ESDU- KariaNet- FAO

ONLINE DISCUSSION FORUM & SURVEY

Improving ICT solutions and rural communication services for small-scale family farmers.

Trends, Experiences perspectives in the NENA region

Family Farming: the need for information and communication.

Summary of online survey and studies conducted in 7 NENA countries

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The present report is a compendium of the different investigations conducted by KariaNet[1] researchers in selected countries (Algeria, Egypt, Jordan, Lebanon, Palestine, Sudan, Tunisia) and the online discussion forum conducted with the FAO Regional Initiative on Small Scale Family Farming in the NENA Region.

Summary:

There is a big potential for ICT tools to improve rural communication services for small-scale family farmers and improve their livelihoods in the NENA region. However, connectivity, internet coverage and costs of internet and devices are still not adequate. The currently widespread and used tools are the SMS phone messages, the email and Facebook pages. Lebanon through the Lebanese Agriculture Research Institute and the Ministry of Agriculture manages a mobile application (LARI-LEB) to send messages to farmers; in Jordan, extension agents often use social media (Facebook) and emails; also in Egypt and Tunisia SMS are used either by the government

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[1] Knowledge Access for Rural Inter-connected Areas Network (KariaNet) is a regional network for the management and sharing of knowledge in agriculture and rural development in the Middle East North Africa region (MENA). With a focus on knowledge management KariaNet facilitates and supports demand driven capacity building activities, action research and networking activities across MENA region through the use of Information and Communication Technology (ICT) and non-ICT tools. The member countries are: Algeria, Egypt, Jordan, Lebanon, Morocco, Palestine, Sudan, Tunisia and Yemen. A competitive call for an expression of interest to host KariaNet was launched and in February 2013, the Environment and Sustainable Development Unit at the American University of Beirut (ESDU) was selected to be the hosting organization. With a new focus on strengthening Local Food Systems (LFS), a proposal was developed in consensus with the nine network member countries to sustain KariaNet work after the full portal management transition to ESDU. For the current third phase of KariaNet, the network will be implemented and regionally administrated by ESDU.

or NGOs to link with farmers. You-tube short documentaries seem to be an effective tool that is easily shared on all social media and smart phones. Radio proved to be more effective than TV; for example the successful radio programs in Palestine. Moreover, farmer conferences showed a high impact in Palestine. Statistical data base on small scale farmers is not available, and when available, it is not accessible and/or not reliable. Agriculture input suppliers develop their own data base but do not share it; they also use ICT tools to inform farmers on agricultural practices; however, their advice is more directed towards the marketing of own inputs. The main challenges facing extension services and the use of ICT is the limited budget and the diversity of farmers with respect to farming systems, literacy and age. Moreover, some areas lack the tools to use ICT (such as connectivity, computers and smart phones), hence the role of extension agents remains important.

Introduction

Family farming in the Near East North Africa (NENA) accounts for more than 80% of all the farms. The sector therefore plays a significant role in food security and the social and economic cohesion of rural families. However, smallholder family farmers in the NENA region face unprecedented challenges marked by the impact of climate change, limited access to resources and inequalities. Access to information and communication is essential for the development of family farmers and rural communities. Small-scale rural farmers in the region, especially women and youth, highly need information and communication support regarding: suitable agricultural technologies and practices; land and water use and tenure issues; access to credit; market opportunities; producers' organizations; and policy dialogue. Adequate rural communication services (RCS) in addition to affordable access to Information and Communication Technologies (ICTs) are needed to meet such information and communication needs. ICTs and RCS are the current innovative trends for sharing information between farmers and extension agents and rural institutions.

Research in the NENA region suffers from information gaps on the extent of ICT use and efficiency. Enhancing the effectiveness of extension services and farmers' organizations in this region requires assessing the current situation in the application of ICT and rural community services for rural development and family farming in addition to exploring the potential of ICTs and RCS in the region. For this aim, the Karianet network in collaboration with FAO Regional

Initiative on Small Scale Family Farming and the Communication for development team, launched an online survey and facilitated an online discussion in August 2016 involving specialists and practitioners from seven countries: Algeria, Egypt, Jordan, Lebanon, Palestine Sudan and Tunisia. The team invited specialists and practitioners to share their experiences on how ICTs and rural communication services can address challenges faced by small-scale farmers, particularly women and rural youth. Both the survey and the online discussion particularly focused on projects and programs that have demonstrated results and achieved scale, as well as on exploring the role that specific stakeholders can play across different initiatives in this field. Following the online discussion, 7 studies were conducted in 7 countries respectively (Algeria, Egypt, Jordan, Lebanon, Palestine, Sudan, and Tunisia) in the period extending from January through June 2017. Two sets of questions were investigated and addressed in the surveys and studies. The first set aimed to identify main trends in the use of ICTs and RCS in the region and share experiences on the use of ICTs, community media and other RCS in support of agriculture and rural development. The second set concerned with respondent's perspectives for identifying a means to improve the use of ICTs and rural communication services in the NENA region - with the ultimate aim of supporting smallholder family farming. *(Refer to **Annex 1** for more details on the two sets of questions.)*

The following section is a compilation of the main initiatives on ICTs per country presenting initiatives implemented by the public and private sector.

Algeria**:**

Public Sector

There is a problem in communication with the farmers and the different agents/stakeholders in the agricultural sector. In order to allow better knowledge transfer and sharing between farmers and actors in the production chain, the **DRDPA** (Director of Regularization and Development of Agricultural Productions) opted for the adoption of several ICTs to improve communication including dissemination through the website of the Ministry of Agriculture the speeches presented in relevant events; outreach and extension sessions on radio stations "Channel 1" and "Channel 3"; communication through mobile phones with leading producers in various regions and for different agricultural chains; and publishing through a Facebook page (Madrp.dz) all the information that needs to be delivered to stakeholders.

Regarding the **National Chamber of Agriculture**, communication among the members of the chamber is not efficient and the only means is the email correspondences. However, with farmers the mobile phone is the predominant means. The Chamber also uses the website of the Ministry of Agriculture and Fisheries concerning the main activities in action. The Facebook pages, one specific page for each chamber and province, as well as some unofficial sites dedicated to agriculture are also used to disseminate information to both farmers and agricultural investors.

The National Institute of Plant Protection (INPV) is concerned with major diseases and pests control and hence disseminates extension services to farmers and agriculture institutions in this matter. Through its stations installed in all the Wilayas (provinces) of Algeria and the experimental stations installed in certain, the institute seeks to fight diseases through research conducted at the level of various laboratories. It receives reports from its branches (local and regional directorates), public agricultural institutions, chambers of agriculture, agricultural cooperatives, and agricultural associations. The results and advice are regularly and widely disseminated via ICT tools: 1) a website (www.inpv.edu.dz/) in which news about the different organized activities are posted; 2) a Facebook page (https://www.facebook.com/INPV-station-boufarik-406599959466578/?fref=ts) on which awareness and vulgarization videos, as well as effective products for vegetable protection are published; 3) e-mails that are adopted to disseminate information to all relevant institutions; 4) a weekly televised program called "إرشادات فلاحية"; 5) a program on radio "Channel 1" and "Channel 3", which is called "معا لتنمية فلاحية مستدامة" between 2003-2005 and was relaunched in 2010, to date; 6) mobile telephone communication (by messages or direct phone calls). Contacts with official bodies and organizations are made through e-mails and correspondence. Agricultural investors are also contacted by mobile telephones and e-mails. The mobile phone is used to inform about events such as fairs and technical trainings. As for small farmers, the institute opts for radio stations as well as television stations. Since its inception in 1975, the institute has seen continuous development of communication tools and techniques over time. The main stages through which the means of communication have developed are as follows: Stage 1 (1975-1985): Posters and awareness posters at different agricultural establishments in the national territory, as well as the adoption of telegrams to contact the directorates concerned. Stage 2 (1986-1994): the use of fixed telephone land line, but in a very limited way. Stage 3 (1995-2003): television program on crop management and disease control. However, not all rural communities had access to televisions at that time. Stage 4 from 2004: Adoption of radio broadcasts, and this procedure received positive

feedback from farmers. And since then, the institute has continued to broadcast the program and improved it. Stage 5 from 2006: mobile telephone was used to communicate and broadcast information. Stage 6 from 2009: Social networks including a website on which all the main activities are displayed, a Facebook page on which the new disease control measures and other relevant information are shared, and the adoption of video conferences for training farmers remotely by experts.

A good example of an experiment on ICT use and efficiency in Algeria would be the "**control of white fly**" experience. In 2010, the region of BISKRA (south Algeria), the first greenhouse production area, was a victim of the white fly that infects the production of tomatoes. During this period of concern in the peasant environment, the INPV played a key role in the fight against the disease and its considerable damage. Tests at the experimental farms of the Institut Technique de Développement de l'Agronomie Saharienne (ITDAS) under the guidance and support of the Ministry of Agriculture and Rural Development and the INPV have made it possible to find means of communication, and knowledge was transmitted to farmers through various field demonstrations. It is because of this fight that greenhouse crop production continues to exist. The main channels of information transfer are: 1) Technical and Open Days: In collaboration with the agricultural associations and the various institutions concerned, INPV organizes technical days and demonstration days at its experimental station or at the level of the ITDAS. In addition, field visits are conducted by extension engineers at the level of the farms with the farmers. During these trainings, the Institute used posters to illustrate the methods of control and prevention. The dissemination is generally done by agricultural technicians and agricultural engineers. 2) The radio: Through radio broadcasts, the institute organizes awareness-raising and guidance sessions on the proper use of treatments for the disease, methods of detection and especially prevention techniques. These broadcasts are made 3 times a week and for one hour duration. 3) Mobile telephone communication: Farmers and participants are invited by phone to the technical days, the institute invites them by phone. Data collection and situation reports are most often carried out by phone calls interviews. The institute was able to master a crisis situation by adopting good communication methods, through which it networked with a greater number of actors. In Algeria, radio and mobile telephones are practically available for all, so intensifying extension through broadcasts is a good attempt. In addition, mobile telephones are affordable. Online and social

media training is also a good learning method to be adopted in the various agricultural training centers.

Private Sector

Groupe Kherbouche is an agriculture consultancy firm and provider of large agricultural equipment. It aims to expand its distribution network and its customer base. Its website (http://gkgroupe.com/gk/index.php) and Facebook page offers farmers all the information they need in the form of extension and material for sale. Emails are also used but only with farmers having good levels of education, or the providers of inputs. The mobile phone remains the effective communication tool through which messages reach the highest number of targeted persons.

The general secretary of **Agricultural development and livestock cooperative Ouargla** raised a big issue in convincing farmers to use ICT. With a first attempt, they tried to activate a Facebook page to encourage farmers to follow the news https://www.facebook.com/cooperative.ouargla, where Information on agricultural extension and other relevant information are posted. However, mobile telephones remain the most preferred means of communication for farmers.

Online Platform

Institut Technique des Grandes Cultures (ITGC) – Technical Institute for crops cultivation (http://www.itgc.dz) is a public administrative institution under the Ministry of Agriculture and Rural Development. It is a scientific and technical institute in charge of crop production and food security facing climatic risks.

Methodology

In order to get a general overview of use of ICT, a number of meetings with resource persons and key informants of different levels and different professions were conducted in order to have general information from key informants from different professions:

- Director of Regularization and Development of Agricultural Productions (DRDPA): Chérif Omari

- Head of Department at the National Chamber of Agriculture: Djeghboub Borhane Eddine

- Communication Manager Groupe KHERBOUCHE: Hani Said

- Agricultural development and livestock cooperative Ouargla Hamdani Youcef

- Head of Division National Institute of Plant Protection (INPV): Ben Salah Kamal

Egypt**:**

Public Sector

In 2011, the Ministry of Agriculture launched the mobile extension initiative through cooperation with the Central Administration of Agriculture Extension, the Agricultural Research Center, Vodafone Telecom, and QuickServe advertising company. The Ministry of Agriculture obtained farmers' database from QuickServe which in turn broadcasts recommendations to registered farmers. Vodafone Telecom offered lines to agriculture directorates, cooperatives and agricultural departments in selected governorates of the Republic. The lines were then distributed to farmers. The telephone department of the Central Administration for Agricultural Extension takes the agricultural recommendations from the Agricultural Research Center each month depending on the crop season and then asks QuickServe Company to send through SMS the recommendations (including appropriate innovations, practices and weather news) to the farmers and extension agents. Future plans aim for hotline connections (two-way communication). As for voice calls, it is answered by subject matter specialists from the mobile extension service staff at the National

Research Center. In addition, a special webpage and a Facebook page exist for sharing information. This service is provided at the normal call rate and the normal message price. The service is funded by the Ministry of Agriculture, and part of the cost of the service is paid by the farmer in the form of a fee for the messages. This service is important since: information reaches the farmer without effort and without incurring the trouble of traveling and moving; SMS messages allow farmers to share information among themselves; the service reaches as many farmers as possible; and it is possible to store messages on mobiles and therefore be a reference to be used when needed.

Private Sector

The Bashaier platform, launched in 2016, is the first Agriculture Digital Marketing Network in Egypt. It is one of the projects of the Knowledge Economy Foundation in collaboration with the Research, Development and Innovation Program of the Ministry of Scientific Research and the Canadian International Development Research Center (www.idrc.ca). Knowledge Economy Foundation (KEF) is an Egyptian NGO created by entrepreneurs with social business interests and by experts in ICT, business information, and agrifood to address the lack of knowledge management and dissemination at the core of Egypt's development challenges. Different partnerships have been established for this initiative including partnerships with the Agricultural Research Center (Climate Institute), Orange Telecom, the General Union of Producers and Exporters of Horticultural Crops (UPEHC), Microsoft, Food Industries Chamber, Faculty of Agriculture - Minia University, Société Générale de Surveillance - SGS (www.sgs.com.eg), and Borsa Merci Telematica Italiana (www.bmti.it). The Bashaier (http://www.bashaier.net/DefaultEn.aspx) is a digital platform accessible through web/mobile combining technical and marketing information and presenting one of the most important online marketplace for agriculture produce and input supplies, linking farmers to buyers. It offers small scale farmers access to market and technical information. It operates as third party independent facilitator linking small-scale farmers to market buyers. It works by establishing a Network of Village Entrepreneurs in partnership with selected Coops/NGOs and train them to manage alternative supply chains at local level and coordinate the bulk offering of small farmers produce and the monitoring of contract farming. It is coupled with capacity building on the principles of Farmers Producers Organizations (Indian model) which combines cooperatives as well as commercial functions; it covers capacity building on marketing procedures and managing supply

contracts and support in developing and promoting marketing plans. The platform provides a permanent marketing link for small-scale farmers with the market buyers through analysis of each category of supply chain, and it develops corresponding manual procedures to be followed by the Village Entrepreneurs and corresponding Coops/NGOs. The program started its first phase with 16 pilot projects in two governorates, Beheira and Minia, with the mapping of the most promising horticultural areas in the two governorates followed by the selection of the best NGOs and Coops to act as bulk contractors for the market buyers. This was followed by the launching of the 1st mobile service: "Prices on Egypt's Wholesale Horticulture Markets" in April 2015, in cooperation with "Mobinil" (Orange Group) using SMS and Voice Mail campaigns and adapted to the basic mobile sets models. In addition, a "Call Centre" with 4 digits number "7676" was customized to register interested small-scale farmers in the service for the future technical and marketing support. This comprehensive marketing and technical web/smart phones platform includes 10 key services: online market place, horticulture in Egypt and Europe, small-scale farmers database, market buyers database, input suppliers database, agriculture experts database, horticulture crop directory, agriculture projects directory, agriculture investors guide, horticulture export guide. The platform hence establishes regular two-ways communication between network of farmers associations and village entrepreneurs, small-scale farmers and exporters, processors, retail chains, input suppliers, agronomists and banks/Micro Finance Institutions. It also enables small farmers groups to focus on good agricultural practices, while relying on Bashaier marketing platform to handle the marketing aspects. Part of this service is funded by organizations, but to ensure sustainability of services, the farmer pays a subscription of 8 pounds/month or 30 piasters/day for information on daily market prices, climate information, agricultural extension, crop sale offers, purchase of production supplies, reception of purchase orders, sales offers by SMS, and offers of sales and purchases (via the mobile and the internet). Another subscription is 1 pound/day or 25 pounds/month to add the analysis of market prices, access to all the data on the Bashaeir website, requests for crops purchase, and the sale of production inputs. This service is significant as it: ensures sustainability of the project since the service is paid; allows connectivity between all parts of the supply chain; helps small farmers to market their crops at the best prices and do not leave it to the greed of traders and intermediaries; enables illiterate farmers or those unable to use ICT tools to call the short service number of Orange Company allowing the employee to assist the farmer in registration; helps companies and factories ensure the supply of their crops;

and helps to exploit the tools of information technology which has achieved a high rate of use in the recent period.

Studies indicate that about half of Egyptians have access to satellite channels on a regular basis, while the other half have an irregular access. Egypt is covered by five local channels in Cairo, Ismailia, Tanta, Alexandria and Assiut, most of which provide agricultural and rural shows within its programs. Egypt Agricultural Channel was inaugurated in September 2011, a self-funded channel targeting the quality of rural life through the human, economic, social, cultural and health aspects of the rural environment. Kabcha[2] (2016) found that 110 farmers (22%) from the study sample of 500 respondents were exposed to the Egypt agricultural channel. The reasons for not being exposed to the channel were lack of knowledge of the existence of the channel, preference for watching other satellite channels, poor transmission of the Egypt Agricultural channel, lack of knowledge of the frequency of the channel, preoccupation and lack of free time. Most farmers watched the channel at a rate of 1-2 hours per day that focused (100%) on agricultural extension programs. In addition, the channel has a website (http://misr.alzeraya.tv) which includes the most important news and guidelines, the list of programs and their dates of transmission, recorded agricultural displays, news of conferences and meetings, etc.

The most important agricultural radio programs and broadcast stations include: 1) The "Talking Journal (الجريدة الناطقة):" a radio program broadcasting an agricultural program on the most important strategic crops on a daily basis at 8:00 pm. 2) "Agriculture and Development" (الزراعة والتنمية): a radio program that informs farmers about different agricultural development programs and agricultural solutions. It is broadcasted on a weekly basis on Cairo Radio. 3) "Our country's services" (خدمات بلدنا): a radio program that broadcasts training seminars daily at 6:50 am. 4) "Dear farmer" (عزيزي المزارع): a radio program that arranges meetings with farmers and officials about the most important agricultural issues and broadcasts extension announcements daily at 10:40 am and at 7:30 pm on the Greater Cairo Radio. 5) "A moment please" (لحظة من فضلك): a radio program that broadcasts guided calls at 2:10 pm and 4:10 pm on Greater Cairo Radio. 6) "Public meeting" (لقاء جماهيري): a radio program that broadcast meetings between the masses interested in agricultural

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[2] Kabcha, A.M. , 2016 (PhD letter), Analytical Study of the Extension Role of Agricultural Satellite Channels, Faculty of Agriculture, Mansoura University, Mansoura, Saudi Arabia

كبشة، دعاء السيد عطية محمد 2016 (رسالة دكتوراه)، دراسة تحليلية للدور الإرشادى للقنوات الفضائية الزراعية، كلية الزراعة، جامعة المنصورة، المنصورة، ج.م.ع.

fields and officials to discuss the most important agricultural events and on the air every Sunday and Wednesday at 12:00 noon on the Central Delta Radio. 7) "Egypt today" (مصر اليوم): a radio program broadcasting seminars and important technical recommendations of agriculture on a daily basis at 7:00 pm. 8) "Extension information" (معلومات إرشادية): a radio program broadcasting the most important daily agricultural recommendations of the most important agricultural crops and agricultural areas. It is broadcasted daily at 7:55 am on the Greater Cairo Radio. 9) "Overview at four" (موجز الساعة الرابعة): a radio program broadcasting at 4:00 pm, 8 episodes per month on the General Radio.

Al-Ahram Agricultural Gate is a specialized weekly newspaper with a long history. It publishes everything related to agriculture and rural Egypt. In addition to Egyptian and international news and reports, it publishes meetings, research, health reports, advisory guidelines, job opportunities, new ideas and lessons learned from projects. It also has a website (http://agri.ahram.org.eg/) which includes an archive of previous topics.

The study found that the means of communication technology used in the extension work in the governorate of North Sinai were respectively: mobile phone (85.7%), agricultural research and extension network (48.6%), international information network (42.9%), e-mail (31.4%), expert farming systems (25.7%), and voice-messages (11.4%). The relative importance of the use of these media for the transmission of the extension recommendations ranked as follows: mobile phone (86.18%), agricultural research and extension network (26.32%), expert farming systems (13.82%), e-mail (3.29%), and International Information Network (1.32%).

The two pesticides and agrochemicals companies Syngenta and Shoura have been relying on different ICT tools to reach farmers to provide information and promote their products since 2012 and 2013 respectively. These ICT tools include: SMS messages, voice calls, a short customer service number, the company's websites (https://www.syngenta.com.eg/ and http://www.shourhemicals.com/en/home), and Facebook pages where the company's experts answer technical farmers' inquiries. In addition, farmers and sales representatives rely on mobile phone and computer connected to the Internet. In these companies, a technical support unit updates information, and design advice based on field trials and demonstration plots. The companies send SMS to the farmers on important agricultural advice. The messages also include the short phone number for customer service allowing farmers to inquire about any problem. Through this service, farmers get agricultural information and warnings about the weather and the dates of agriculture

and the emergence of some diseases and pests with the nomination of the most important pesticides company, and the companies reach the largest customer base and thus achieve the required sales, and overcome the weakness of the number of sales representatives of the company. The companies organize agricultural extension seminars for farmers during which a registration form is distributed to the farmers to fill personal data. Data includes: name of farmer, mobile phone number, name of the center/branch of the company, the village, and 3 crops as per farmer's preference. In addition, Syngenta partners with an advertising company to obtain the farmers' database. The cost of the service is covered by the companies as part of their advertising strategy. This cost is compensated by increased sales. Receiving SMS messages is free of charge, and the voice call service is charged at a regular minute price however it is judged cost-effective. These services are significant since information reaches the farmer without effort and without incurring the trouble of traveling and moving; large broadcast of information is possible; and travel for the delegates of the company to reach farmers costs less.

Online Platforms

Kenana Online Community Development Portal (http://kenanaonline.com/) is a project established by the efforts of The Ministry of Communications and Information Technology to increase community integration using ICTs aiming at: empowering rural and marginalized communities through development projects and raising awareness of benefits of ICTs; promoting development in rural and marginalized areas through application of technology solutions to establish an integrated sustainable development model; empowering women through illiteracy eradication programs; and improving services in education and healthcare and supporting SMEs. It is available in Arabic language.

KarmSolar (http://karmsolar.com) is a solar technology and integration company that delivers innovative solar solutions to the agricultural, industrial, tourism and business sectors. Since its founding in 2011, KarmSolar has been Egypt's largest private off-grid solar energy integrator, with exceptional experience in developing its award winning high-capacity solar pumping stations, including the region's largest off-grid Hybrid Pumping & Irrigation System (147 kW). KarmSolar also offers MW-scale off-grid solar energy stations and grid-connected utility-scale installations. Committed to R&D and innovation, its goal is to commercialize sustainability, enabling businesses to gain from an increase in productivity whilst benefiting from, and protecting, the environment.

Agricultural Extension and Rural Development Research Institute (AERDRI) (http://www.arc.sci.eg/InstsLabs/Default.aspx?OrgID=10&lang=en) was established in 1977. AERDRI conducts applied research in the fields of agricultural extension, rural community development, and rural home economics. The overall objective is to communicate the results of such studies to policy-makers and to assist them in providing better extension service that contributes to Egypt's sustainable agricultural development. It is available in English and Arabic languages.

Arab Organization for Agricultural Development (AOAD) (http://www.aoad.org/Eabout.htm) was established in 1970, upon the desire of the Arab countries. Realizing the vital role of agriculture within the region's economy, the Arab countries recognized the need for coordination between their different policies in agriculture, natural and human resources as well as economic development, in order to achieve the ultimate goal of a fully integrated Arab economies. It is available in Arabic and English languages.

Methodology:

This study includes a detailed analysis of some successful cases of ICT use for small farm households. A questionnaire was used to collect the required data and information through a personal interview of two officials in each area. The study data were collected during February and March 2017. The questionnaire included two sets of guiding questions:

- The first set of questions helped identifying main trends in the use of ICTs and RCS in the region and share experiences on the use of ICTs, community media and other RCS in support of agriculture and rural development.
- The second set of questions helped identifying a way forward to improve the use of ICTs and rural communication services in the NENA region - with the ultimate aim of supporting smallholder family farming.

Jordan**:**

The study revealed that the use of ICT services in Jordan is often irregular, except in the formal framework of the Ministry of Agriculture, the National Center for Agricultural Research and Extension, and some institutions dealing with agricultural education, such as universities, where the agricultural information is archived and recorded by press reports, short televised interviews, and broadcasting radio programs on a daily or periodic basis and as required by the official and

private television stations and channels. The media mostly depends on interviews with experts, technicians, people concerned and press reports. Early Warning System and Knowledge Stations has been launched in addition to the use of social networking tools such as WhatsApp and Facebook by research institutions and many people interested in the agricultural sector. But this is not done through a certain methodology or planning, and the outcome of this work and the impact obtained are limited.

Agricultural extension methods used include: 1) Text messages through mobile phones, especially in the case of frost and heat waves. The messages are usually sent via groups on WhatsApp and Facebook among farmers and extension agents to exchange experiences and information. This process is applied through private mobile phones or extension sites of the extension department on Facebook or through a direct hotline; 2) Short agricultural messages on the local TV news relative to the agricultural seasons; 3) Social media (Facebook), YouTube, photography; and 4) Periodic magazines and newspapers. In some areas, IT centers allow farmers to use computers to obtain information. In general, technicians and extension workers communicate with each other using social media such as Facebook, e-mail, and WhatsApp. In addition, courses are usually held for agricultural extension workers to train them on the usage of information technology in order to document agricultural work and records of agricultural land and practices for each farm (The records are prepared by the Research and Extension Department and distributed to the farmers). Some organizations use electronic training via Skype, and one case has been monitored where a group of farmers and stakeholders in Gaza / Palestine have been trained.

Farmers' experiences are documented through: reports and field visits; photography clips showing the nature of the activity or technology that would be presented in the periodic technical meetings and seminars; radio interviews or illustrated agricultural programs; the website of the National Center, Ministry of Agriculture, Jordan Radio and Television and private stations; publications that include success stories for rural women and farmers (case studies are published on the social networking sites and the Agricultural Research and Extension Department website (http://www.ncare.gov.jo/DefaultAr.aspx); and social networking pages, by uploading short videos on social media. There is a reluctance in financing documentation on agriculture in the projects due to budget limitation and incompetence in the field of knowledge management. Moreover, there is a reluctance in sharing knowledge that would not be acknowledged.

Knowledge in Jordan is shared through: 1) Extension visits to farmers by extension service providers; 2) photography, recording and presentation of short instructional films for new agricultural techniques and success stories in various agricultural branches during the orientation meetings; 3) media coverage for agricultural activities; 4) television broadcasting: TV news reports about exhibitions and agricultural festivals such as the "olive festival" and "guava festival" and other agricultural events such as the celebration of the tree festival; in addition to reports on agricultural information and methods (ex: (برنامج سواعد الإنقاذ - المبيدات الزراعية) "Pest Control Program- Agricultural Pesticides"

https://www.youtube.com/watch?v=jF1EZp137mM&feature=youtu.be); 5) social networking pages such as Facebook and WhatsApp for institutions, farmers, associations, initiatives and activities; and 6) printed extension material.

Public Sector

The Ministry of Agriculture, through the Extension Department, notifies farmers of emergency situations related to weather and pest outbreaks by sending messages through WhatsApp or Facebook and through radio and television broadcasts.

The National Center for Agricultural Research and Extension (NCARE), receiving its core funding from the government, is responsible for: organizing agricultural research and extension plans for sustainable development; adopting the latest agricultural techniques for local conditions; disseminating appropriate technologies to farmers through extension agents; enhancing knowledge and improving skills of researchers and extension agents through education and training activities; conducting socio- economic studies; evaluating the effect of economic factors on agricultural production; and capacity building of researchers and extension agents in collaboration with local, national and international partners and providing training and cross-learning opportunities in order to better address agricultural development problems. NCARE website (http://www.ncare.gov.jo/) and Facebook page https://www.facebook.com/-المركز-الوطني-للبحث-والارشاد-الزراعي 1794566693902245/ share important information on agricultural experiments and best practices. In addition, in some of the typical farms, field activities are being implemented for the training of farmers where crops such as strawberry and production of seedlings are being demonstrated. These experiments are documented and published on NCARE Facebook page.

Agricultural extension units do not have any organized and complete electronic database, especially for small farmers; therefore, it is difficult to reach them and send information. These information are available with those who work in the field including extension agronomists and engineers. The Directorate of Agricultural Information and Management in collaboration with the Training Directorate at the National Center for Agricultural Research and Extension train farmers on farm records and documentation of all agricultural practices to estimate the financial benefits of the farm and monitor agricultural operations. The National Center for Agricultural Research and Extension, in cooperation with Jordan Telecom Companies, has created a database that is still limited by sending SMS on warnings of frost and high temperatures. These messages are sent free of charge to farmers.

The radio broadcasts on the official Jordanian radio a program entitled "With the Farmer" and the local radio stations broadcast weekly agricultural programs, evening and daily morning programs, through which the farmer can obtain information, guidance, techniques and modern methods in agriculture, both plant and animal production. These programs as well highlight the role of projects and activities in serving farmers and women and reveal success stories for farmers, both men and women, and deliver their voice and demands.

Private Sector

The collective approach of farmer field schools has been applied in several major agricultural areas in Jordan, particularly the Jordan Valley, within the framework of a regional program entitled "Regional Program for Integrated Pest Management (IPM)" funded by the Italian Government and implemented by FAO in collaboration with the Ministry of Agriculture. The program started in 2004 and terminated at the end of December 2012. The total number of beneficiaries was about 3,000 farmers. It worked to promote local adaptation to integrated crop management mechanisms and local agricultural products. The importance and results of these farmer field schools are documented on the Good Practices in Agriculture website (http://goodpractices.agrinnovation.net/Pages/FFSDetails.aspx?Id=62&lang=AR&I=0&DId=0&CId=0&CMSId=58)

Online Platforms

African – Asian Rural Development Organization (AARDO)
(http://aardo.org/aardohomepage/English/about.html) is a non-political body enjoys observer status with various UN and other international organizations like Food and Agriculture Organization (FAO), International Fund for Agricultural Development (IFAD), United Nations Conference on Trade and Development (UNCTAD), United Nations Educational, Scientific and Cultural Organization (UNESCO), United Nations Development Programme (UNDP), International Cooperative Alliance (ICA), Centre on Integrated Rural Development for Asia and the Pacific (CIRDAP), etc. It also promotes collaboration with various international organizations for the economic and social welfare of the rural community. It is available in Arabic, English and French languages.

National Agricultural Information System (NAIS) (http://www.nais-jordan.gov.jo/Pages/index.aspx?lang=EN&DId=0&I=0&CId=0&CMSId=8) is a national platform for Information dissemination and knowledge sharing and exchange for Agricultural Research and Development (ARD) for target groups and stakeholders in Jordan. It is available in Arabic and English languages.

Methodology

In order to study the use of ICT in Jordan, several institutions, companies and associations, including the Ministry of Agriculture and the National Center for Agricultural Research and Extension (NCARE), were interviewed as main centers for agricultural extension services.

Lebanon:

Public Sector

Around 28 centers of advisory services in Lebanon communicate with farmers directly by phone to reply to the farmers' concerns and give them advice. They organize seminars and farmer field schools often linked to externally funded projects and they inform and invite farmers in their region by sending them SMS messages. These SMS are sent through the directorate of the ministry of agriculture (there are 5 directorates) based on an email request by the center of advisory service who provides the content of the message and the list of phone numbers to be reached. However, the budget is limited to 2000-3000 SMS per year, and many agents have no mobile phones. The ministry had one project where they used to send SMS to farmers, but the only success ICT tool

has been the LARI SMS messages and currently the App LARI-LEB. In addition, the ministry has a farmer record for grapes farmers and a list of farmers per center.

The Lebanese Agricultural Research Institute (LARI) is a governmental organization under the Minister of Agriculture Supervision. The institute conducts applied and basic scientific research for the development and advancement of the agricultural sector in Lebanon. In addition, the Institute keeps close ties with the farmers and tries to develop research activities aiming at solving their problems. It has 8 different experimental stations (Tel Amara, Tourbol, Kfardan, Kfarchakhna, Abdeh, Sour, Fanar, Lebaa) located in agricultural areas. Research Projects are conducted in the stations through its different agricultural departments and laboratories. The Department of Irrigation and Agro-Meteorology (DIAM) is responsible for maintaining the network of sixty weather stations all over Lebanon. The weather stations are currently covering almost every microclimate zone in Lebanon. The Department collects all the information from the stations, stores the climatic data and checks its accuracy. In 2009, LARI introduced a short message system (SMS) to send early warming to farmers in Lebanon. Farmers received daily warming on irrigation water advices and requirements, early warning systems for pests and diseases (in collaboration with the other departments), drought events and weather forecast in direct relation to agriculture. In 2015, a smart phone application (LARI-LEB) available on apple and android was introduced that provides the farmers with the same information also maintained by DIAM. LARI has now more than 3000 registered farmers and more than 14000 subscribers to this service via SMS, smartphone and web-based application. However, many farmers are reluctant to use the application as they do not find applications practical especially due to their low experience in using such technologies. In addition, LARI has two specialized softwares specific to the analysis of data for potato and apple crops respectively. This enables LARI to send alert messages based on weather data and analyzed by the system to give timely and accurate advice and messages to the farmers. However, these messages are only accurate for the region covered by the weather stations and not always relevant to areas with a specific micro-climate.

Private Sector

Pesticides and fertilizers companies share information regularly through their Facebook pages. They get in direct contact with farmers through their representatives in the field who are agriculture engineers and give direct advice to the farmers and respond to their phone calls.

Mada Association (www.mada.org.lb) is an active non-profit organization for development in the North Lebanon since 2004. A recent project funded by the European Union supported 133 apple growers in Akkar to build their capacity on good agricultural practices. The project installed a weather station in the area where the apple growers are present and commissioned LARI to send alert SMS to 300 farmers on weather forecast, pest outbreaks, and expected diseases, with instructions on the required control and preventive measures. In December 2016, this service was evaluated among 75 beneficiaries of which only 29% use the LARI Leb application; all beneficiaries receiving SMS messages from LARI-MADA are satisfied and prefer it compared to the LARI-LEB App. Early warning on pest outbreaks and time of spraying were selected as the most useful information received. The advantage of this service is that the messages were specific to the geographical location of the farmers and was serving them directly.

The Georges N. Frem Foundation (GNFF) (http://www.georgesnfrem.org/agriculture) is a Lebanese non-profit organization established in 1997. Its mission is to improve the economic prosperity and quality of life of the Lebanese people through the implementation of effective programs targeting economic, agriculture, education and community development. Since its inception, GNFF has assisted growers across Lebanon to modernize their orchards and provided them with technical assistance on good agricultural practices to ensure the production of safe and healthy products. In 2009, GNFF pioneered in launching the SMS mobile phone service to growers as part of its extension program from its own budget. The agriculture team at GNFF regularly sends through SMS messages relevant and timely advice on proper cultural practices (pest control, fertilization, irrigation, etc.…) to more than 1,000 growers spread in Lebanon and who took part of the trainings implemented by the foundation. Growers are also provided with a hotline number to contact the team members and get the needed advice. Some growers also communicate with the team via email. More recently and in view of the widespread of mobile apps, GNFF started to connect with the growers via WhatsApp. Moreover, a monthly informative newsletter is sent to the growers in a form of a link in addition to invitations to workshops and events. Growers also use this app to consult with the engineers on urgent symptoms that cannot await the scheduled field visit. GNFF believes in the role that ICT can play in strengthening the linkages between the growers, engineers and new research and will always strive to use new technologies that are convenient for the growers to transfer appropriate knowledge.

Palestine**:**

The use of community communication is common across organizations and many individuals in Palestine, but knowledge production is not done in a systematic manner and may be weak. The impact of use of these tools has not been evaluated so far. The extension tools used include: radio programs; TV meetings; text messaging through mobile phones; social media; YouTube; photography and news press. Farmers' experiences are usually documented through the website of the Palestinian radio, television and other Palestinian stations, social networking pages, and sites of the General Directorate for Guidance and Rural Development. Knowledge in Palestine is shared through 1) individual visits; 2) short informative films during extension meetings (these movies showcase new agricultural techniques and success stories that pertain to various branches to agriculture); 3) media coverage (radio, television, documents) for group and individual activities; 4) TV broadcasts showcasing reports, exhibitions and all sorts of agricultural related events; 5) distribution of the "Agricultural calendar"; and 6) Facebook pages to promote institutions and people. There are no studies conducted to assess the percentages of farmers that have access to the internet or are interested in watching television or listening to radio broadcasts. When it comes to mobile phones (dial-up connection or mobile networks), a number of communication companies reaches the majority of farmers in Palestine except for the areas occupied by the Israeli regime and dominated Israeli lines and connectivity, hence hindering the spread of timely information through text messages. Through the use of different social platforms such as Facebook and the internet, a farmer can get in contact with agriculture extension officers. In addition, he would be able to browse the official website of the Ministry of Agriculture and other institutions to access extension material. This can be achieved through the use of mobile phones or laptops owned by farmers. However, no studies have been done in this regard. Access of small-scale farmers to information and knowledge is hindered by: the location of some farmers near the borders or in remote areas where access to the internet or transmission signal of mobile phones is weak; or interrupted electricity (case of Gaza). The process of storing data is done through individual initiatives or by institutions and usually not shared. The only source of statistics is generated by the Palestinian Central Bureau of statistics, and it only covers general indicators.

Public Sector

The use of information and communication technology in Palestine is often irregular, except in the Ministry of Agriculture Information Department, where the agricultural knowledge is documented in press reports, media coverage and radio broadcasts. This is done periodically and based on the needs of official and private radio stations.

The National Strategy for Agricultural Extension aims to empower farmers by expanding the exchange of information and transfer of knowledge and skills and changing their behaviors in order to help them manage their resources efficiently. The strategy aims to do all this in the context of environmental conservation. However, in all strategies (for the agricultural sector, extension, olive sector) there were no clear indications of agricultural knowledge sharing, neither on the strategic objective level nor in regards to policies or interventions. The Ministry of Agriculture provide the only examples from Palestine. However, its efficiency cannot be proven due to the lack of evaluation to assess viewers' ratings, the specific audience and followers. At present, the Agriculture Directorate has no electronic database. Information available at the regional level is partially stored as administrative files, making agricultural information available at the district and village level limited and insufficient.

Farmers' experiences are documented through radio interviews or videoed interviews upon the possibilities available for farmers, in addition to reporting and documenting the success stories and new agricultural techniques and disseminating them on the agricultural channel of the Director of the Department of Agricultural Media https://www.youtube.com/c/EngDohaAbedi.

Knowledge is shared in the Ministry of Agriculture through the Department of Agricultural Media that follows the General Extension Directorate through: 1) Sharing specific agricultural news; for example:
https://www.facebook.com/duha.abedi/media_set?set=a.10154466070327976.1073741877.8105 32975&type=3&pnref=story. 2) Presenting short instructional films for new agricultural techniques and success stories in various agricultural branches during the extension meetings. 3) Media coverage of group and individual activities. 4) Demonstration of reportages on exhibitions and agricultural festivals carried out by the directorates of agriculture "Guava Festival, Grape Festival, Cherry Festival...." on TV. 5) Press coverage of local and international agricultural exhibitions and participation in provincial exhibitions. 6) Media coverage of various awareness campaigns based on agricultural seasons and in cases of hazards facing agricultural practice "rain, floods, frost, heat, diseases on agricultural crops or livestock". 7) Sending text messages via cell

phones to warn, guide and educate farmers, with more than 17,000 registered people on the agricultural media list. 8) Displaying agricultural radio programs through official radio and local radio stations. 9) Social networking pages and sites of the General Directorate for Extension and Rural Development; examples: How to protect your farm and animal wealth from frost... http://www.arn.ps/archives/191291; https://www.youtube.com/watch?v=y9XWd8cNVuQ; Agricultural Calendar https://www.youtube.com/watch?v=cd3s_SDQBvk; Agricultural guidelines https://www.youtube.com/watch?v=MEnZa87yD-g; The impact of high temperatures on the agricultural sector Https://www.youtube.com/watch?v=kV0f4Uuecj4; Agricultural guidelines https://www.facebook.com/duha.abedi/posts/10154686556177976?pnref=story; Agricultural guidelines on plants used for decorations https://www.youtube.com/watch?v=EdhuwiT-1_o; Bee-keeping https://www.youtube.com/watch?v=NNoH7oYbnl4.

In addition, the Department of Agricultural Media in the Ministry of Agriculture works on publishing new techniques and how the farmer can apply them, and clarify through a reportage or a short extension film the extent of the farmer's application of this technology and its impact on production. This reportage would be uploaded to YouTube and the following examples illustrate this: Short video on: Pollination of vegetables, origin, taste, method, incubation and reproduction https://www.youtube.com/watch?v=J1Pnx-BZjBs; Short video about compost manufacturing units in the Jordan Valley area Https://www.youtube.com/watch?v=qB2gNKLSRA4; Video on breastfeeding made locally for small babies Https://www.youtube.com/watch?v=N4oza4aAHww; Video about olive trimming in West Line Areas; Palestinian Green Gold Project and program from the field Https://www.youtube.com/watch?v=O9ihU8pdKR0; and The 'beautiful patience plant' and information about it Https://www.youtube.com/watch?v=eB6S4MWSQSw. The Department of Agricultural Media documents as well farmers' success and resilience stories, communicating their voices to officials, and finding solutions to their concerns, for example: Farmer Jihad Sarras from Khallet Afana, Bethlehem Governorate: Story of commitment and success Https://www.youtube.com/watch?v=ZvvKEOXJz-U; Vegetable Pollination: The success story of farmer Iyad Maluh Https://www.youtube.com/watch?v=mQqn73QLHVo; A successful agricultural project, Mrs. Sabha Abu Sousin Https://www.youtube.com/watch?v=gidQq0N7xI8; and a Successful story on how to manufacture liquid soap: Sabha Douha Https://www.youtube.com/watch?v=NEwqrnYmsg8

The Department of Agricultural Information in the General Administration for extension and Rural Development, at the Ministry of Agriculture in collaboration with the Palestinian Telecommunications Company "Jawwal", has carried out a program through which extension alert messages are sent notifying users about high or low temperatures or the impact of particular pests. These messages were delivered through a computerized program, at the Department of Agricultural Information in the Directorate General for Extension and Rural Development, to more than 17 thousand beneficiaries registered on the agricultural media list. These included farmers and rural women, associations, nurseries, beneficiaries of projects, fishermen, private enterprises, agricultural extension officers, and ministry employees. The service was free of charge. In addition, radio programs are broadcasted through the official radio station "Voice of Palestine" and local radio stations. They transmit weekly agricultural programs, during both the evening and the morning, allowing farmers to obtain information, knowledge, techniques and best practices. For example, an agricultural radio program "Agricultural Messages" is now being displayed on the official "Voice of Palestine" radio, enabling the agricultural advisor and the agricultural expert to direct the extension letter based on the agricultural seasons. The farmer can send messages to the official or other farmers. These programs are prepared and submitted free of charge by the staff of the Department of Agricultural Information.

Private Sector

Some organizations use text messages with the beneficiaries of some projects. For example, American Near East Refugee Aid (ANERA) sends to 70 farmers messages and information about food security projects in a specific area.

Daily radio programs are broadcasted such as "with the farmer", broadcasted by the official radio station "Voice of Palestine", and the "Blessed Land" program broadcasted on the Holy Quran radio / Nablus. Through these programs, daily communication with farmers and citizens are established in order to raise awareness and give proper advice concerning various agricultural fields and common disease between humans and animals**.**

Sudan**:**

Public Sector

The General Directorate of Agricultural Extension of the Ministry of Agriculture launched in 2009 and for the first time the mobile Agricultural Extension Service, known as the Mobile Agriculture Service, to support farmers with agricultural news and information in different agricultural fields in a simple and timely manner. SMS messages are sent for free on an average of 15 messages per month from the Central Administration of Agricultural Extension under the supervision of a group of experts (subject matter specialists). The service was launched through two telecommunications companies, Zain and Sudani. The General Directorate of Technology Transfer and Extension initiated the transfer of extension material through this service. A contract was signed with Datanet for the implementation of the program, which aims to involve producers through individual contact on a 4-digit short number 1519 to provide him with technical and market information.

Private Sector

The Sudan Integrated Food Security Information Program (SIFSIA) program, funded by the European Union, is implemented by the Food and Agriculture Organization of the United Nations (FAO) in cooperation with key national institutions in Northern and Southern Sudan. It is a Mobile Market Information System to help farmers in getting better market deals; and traders in making

decisions about what, where and when they can buy and sell. It also provides policy makers with the information they need to make markets more efficient and guide researchers with lines of action for applied market research. SIFSIA works with the government to enhance its ability to manage existing information systems in the market and to strengthen their capacity to produce, analyze and disseminate food security information. In the meantime, they are working together to build more modern systems and strengthen public-private partnerships to make them sustainable.

In addition to mobile services, the radio plays an important role as an ICT tool in Sudan. FM 95 addresses agricultural issues and related problems that are of importance to the population. It transmits news and urgent alerts through the following programs: i) daily program on agriculture news (3 minutes news); ii) weekly (every Sunday) agriculture journal broadcasting a specific educational topic; and iii) weekly (every Monday) extension agriculture program.

In an attempt to compare the two preceding tools, the radio and the SMS, it is revealed that radio programs are considered the best system in Sudan due to the high illiteracy among the farmers and the wide coverage by radio waves especially that the FM covers all parts of Sudan and uses local dialects. The system of SMS by mobile is a good system in the delivery of agricultural information, mainly prices, but the system is used by a small proportion of farmers due to the high rate of illiteracy.

Country Level Platforms

The Sudanese Agricultural Extension Site (http://www.ttea.gov.sd) is the official site of the General Directorate of Technology Transfer and Extension of the Ministry of Agriculture and Forestry. The site provides its information services to the workers in the agricultural sector, the farmers and the companies.

Kenana Online (http://kenanaonline.com/users/sudaextension) is considered one of the most important information portals visited by students, researchers and workers in the agricultural sector. It is an Egyptian based portal and has a special page for Sudan (http://arc.sudanagri.net/). It is one of the important interactive portals in the delivery of agricultural information and includes a number of websites (the site of agricultural extension and livestock and the project of upgrading and development of the Ministry of Agriculture State of North Kordofan).

Tunisia**:**

Public Sector

In 2013, the National Institute for Agricultural Research in Tunis (INRAT or Institut National de Recherche Agronomique de Tunis), in collaboration with the Regional Commissariat for Agricultural Development (CRDA de Siliana), established a pilot remote communication system through SMS for farmers who cultivate grains and forage. This system targeted at first 50 farmers and expanded to reach 160 farmers in 2016. The number of beneficiaries is still low compared to the total number of farmers (around 20,300 individuals) of which 60% are small land owners with areas that do not exceed 10ha. The service is supposed to be reaching 1000 farmers in 2017. This service aims to increase productivity, by improving the technical capabilities of grain and forage farmers in Siliana. The SMS messages are free and are addressed to large, middle, and small scale farmers and to 30 extension agents. They include information on the adjustment of the seed drill to ensure an adequate application rate for seeds and fertilizers; the treatment of seeds against fungal diseases and weed seeds; the appropriate and timely use of phosphate (P2O5) and ammonium nitrate fertilizers; the prevention of fungal disease incidence; the maintenance and adjustment of some parts of combined harvesters to avoid grain losses; the prevention of field fires; and invitations to attend capacity building events. This ICT service will be further developed to include irrigation advice to increase the productivity of irrigated crops. However, this requires the use of smart-phones, technical and financial assets and agricultural equipment, which are not always available or affordable for small scale farmers.

The CRDA Siliana also relies on broadcasting voice messages through a loud speaker set on a car and visiting the agriculture areas to alert from disease outbreaks and veterinary care and other information.

As for the dairy breeders, they use mobile phones more often as they need to communicate with the experts by phone calls or SMS messages regarding matters such as artificial insemination and veterinary care at the CRDA – Siliana (OBP[3] 2017). This tool is considered the most effective and most used by around 60 to 70% of dairy breeders.

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[3] Office of Breeding of Pastures (OBP), 2017, Annual report of the activity of the Regional Commissariat for Agricultural Development in Siliana, entitled 2016

"الجمهورية التونسية وزارة الفلاحة والموارد المائية والصيد البحري المندوبية الجهوية للتنمية الفلاحية بسليانة، 2017، التقرير السنوي لنشاط المندوبية الجهوية للتنمية الفلاحية بسليانة بعنوان سنة 2016."

In addition, the agency for extension and agriculture education AVFA (Agence de Vulgarization et de formation Agricole http://www.avfa.agrinet.tn/fr/accueil.php) develops radio and television programs that are broadcasted during specific seasons to raise awareness on plant pest, disease control and animal health care. This initiative is funded by the ministry of agriculture.

Private Sector

Some agricultural cooperatives use websites and/or Facebook to promote their services and innovations in the agricultural sector such as the GDA (Groupements de Développement Agricole) (https://www.facebook.com/GDAJilma/) and the SMSA (La Société Mutuelle des Services Agricoles de Majel Bel Abbès). The latter was established in 1999 and works in the region of Magel Bel Abbas for organic production of pistachio, almonds an olive oil; it has a website and a facebook page to share information (http://www.smsa.tn/; https://www.facebook.com/Plate-Forme-Pistachier-Majel-Bel-Abbes-1089477334448635/?fref=ts).

Suppliers, entrepreneurs and engineers rely on emails, SMS messages and websites to access information related to market, technology and agriculture practices.

Methodology:

- A questionnaire targeting a group of agricultural extension workers, big, medium and small scale farmers
- Interview with agriculture extension agents and farmers
- Meeting with heads of agricultural extension centers affiliated to the Regional Commissariat for Agricultural Development in Siliana.
- Review of annual reports of three development institutions: a) Regional Commissariat for Agricultural Development in Siliana, b) Branch of the Bureau of Livestock Breeding and the Provision of Pasture and c) National Institute of Agriculture in Abu Salem
- Online research for reports related to ICT

Conclusion

The use of information and communication technologies (ICTs) is significant for ensuring farmers' access to information which is crucial for their development. In addition, ICTs contribute to reducing gender imbalances in agricultural extension and information services for rural women in this region. Rural women do not meet agricultural extension workers, especially when they are mostly male, and rural women do not participate in meetings or trainings. Information will be available to these women through ICTs. Radio and television programs for rural women especially in the field of home gardens and food industries must be supported.

Stakeholders and employees in the agricultural sector in the NENA region are realizing more the importance of ICTs for rural communities; in Jordan for example, stakeholders are valuing the role of ICTs in the social and economic development and gender equality. Therefore, ICTs services have been offered in this region including mainly phone calls, SMS, online portals, TV and radio shows initiated by governmental organizations or public institutes or through a collaboration between both public and private sectors. Phone calls and SMS are considered in many countries of the most successful tools used such as in Tunisia where 60 to 70% dairy breeders use this tool. However, surveys have revealed that application of ICTs still faces considerable challenges in many countries in the NENA region specially that it requires the use of technical and financial assets, not always available or affordable for small-scale farmers. In Jordan and Palestine for example, some agricultural areas do not receive telecommunications network or receive a weak network because of their remote location such as the southern Jordan Valley and Gaza respectively. The Online Discussion Forum and Survey on Improving ICT solutions and rural communication services for small-scale family farmers (2016) and the studies conducted in 7 countries (Algeria, Egypt, Jordan, Lebanon, Palestine, Sudan, and Tunisia) in the period extending from January through June 2017, revealed that the high prevalence of illiteracy among farmers presents a major constraint as well usually resulting in the young generation most using such services. In addition, ICTs services providers suffer from: lack of logistic tools such as cameras, voice recorders and special computers; the high cost of communications and lack of funding to achieve specialized television programs or specialized agricultural radio programs on radio stations…; lack of training required for those in charge of agricultural media; and lack of knowledge sharing strategies. For example, in Egypt, the main challenge is the limited budget and the complexity of technological services. Projects implemented in this field lack sustainability since they rely mostly on external funding, however, some studies have shown that rural people are willing to pay in return for proper knowledge and information (case of Egypt).

In order to enable farmers' access to ICTs and the communications services, the following aspects should be taken into consideration: (a) access to and availability of Internet in rural communities; (b) affordability of ICTs based products and services; (c) awareness of the importance and usefulness of information and communication technologies and (d) the ability to translate ICT access to value. In order to improve the efficiency of ICTs services provided, technological means must be provided to support farmers as well as workers in the agricultural extension sector.

Cooperation between the private sector and the public sector would increase the efficiency of ICTs services. Furthermore, necessary training and capacity building should be provided for trainers, extension agents as well farmers on the use of the ICTs tools; a fulltime staff in the field of ICTs with the right qualifications is inevitable to be hired. The extension agent remains an important facilitator in defining farmers' extension needs. Moreover, it would be effective to develop new applications that focus on agricultural knowledge targeting youth who are already acquainted with ICTs tools. Comprehensive studies and surveys must be conducted in the field of agricultural activity, and there must be indicators for the effective impact of such technology; in addition, it is important to classify farmers based on a number of indicators such as access to ICTs tools, connectivity, and literacy, prior to any action planning.

Annex I

Survey

The survey particularly focused on projects and programs that have demonstrated results and achieved scale, as well as in exploring the role that specific stakeholders can play across different initiatives in this field.

Guiding questions, divided in two main blocks:

A. Trends and experiences

The first set of questions will help identifying main trends in the use of ICTs and RCS in the region and share experiences on the use of ICTs, community media and other RCS in support of agriculture and rural development. The five (5) guiding questions are the following:

1. Do you use ICTs or other types of communication media tools as part of your work in agriculture and rural development? Please describe.

2. Are you aware of examples of the use of ICTs and communication services or media that work in your field? Please share relevant examples and lessons from your experience making reference, if relevant, to the usefulness and cost efficiency for small-scale farmers who have limited access to resources. Do you have evidences about the results?

3. Farmer Field Schools (FFS) represent an effective approach to share knowledge among farmers in the NENA region. Are you aware of existing contributions of ICTs and community media, such as rural radio, to FFS in the NENA region?

4. Based on your experience, can you identify the main challenges that the region is facing when it comes to share information and knowledge through ICTs and other media and suggest ways to enhance their accessibility in your country? How can these challenges be addressed?

5. Data about smallholder and family farmers are pivotal to design informed policies to strengthen their livelihoods. What are the main sources of data on smallholder and family farmers in the region? Are there examples of ICT-based data collection systems used by/with farmers (e.g. registries)?

B.   Perspectives

The second set of questions will help identifying a way forward to improve the use of ICTs and rural communication services in the NENA region - with the ultimate aim of supporting smallholder family farming.

1. Do you believe that ICT tools and services are accessible to farmers in your region? What are the data gaps regarding the status of small-scale farmers' access to information and knowledge as well as the challenges they face?

2. How can programs in knowledge sharing through ICT and other communication media/tools reach small-scale farmers in a cost-effective manner?

3. How can access to training in ICTs and Communication for development be improved to support small scale farmers in general and rural women and youth in particular to improve agriculture? What are the skills and support they need?

4. What are the factors that affect farmers to get timely and relevant agricultural information via ICT tools? How can ICTs help to reduce gender imbalance in agricultural extension services and information delivery? Are there existing examples from your region?

5. What is the potential of blended ICTs, communication services and community media?

6. What are the policy implications to promote access to ICTs and rural communication services for family farming in the region?

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Tunisia