance to shift towards electronic agricultural advisory & extension Services for different reasons according to their point of view; the electronic agricultural advisory keeping abreast of modern agricultural technologies and the social media multiplicity which will reduce the effect of governmental measures imposed by the Corona pandemic on the agricultural advisory system and strengthening agricultural knowledge especially with the difficulties of agricultural advisory agents to reach farmers at their farms while the number of unskilled farmers increases year by year as a result of the fragmentation of agricultural property in Jordan, the agricultural advisory agents stressed the importance of e-advisory to achieve the advisory system vision and objectives, so that, it must be starting to develop the e-agricultural policy, Awuor et al., 2016, also reported that, increasing agricultural productivity implies a transformation from traditional to modern agriculture.

Table (5): Target Group opinion of the importance to shift towards Electronic Agricultural Advisory & Extension Services

No.	Item	Disagree	Neutral	Agree	Total	Sig.	LSD
21.	Keeping abreast of modern agricultural technologies and the social media multiplicity	3	0	97	100	*	0.223

22.	Adapting positively with the governmental measures imposed by the Corona pandemic on the agricultural advisory system	0	0	100	100	*	0.101
23.	E-Advisory is a must because of Increasing the number & unskilled farmers and the difficulties of reaching agricultural production areas	1	0	99	100	*.	0.096
24.	Strengthening of knowledge (research, learning, counseling) and the emergence of specialized agricultural advisory	3	0	97	100	*	0.163
25.	E-advisory system is not successful Jordan and doesn't achieve the advisory system goals	76	14	10	100	nc	-

* Significant at $P \leq 0.05$.

4.3.2. Electronic Agricultural Advisory Implementation Obstacles;

The study target group illustrated that; the electronic agricultural advisory services in Jordan suffer from various implementation obstacles; the low public awareness of the use of informatics tools in the agricultural advisory systems, the lack of proper planning of informatics tools usage in the agricultural advisory system and the lack of legislation of e-agriculture policy that regulating the application of informatics tools in agricultural advisory work which reflect on the unconvinced agricultural stakeholder and management seniors of the importance of using informatics tools in the agricultural advisory system, also the high cost of E-Agricultural advisory system lead to delay the application of electronic agricultural advisory process in Jordan despite the urgent need for it in the current period due to the effects of the Corona pandemic on the agricultural sector in Jordan, table(6).

Table (6): Target Group opinion of the Electronic Agricultural Advisory & Extension implementation obstacles;

No.	Item	Disagree	Neutral	Agree	Total	Sig.	LSD
26.	The high management seniors and agricultural stakeholders is not convinced of the importance of using informatics tools in agricultural advisory system.	49	0	51	100	ns.	-
27.	Lack of proper planning of informatics tools usage in agricultural advisory system	11	7	82	100	*	0.232
28.	Low public awareness of the use of informatics tools in agricultural advisory system	8	21	71	100	*.	0.335
29.	High cost of E-Agricultural advisory system	0	2	98	100	*	0.123
30.	Lack of legislation regulating the application of informatics tools in agricultural advisory work	0	0	100	100	*	0.095

* Significant at $P \leq 0.05$.

4.3.3. E-Agricultural Advisory Successful Shifting Requirements;

The successful shifting requirements needed for the electronic agricultural advisory services development in Jordan are to convince agricultural advisory agents, farmers, and decision-makers of the importance of electronic advisory, on the other hand, providing advanced technological infrastructure at the Ministry of Agriculture such as Tablets, servers, computers, e-agricultural advisory application, radio, Television etc., the availability of communication tools with farmers such as smartphones, then, after availability of e-agricultural advisory tools with farmers and at the Ministry of agriculture, it must raise the efficiency of agricultural advisory and extension agents and farmers by training and capacity building on e-agricultural advisory, then follow-up agricultural sector developments by advisory agents for proper delivery of the advisory and extension message and/or training, table (7).

Table (7): Target Group opinion of the Electronic Agricultural Advisory & Extension Successful Shifting Requirements;

No.	Item	Disagree	Neutral	Agree	Total	Sig.	LSD

31.	Providing advanced technological infrastructure at the Ministry of Agriculture	0	5	95	100	*	0.143
32.	Training and capacity building of agricultural advisory agents on e-agricultural advisory	0	0	100	100	*	0.095
33.	Availability of communication tools with farmers	0	0	100	100	*.	0.095
34.	Convince of agricultural advisory agents, farmers and decision makers of the importance of electronic advisory	42	3	55	100	ns.	-
35.	follow-up agricultural sector developments by advisory agents for a proper delivery of the advisory and extension message and/or training	6	3	91	100	*	0.162

* Significant at $P \leq 0.05$.

4.4. Future Vision of Electronic Agricultural Advisory System in Jordan;

The e-agricultural policy development in Jordan became a must, specially to regulate the e-agricultural advisory and extension process to the benefits of agricultural sector development in Jordan, first, it must change the future vision of the agricultural advisory and extension services in Jordan, the study target group discuss the following items ;

4.4.1. Why Do We Need in Jordan to Shift Towards Electronic Agricultural Advisory & Extension in the Future?

Table (8) show that; Jordan need to shift toward electronic agricultural advisory and extension services in future because of a number of factors that affected the agricultural advisory and extension process in Jordan, including: low numbers of agricultural advisory & extension agents work at the Ministry of Agriculture that make it difficult to provide immediate advisory information, especially concerning natural disasters, this result was also reported by FAO, 2017, there is a need for a great number of extension agents to reach geographically dispersed and remote farmers, interact with, and advise them on innovative productive technologies that can be crucial for their livelihoods, on the other hand, the migration of experienced farmers and the increase in the number of unskilled farmers who needs for agricultural advise and follow their agricultural production, and the spread of the phenomenon of specialized implants in the agricultural sector and the need for more specialized agricultural information Also , the steady rise of Jordan's population and the increase in information needs at different sectors and agricultural sector lead to think to shift towards the e-agricultural advisory and extension services.

Table (8): Target Group opinion of the need to shift towards Electronic Agricultural Advisory & Extension in the Future

No.	Item	Disagree	Neutral	Agree	Total	Sig.	LSD
36.	The steady rise of Jordan's population and the increase in information needs	0	0	100	100	*	0.091
37.	The emergence of specialized implants and the need for more specialized information	2	2	96	100	*	0.142
38.	The migration of experienced farmers and the increase in the number of unskilled farmers	0	2	98	100	*.	0.123
39.	Low numbers of agricultural advisory & extension agents work in the Ministry of Agriculture	0	0	100	100	*	0.083
40.	The difficulty of providing immediate advisory information, especially with regard to natural disasters	0	0	100	100	*	0.083

* Significant at $P \leq 0.05$.

4.4.2. Future Vision of E-Agriculture towards Electronic Agricultural Advisory & Extension in Jordan;

Results in table (9) represent the target group opinion of the future vision of electronic agricultural advisory and extension in Jordan, referring to previous results, the e-agriculture policy became a must to Jordan, the future vision of electronic agricultural advisory and extension in Jordan are creating electronic agricultural advisory & extension applications free download for farmers, determining the identity of the Jordanian farmer by agricultural activity, location and size of holding which will offer a data bank of agricultural sector will eager the decision-maker to ease and facilitate decision making, providing remote training services for Jordanian agricultural sector workers and their families fast, accurately and proficiently and establishment of a technology center at the Ministry of Agriculture to control electronic agricultural advisory & extension, but the target group suggested that , it must be integrating of traditional agricultural advisory & extension with electronic agricultural advisory & extension services until the process became familiar to the farmers and agricultural advisory agents.

Table (9): Target Group opinion of the future vision of electronic agricultural advisory and extension in Jordan;

No.	Item	Disagree	Neutral	Agree	Total	Sig.	LSD
41.	Establishment of a technology center at the Ministry of Agriculture to control electronic agricultural advisory & extension	6	5	89	100	*	0.258
42.	Create electronic agricultural advisory & extension applications free download	3	5	92	100	*	0.147
43.	Determining the identity of the Jordanian farmer by agricultural activity, location and size of holding	4	5	91	100	*.	0.187
44.	Providing remote training services for Jordanian agricultural sector workers and their families fast, accurately and proficiently	2	5	93	100	*	0.129
45.	Integrating of traditional agricultural advisory & extension with electronic agricultural advisory & extension	0	0	100	100	*	0.083

* Significant at $P \leq 0.05$.

4.4.3. Advisory Agents Opinions about the Transition to Electronic Agricultural Advisory & Extension;

According to the results of table (10); the targeted group focus on the importance of traditional agricultural advisory & extension which need for more development and it's important to integrate traditional agricultural advisory & extension with e-agricultural advisory & extension and increase of the advisory agents, Bell, 2015, was agreed with this result, he noted that the agricultural sector has taken advantage and there are hopes that ICT can fill the void that public extension is unable to address, as farms are often resourcing poor and there are not enough extension workers to reach all smallholder farmers.

Table (10): Target Group opinion of the shifting toward electronic agricultural advisory and extension

No.	Item	Disagree	Neutral	Agree	Total	Sig.	LSD
46.	E-agricultural advisory & extension is unsuccessful in the short and long term	100	0	0	100	ns	-
47.	Traditional agricultural advisory & extension is important but needs for more development	0	10	90	100	*	0.169
48.	It's important to integrate of traditional agricultural advisory & extension with e-agricultural advisory & extension	0	0	100	100	*.	0.083
49.	Continuation of traditional agricultural advisory & extension system with an increase in the number and efficiency of advisory agents	0	44	56	100	*	0.659
50.	I don't had the ability to deal with e-agricultural advisory & extension system	100	0	0	100	ns	-

* Significant at $P \leq 0.05$.

5. Conclusions

Jordan is one of the developing countries which try to implement electronic strategies including; e-government, e-education, e-commerce, e-industry, and e-society , the study show the need to start thinking and working on e-agriculture policy which can improve the efficiency of the agricultural value chain , improve and develop the agricultural advisory and extension services through shifting towards electronic services to reduce the challenges that was suffer from traditional process, the traditional agricultural advisory & extension is well known and can't be dispensed but it had low effect to transfer of modern technologies at the right time and place , fail to regulate the agricultural production, fail to encouraging innovation and creativity among advisory agents and farmers, so that , its importance to shift towards electronic agricultural advisory & extension Services to keep abreast of modern agricultural technologies and the social media multiplicity , strengthening of agricultural knowledge and the need for more specialized information and the difficulties of providing immediate advisory agricultural information and technology transfer with the excestance of unskilled farmers, these challenges could be addressed through the e-agricultural advisory, which is characterized as fast, modern, cheap advisory system, reduce time and efforts , support farmers abilities and increase of the farmers connection with different important aspects also can facilitate of integration with agricultural agencies, on the other side the e-agricultural advisory process need an expensive infrastructure and maintenance, it requires training and capacity building of agricultural advisory agents and farmers , and the agricultural advisory agents believe of the importance of e-agricultural advisory system but it's vital to integrate of traditional agricultural advisory & extension with e-agricultural advisory & extension process until the process became familiar to the farmers and agricultural advisory agents. Jordan future vision is creating electronic agricultural advisory & extension applications free download for farmers, determining the identity of the Jordanian farmer by agricultural activity, location, and size of holding which will offer a data bank of the agricultural sector will eager the decision-maker to ease and facilitate decision making, providing remote training services for Jordanian agricultural sector workers and their families fast, accurately and proficiently and establishment of a technology center at the Ministry of Agriculture to control electronic agricultural advisory & extension.

6. Recommendations

According to the study results, there is a need to implement e-agriculture policy in addition to the other e-services; e-government, e-education, e-commerce, e-industry, and e-society, the social and political environment within which ICT operate is crucial and supportive. Since the use of ICT in agriculture is still new, there is a need to raise awareness among government and other national stakeholders, the government policies and measures required are; the government should appoint a commission to study the deployment of ICT for the benefit of farmers and recommend ways to expand the role of ICT in agriculture, the government should draw new policies that systematically capture local knowledge, ensure appropriate research agenda setting and support the functioning of intermediary organizations and should aid the process of identification and vertical integration of diverse ICT tools that are employed to agricultural practices. The first action of the Jordan government is going to use ICT-based extension should be an assessment of the needs of the agricultural community, on the other hand, the government should adopt, monitor, and evaluate ICT enabled services to conduct benchmark surveys before introduction to get a good overview of the actual agricultural sector situation, ICT tools need to be selected and developed to correspond to the desires and needs of the agricultural sector, then, the newly developed ICT-based services are introduced and used in agricultural advisory and extension and it must ensure sustainability, it is recommended to search for partnerships with stakeholders or seek for integration of the services in the agricultural extension system. Monitoring and adaptation are important and should be realized the impact assessment to determine the success degree of the electronic agricultural advisory and extension services implementation.

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