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### ENHANCING AGRICULTURAL EXTENSION SERVICES FOR RURAL DEVELOPMENT IN JORDAN

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#### ABSTRACT

This paper provides a review of the agricultural extension system in Jordan, with a focus on strengths and constraints, as well as options for how to improve efficiency in service delivery and efficacy in outcomes. While public extension in Jordan has gone through many reforms and phases over the past three decades, contemporary concerns related to regional conflict and blockages in access to traditional trade routes require a repositioning of extension and advisory services within the Kingdom. This need is further strengthened by persistent pressure on the use of water resources that is well above natural recharge rates. Both international donors supporting the Kingdom in dealing with the mass influx of Syrian refugees, as well as the government itself, will require significant contemplation over how to shift some of these funds towards research and extension activities that seek new markets for a range of products that are competitive internationally given the need for costly air freight. Equally important, and connected to international community demands for employment of Syrian refugees within Jordan is attention to skills training, matching of skills with demands of employers, as well as access to profitable agricultural value chains for both refugees as well as host communities within which refugees are placed. This will require a meaningful change in the manner that agricultural extension and advisory services are delivered, with more attention to aspects of social work and care – an area that receives little attention within agricultural education curriculums – and reform of agricultural education more generally.

**Keywords:** Agricultural extension, agricultural development, rural advisory services, learning and innovation, Jordan.

#### INTRODUCTION

Located in the heart of the Middle East, Jordan is one of the smallest economies within the 'Arab' World. Seventy five percent of the population, estimated at close to 8 million, is now settled in cities and towns with relatively good public infrastructure and services, The current population estimates suggest an increase of almost 41 percent since the 2004 census, and particularly so given the continued stream of Iraqi and now Syrian refugees (Malkawi, 2014). Unemployment, by official estimates, was 12.1 percent in 2011, with conventional wisdom suggesting that the true rate may be double that number.

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The CIA fact book (2014) sets the rate of unemployment among the youth (15-24 years) at 27 percent, and in general males at 22.6 percent and females at 45.9 percent (Malkawi, 2014). The public sector continues to provide sources to income for a relatively large number of Jordanians, estimated at 35 percent of the population (Akroush *et al.*, 2016). Taken together with limited natural resource stocks and export potential, it is not surprising that the national debt reached \$22.04 billion in 2013, with the country largely dependent on foreign assistance, and a need to import a significant share of its food and energy. The climate is Mediterranean and characterized by hot, dry and long summers; with mild and short winters where snowfall and precipitation are both limited. Historical rainfall patterns that blessed

farmers in mid-October have more contemporarily shifted to December and January. The main production area for commercial agriculture remains the Jordan Valley (JV), where intensive agriculture continues to exist, given a continued reliance on groundwater from existing, yet depleting aquifers. A range of vegetables, citrus, grapes, date palms and bananas continue to be produced, and despite regulatory bans on the latter given declining groundwater resources. The “Highlands”, an area between the JV and the vast desert, is an arid and semi-arid zone receives an average of 350-500 mm of precipitation annually (occasionally snow on higher altitudes) and provides a suitable environment for olives, from which the Kingdom is ranked eighth in volume within global producers of olive oil, exports of which are generally destined to the Gulf region (Khawaja, 2012). The Desert (Badia), covers over 90 percent of the Kingdom, and is characterized by very light vegetation cover, with annual precipitation not exceeding 50 mm per year.

Despite limited land area for production, agriculture remains important to the national economy given the potential to mitigate expensive imports of fruits, vegetables and animal sourced products (dairy and meat). In addition, despite high rates of urbanization, 25% of those characterized as “poor” in Jordan live within rural areas, are dependent on agriculture (e.g., livestock keepers, small holder farm households, and landless laborers); and despite poor motivation of rural youth to engage, agriculture is an important employer within rural communities (Akroush *et al.*, 2016) as well as a source of both primary income and nutrition.

Globally, public provision of agricultural extension services (AES) has historically played a significant role in improving agricultural productivity, and in facilitating transfer of knowledge to rural communities. Where potential exists, this transfer of knowledge, whether embodied in new seeds, mechanization or in terms of more effective and efficient land and irrigation management practices, has allowed (some) nation states to prosper through export led growth. More importantly, however, extension services have historically held the promise for moving towards food and nutritional security through facilitating linkages between the research community, farmers and stakeholders within agricultural value chains.

Within the region of Middle East and North Africa, a number of countries have strived for food self-

sufficiency despite limited land areas for agricultural production. More specifically, there is an overwhelming concentration on the production of grains (wheat and barley), which has been the focus of ‘food self-sufficiency’; and largely given the historically political dimension of bread within the region (IMF, 2013). Most nations within the region continue to be net food importers, and the Kingdom of Jordan is not an exception in regard. In addition to limited land areas that are suitable for production, a number of factors have been obstacles to agricultural development in general and to AES development in particular. Poverty, persistent drought, shifting seasons, vagaries of weather, urbanization, high unemployment rates, embargoes and economic strife, desertification and soil degradation are few within a list of challenges facing the region in general and Jordan in particular (Jansouz *et al.*, 2013).

Our review of agricultural extension in Jordan suggests that there has been little contemporary attention paid to this important service within the Kingdom, by both the government and the international community (research as well as development). While attrition within public extension service is a global phenomenon, Jordan has not kept pace with international movements towards more pluralistic provision of rural advisory services through private and civil society engagement. In fairness, however, the Kingdom has been burdened with a continuous influx of refugees – Iraqi and more recently Syrian. The total number of Syrian refugees registered with the UNHCR in Jordan since the start of the Syrian crisis stood at 655,404 in Dec 2016, of whom 140,822, or (21%), reside in camps (UNHCR, 2016). The largest numbers of Syrian refugees are located in the northern governorates of the country. Amman, Irbid, Zarqa and Mafraq governorates alone are hosting more than (88 %) of all Syrian refugees in Jordan. Meanwhile, other governorates particularly in the south host approximately 10% of the total number of the registered Syrian refugees in Jordan. The Government of Jordan, in its ‘Jordan Response Plan 2015’ (JRP, 2015), estimates the total number of Syrians at around 1.4 million of whom, almost 650,000 are registered as refugees. The large majority of these, more than 520,000 (around 80%) are, according to UNHCR, living in Jordanian host communities outside of the camps (mainly in Irbid, Zarqa, Mafraq and Amman). The Syrian refugee crisis is clearly placing a burden on Jordan, creating significant economic, social and political strain on the country.

Equally important is concern from European nations for Jordan to provide a buffer against streams of migrants landing on European shores. Yet, there are also demands (internal and external) for provision of greater employment opportunities for both Syrian refugees living outside of the United Nations camps as well as for Jordanian communities hosting Syrian refugees (UNHCR, 2016). These opportunities are not solely limited to urban sectors, but also in terms of agricultural employment potential. In this regard, recent advances by the Government of Jordan to support greater engagement of Syrians within the agricultural sector have led to restrictions on the number of work visas for Egyptian agricultural labourers, historically a strong seasonal labour force, in order to support greater employment for registered Syrian refugees. Skills training for refugees who may have never been engaged in agriculture is an area that has not historically been within the mandate of public extension services, and together with adapting to climate change for rural Jordanian communities is placing much pressure on an already stretched and underfunded system of agricultural extension within the Kingdom (USAID, 2005). It is within this framework that this paper deals with an in-depth assessment of the agricultural extension system in Jordan with a special emphasis on institutions and efficacy in service provision. We expect that learning from this study will be of benefit to ongoing policy dialogue within the Kingdom of Jordan, as well as internationally, in terms of the role of public extension service within an environment of significant economic, environmental, and social flux within the Middle East and North Africa region.

**Agricultural Sector in Jordan: An Overview:** The Kingdom of Jordan is comprised of approximately 91,000 sq. km, of which over 90 percent is characterized as arid and semi-arid, receiving on average less than 250 millimeters of rainfall annually. Less than 5 percent of the arable land area is available for production under irrigation, and thus a heavy reliance on rainfed production systems. Access to water is a significant constraint and reflected in statistics indicating that 90 percent of its cereal needs and 80 percent of animal feed requirements are imported (EU, 2012). Some sources, such as the Chronicle of the Middle East & North Africa

([www.fanak.com](http://www.fanak.com)) state that national wheat production does not exceed 50 thousand tons annually, while total demand is close to 700 thousand tons. Food self-sufficiency has declined from 70 percent in the 1960s to meeting only 12 days of national need today, given shifts in weather patterns - timing, quantity and uneven distribution (EU, 2012); as well as a continuous influx of refugees from within the region.

Quite apart from the impact that refugees have had on food security, serious issues related to water shortages have been binding since the early 1960s, and are now more acute given continuous influx of thousands of refugees and current use of water resources that exceed renewable supply (Mayrhauser, 2012). This deficit is covered through over exploitation of highland aquifers in an unsustainable manner, resulting in declining water quality and lowering water tables. In the early 1990's, the deficit was 358 Million Cubic Meters (MCM) and is expected to reach 500 MCM by 2020 (Mayrhauser, 2012). According to Jordan's most recent water strategy, the country has an annual per capita water supply of 145 cubic meters; a number that is very low by all standards, if we take into consideration that countries with less than 500 cubic meters per person per year are classified by the United Nations as having an "absolute scarcity" of water; and in recognizing a widely recognized "water poverty line" of 1,000 cubic meters per capita per year (Mayrhauser, 2012).

Today, irrigated agriculture consumes over 60 percent of the country's water resources, which is expected to decrease, as water will be prioritized for domestic and industrial uses (Akroush *et al.*, 2016). New training activities are taking place to teach water saving methods and techniques at the family, farm and industrial levels. Households, schools, mosques, women associations and ordinary citizens are learning to use every single drop of water in their farms, rooftops or gardens. Water harvesting techniques are also taught and practiced in schools to collect rain in special ponds, wells and reservoirs. Farmers are conserving water by switching to drip irrigation techniques (where groundwater sources exist) and by producing less water-intensive crops either by volition or through regulatory measures that ban the production of water intensive crops such as bananas. Conserving agriculture, or "Zero Tillage", as one of the best practices to conserve soil moisture and retention within rainfed production areas has been also promoted.

<sup>1</sup><http://www.unhcr.org/news/briefing/2016/4/5715ef866/access-jobs-improving-syrian-refugees-jordan.html>.

**Jordan agriculture extension system: Setting the scene:**

The first "Agriculture Extension Education Section" under the Ministry of Agriculture was established in 1939, with a stated purpose of increasing productivity and improving quality of agricultural products. In 1986 the National Center for Agricultural Research and Technology Transfer (NCARTT) was established with other six regional centers (expanded to eight today). NCARTT was mandated to conduct applied research and technology transfer through identification, testing and transfer of improved agricultural technologies.

The Department of Extension was created in 1992, with district level offices established to service remote areas. The main goals of the department were to enhance food security and boost agricultural production in rural areas, rationalize water resources and optimize their use, achieve sustained household income through mini income generating projects and to facilitate competitiveness. In 2008, a merger was undertaken between research and extension function, where the National Center for Agricultural Research and Extension (NCARE) was created. Within the current structure, agricultural extension services are distributed nationally through 13 extension units (one unit in each district) each providing "programmed" and "non-programmed" extension services. The former are implemented with specific goals and targets, whereas the latter are implemented based on needs and/ or urgency of the program. In 1954, major goals related to increasing agricultural production and improving quality, while today extension services aim to enhance market driven agricultural production as well as "Market Oriented Agricultural Advisory services" (MOAAS).

85 extension officers are placed nationally (six at the main headquarters in Amman and 79 across 13 units in rural areas). Female representation within the cadre is not high at the district level, but in general comprises approximately one-fourth of the total. The role of gender within agricultural production systems is an important aspect of extension services in Jordan, and particularly so given the growing importance of welfare societies and community based organizations that provide services to female farmers. Women associations are being targeted through training on food processing, mushroom production, methods for dehydration, herbal and medicinal planting and effective packaging processes. Milk processing (mini units) have been demonstrated

within associations and are slowly becoming a source of primary income for both female headed households and rural communities more generally. With products slowly finding their way to major malls and supermarkets, success stories can be found within every district.

Climate change impacts and avenues to mitigate continue to remain the main responsibilities of NCARE staff members. Zero Tillage (ZT), within the broader paradigm of "Conservation Agriculture", continues to be promoted in order to cope with shifting months for precipitation and uneven distribution. Yet, given persistent water shortages, and recently reduced destinations for export of fresh fruits and vegetables (given that trade routes through Syria are now effectively closed with ongoing conflict), public extension has broadened its engagement by moving beyond the farm gate and targeting schools as well as welfare associations within rural communities. Students are being trained in the reuse of greywater to water backyard "kitchen" gardens, while rooftop gardens are being introduced to produce vegetables, medicinal and herbal plants. Micro- income generating projects, tackling issues of environmental degradation, as well as a host of other reactive measures for dealing with climate change have become routine work for the small cadre of extension agents.

**Trends affecting AES in Jordan:** It is expected that per capita water share will drop sharply to under the 100 cubic meters in the coming years, thereby putting Jordan into the category of having an absolute water shortage (Akroush et al., 2016). As a result, the share of water in agriculture will likely be directed towards domestic and municipality use, given pressures to support household and basic services. As a result of persistent water shortages, the Kingdom will have no choice but to seek out non-conventional sources of water. Treated wastewater, saline and brackish waters will have to be used for irrigation and this is likely to involve the simultaneous use of pesticides. Given restrictions on the imports vegetables and fruits using such sources, traditional and future export markets may be limited, and this has already occurred. Pressure is likely to be placed on both research and extension to find alternative cropping choices, in light of a strain of local markets to handle extra produce not destined for export markets.

While conventional wisdom would suggest that the influx of refugees and Syria has a positive aspect in

terms of creating greater demand for food products nationally, there is a countervailing force of adding more urban space to house a growing population with construction of residential buildings, schools, hospitals, highways, on the rise. Together with fragmentation of lands due to customs and norms of inheritance, the ability for use of machinery on limited parcels of lands within rainfed areas of production leads to potentially higher costs of production. This latter point, however, has been relieved through contemporary regulation that forbids the parceling of land into areas smaller than economically feasible on lands that house groundwater sources for irrigation. The role of extension within such an environment requires amendment, away from a focus on profitability and more towards resilience and sustainable farming practices.

**National agricultural extension system: An appraisal:** The system of agricultural extension in Jordan is contemporarily broader in scope, with a complex network of various stakeholders that include farmers, women groups, youth, school and college students, input supply dealers, marketing groups, etc. Enhancing technical capacities within the network, and ensuring regulatory oversight will require effective coordination and communication. Subjects such as the emerging issues of climate change, environmental degradation, empowering women, curriculum reforms within higher education, marketing, bio-fuel crops, governance, organic certification and international adherence to phytosanitary standards are coming to the fore. Equally important is a growing focus on Syrian refugees and assistance required in enhancing the skills and capacities for those willing and able to work within the agricultural sector. In large part, this will require the extension services to take on more of a rural advisory role, away from simple transfer of technology functions, to more engagement on matters of social service delivery and issues of well-being (social, economic, environmental) in general. This is a fundamental paradigm shift in the delivery of services and one which spans more than simple institutional redesign and policy reform. The shift will require significant and purposeful effort in training a new cadre of personnel to deal with emerging issues that are interlinked through connections between biophysical, social, environmental and economic spheres.

**Public extension service:** The public extension service is the oldest and most popular in the country. It is,

however, the least advanced given shortages in financial resources, and ability to reach many farmers with limited staff. Technological advancements in information and communications technologies (ICT) exist, but are not widely promoted, and opportunities for in-service training is limited; thereby compounding the constraint of limited number of extension service personnel. Focus group discussions with extension staff, as well as key one on one interviews, suggest a growing concern over the fate of public extension services in Jordan despite an understanding that such a service is still required and particularly so for the many marginalized farmers who continue to produce on degraded lands.

Within the category of public extension services, three are of significant mention within the Kingdom: Governmental ministries, Universities, and regulatory bodies.

**Ministry of Agriculture (MOA):** The ministry is the main body responsible for public extension services. It directly oversaw extension services for over six decades before it was transferred to NCARE. A special department handled all issues of the extension services, including but not limited to, extension programs, financing, capacity building and agricultural media and information. 12 departments covered the whole kingdom, one in each Governorate, in addition to dozens of sub-offices. The Department of Extension Services was merged with and separated from research on a number of occasions, with the last merger occurring in 2008, at the time of establishment of NCARE.

**The National Center for Agricultural Research and Extension (NCARE):** The center is a semi-autonomous public facility, receiving most of its core funds from the MOA. NCARTT (prior to the merger) was established in 1985 by USAID on the basis of an agreement between the government and the United States Department of Agriculture (USDA). It's headquarter is in Baq'a, north of Amman, and hosts all major departments in addition to a management function for national, regional and international projects. The center maintains 13 research stations covering various agro-ecological zones in addition to 13 extension units covering the whole kingdom. Since 2008, the center is responsible for both agricultural research and extension in Jordan. Generally, the main approach used in most agricultural extension activities is either programmed or non-programmed extension services. Most programmes are prepared and submitted in a decentralized manner by staff and usually

approved, followed up and monitored by the central office. An average of 40-45 programs are implemented each year. On the other hand, the non-programmed extension services are implemented to meet urgent or immediate farmers' needs using field visits, demonstrations, seminars, TV and radio and printed publications.

The mandate of the center is to undertake and coordinate applied agricultural research within the country in addition to agricultural extension responsibilities. The two branches are responsible for the transfer of research results and the adoption of appropriate and improved technologies from outside sources that fit the local conditions. The main responsibilities of NCARE include, but are not limited to, applied agricultural research for the purpose of increasing agricultural productivity, improvements in the quality of agricultural crops and promotion sustainable production practices. The center also undertakes socio-economic studies to improve profitability, efficiency in farmers' organizations and equity in access to resources. Other important responsibilities cover the area of livestock for the purpose of enhancing animal health and production of animal sourced foods. The center also concentrates on professional development of staff and develops special plans and strategies to upgrade the abilities and skills within its research and extension cadre.

**Ministry of Water and Irrigation (MWI):** The ministry oversees optimization and conservation of water consumption at the household, commercial and farm levels. The ministry publishes informational brochures and leaflets, develops awareness programs and organizes conferences to disseminate message on water conservation. The ministry also targets schools, households, agricultural associations, universities and others for the same purpose. In response to Jordan's chronic water problem, and in recognition of the crucial need for better, comprehensive and integrated conservation approaches to the precious national water resource (MWI, 2011), the ministry has created two water bodies in the Jordan Valley to control and enforce the ministries policies and regulations; the Jordan Valley Authority (JVA) and the Water Authority of Jordan (WAJ). Both are involved in the distribution of water within the Jordan Valley and the Highlands. The ministry is also in charge of formulating national water legislations, strategies, regulations and policies relevant

to the water sector. The tasks it performs range from the development and protection of water resources, through to enforcement of legal and administrative regulations; as well as policies and procedures for data collection and upgrading of water resource infrastructure for effective distribution to municipalities. Extension agents serve a role in enforcing these regulation, and thereby enter into a very precarious position of being seen as enforcement officers rather than facilitators of knowledge and innovation.

**Jordan Valley Authority (JVA):** The JVA was established to undertake a wide array of activities with its constituents. With over 40 different services provided, more than 30 are focused on issues of irrigation maintenance and water distribution as well as land management. The main goal of the JVA is to increase and sustain water resources in the JV through improvements in the efficiency of irrigation systems, and through uncovering non-conventional water resources for irrigation (eg. treated wastewater). JVA does not limit its scope of work to agriculture and water sectors, but also to social, economic, and environmental plans as well. It encourages economic development of the area through small and medium enterprises through attracting local and foreign investments as well as in the provision of an enabling environment for profitable investments. With regards to other economic plans, the authority designs detailed structural charts and maps for the lands located outside of organizational boundaries, as well as constructing and maintaining agricultural roads, building etc. Extension services play an important role within the JVA in terms of disseminating knowledge on more effective water use practices, as well as access to knowledge on sources of investment and access to public services.

**Water Authority of Jordan (WAJ):** The authority is a self-governed organization of farmers who combine their financial capital, technical abilities and human resources for the use and maintenance of a shared irrigation network. The basic function of the technical staff is water management and water distribution to members. Given chronic water shortages, the authority is not immune to governmental oversight on water use and distribution. Environmental concerns, particularly water pollution is also of immense importance. Extension services within the WAJ is largely limited to water efficiency issues. Other responsibilities include training on the safe use of treated wastewater according

to environmental and health standards set by the ministry. Several international agencies such as the USAID, German organizations such as GIZ, and the Japanese (JICA) and a host of others are funding the training of farmers within the valley. One of the largest challenges relate to the safe use of treated wastewater for trees as well as a range forage crops, and information of how to safely apply (or not) treated wastewater for a range of vegetables. The issue is sensitive from a health perspective, but also since some hold a view that religious custom prohibits the use of treated wastewater. Extension services require sensitivity in this regard, when delivering knowledge on best practices related to the use of treated wastewater. Moral challenges may also exist where personal (individual) conviction is at odds with organizational mandates for promoting the use of non-conventional sources of irrigation water use.

#### **Universities**

**University of Jordan:** Jordan's system of higher education was well ranked in the past, but reports by foreign agencies indicate that the quality of education has quickly slipped (USAID, 2012). Located in Amman, it is the oldest public university nationally, and provides seats to over 37 thousands students (5000 of which are post-graduate), while employing approximately 1400 faculty (<http://ju.edu.jo/home.aspx>). With an offering of graduate studies in agriculture (MSc. and PhD), most popular disciplines are "water and irrigation" and plant protection. The university also maintains an agricultural center for training that provides advanced courses in the areas of water and irrigation, soil health, plant production, and animal husbandry among others; as well as consultation on request. Yet, the USAID report (ibid) suggests that the system suffers from an outdated curriculum, as well as pedagogical techniques and technologies.

**Jordan University of Science and Technology (JUST):** Located 70 kilometers north of Amman, JUST is the second oldest and largest university campus nationally with degree programs offered in various disciplines (plant production, plant protection, animal husbandry, food technology, nutrition, natural resources, environment and veterinary medicine). The university is the only campus that has a community center that serves neighboring communities with extension type services that are inclusive of short training courses and workshops, field days, exhibitions, et cetera. Faculty

members provide consulting services on wider range of issues related to agriculture,

**Balqa Applied University:** The University is situated in Balqa governorate, approximately 35 Km from Amman. The Faculty of Agriculture provides courses on most disciplines, but very little in terms of agricultural extension services and consultation.

**Mu'ta University:** To the south of the Kingdom, within the governorate of Karak, the university was initially a military facility prior to offering other disciplines - including agriculture. The university does not provide agricultural extension services or consultation.

**Private extension service:** The private sector is well developed in Jordan and includes a wide array of small and large companies, most of which are engaged in the import-export of agricultural inputs and therefore profit oriented. Very little extension services are provided except that which is in line with the companies' interests (those related to seeds, machinery, fertilizers, and other farm inputs). Many private sector companies organize festivals and exhibitions, conduct workshops and seminars, while others are involved in landscaping. Magazines and leaflets as well as brochures are regularly printed in order to promote their business operations, with technical support services tied to the sale of equipment and inputs. Very few are involved in certification services such as Global GAP.

**Non-governmental organizations (NGO's):** Most NGO's are engaged in water conservation activities and in the creation of micro-income generating projects. Some women organizations provide agricultural extension services to female farmers and encourage them to be involved in rural community development and activities related to fostering of empowerment. Several have succeeded in establishing small production facilities, such as for mushrooms, honey, dry fruits, and milk processing. Some other organizations provide training courses, technical advice and consultations. Key challenges include access to technical training and upgrading, as well as knowledge on how and whether 'off the shelf' technologies are amenable to transfer and adaptation without serious environmental harm or harm to animal (and potentially human) health.

**The Hashemite Fund for Development:** The fund was created in 2003 to serve the Badia (rangelands) within the kingdom. The fund aims to address poverty and issues of unemployment through improvements in skills and capacities of local communities. The ultimate goal is

to achieve comprehensive development of the Badia, through participatory involvement of local communities and users of the Badia within implementation projects. The fund also supports, fully and partially, micro-income generating activities within the Badia. The Fund implements projects to promote the Badia as an attractive destination for tourists with extension working towards the development of all aspects of life within the Badia. Building a comprehensive database for natural resources to provide accurate, credible and potential value to investors is also among the duties of the fund. In light of significant potential conflict between the users of the Badia, extension services are also extended to a function of building peace between communities through avenues for improving knowledge on sustainable grazing management practices, as well as facilitating access to technologies and practices for improving sustainable productivity within the Badia.

Farmers' associations-Linking farmers to regional and international markets is a major goal of most farmers' associations as is the rational use of water and changing farmers' attitudes and behavior regarding the use of wastewater and other unconventional water resources. Extension agents with other agencies and research institutes cooperate to assist farmers in finding economically viable avenues for replacing the use of fresh water within their irrigation systems with treated wastewater. Other programs supported are the encouragement of members to replace older irrigation systems with those that more efficient - such as fertigation systems that promise to save between 25-50 percent of water and fertilizer applications. The MOA, MWI, Jordan Valley Farmers Associations, Jordan Exporter Producers Association, and many others are actively collaborating with both farmers associations as well as community based organizations.

**Public private partnerships:** There is a prevailing argument that the government is missing significant opportunities to modernize the agricultural sector (EPC, 2016), as well as to accelerate effective and efficient practices by not having strong ties with private and civil society actors. Avenues for fostering greater public-private partnerships include?

- Establishment of a public-private board for research and extension, an umbrella organization, that will serve as an advisory board to support policy formulation at the national level;

- Encouragement of joint research projects, where public personnel know the clientele better, while the private sector can assist them in management aspects, technical skills and marketing options, seeds, fertilizers, post-harvest, pesticides, crop production and management, crop diversification for high-value crops, livestock and other enterprises. This may lead to strengthened credibility of the public extension services who are sometimes viewed as enforcement officers rather than facilitators of knowledge;
- Training of extension personnel by the private sector, particularly in areas of communication, marketing, postharvest, climate change and lab testing services, which could help staff in providing solid and accurate advice to farmers';

#### **Fostering more effective extension services in Jordan**

**Market driven:** Approximately 90 percent of all efforts are production oriented and only 10 percent are market oriented (Rajesh K., et.al, 2012). If market led extension is applied in Jordan, there is an urgent need for new reforms in policies and regulations within the extension system, updated knowledge of markets, capacity building to reduce post-harvest loss, more effective methodologies for interactive communication, improved storage facilities and agro-processing linkages. The key challenge today, considering regional conflict, is how to continue with market driven approaches in light of blockages to traditional (road) supply routes and prohibitively expensive air shipment for fresh fruits and vegetables. Research and extension are critically needed to uncover new products and markets that are internationally competitive based on costly air shipment. The new approach will surely require strengthening and reorientation of the extension services system, promoting and encouraging the private sector, as well as using effective media tools to promote the market-led approach. Extension services will ultimately be forced to direct their efforts toward marketing issues, and towards facilitation of knowledge to produce export-oriented commodities with high quality standards and sound environmental underpinnings in light of perpetual constraints to water resources.

**Cyber Extension (CE):** Good access to information and technology and improved communication are crucial for agricultural development. The use of online networks and digital systems, computers and other



communication tools have increased dissemination of agricultural practices dramatically. Information and Communication Technology (ICT) and Cyber Extension (CE) are the major forms of agricultural extension services and likely to be favored technology dissemination tools in the future. Considering the availability of thousands of digital phones with farmers and other high tech devices, there is significant potential for the use of CE within the Kingdom. NCARE started using the system almost a decade ago, when farmers were able to receive warning messages about frost, floods and /or drought. Lately, the extension services added SMS to send advices and instructions to farmers. Yet, concerns exist over the future viability of such a system given geo-political sensitivities in the use of electronic media and concerns over activities that could promote insurrection or acts of terrorism. With occasional blockages in access to internet services and specific websites or online services, the viability of continued access to CE is moot.

#### **CONCLUSION**

To improve the structure and efficacy of agricultural extension and advisory services in Jordan, there is an urgent need for reorientation in light of contemporary concerns and constraints:

1. While a shift towards market orientation has been ongoing for some time, there is a critical need for attention to the development of a new range of products and product categories that are less perishable and more amenable to competitive pricing in foreign markets given the need for air freight. This will necessarily require collaboration between research, extension and the private sector. A continued concentration on fresh produce that has historically had profitable niche markets in Europe due to seasonality is no longer viable given blockages to traditional land routes through Syria;
2. Claims that public extension systems are outdated and not cost effective are not specific to Jordan. These are global concerns, with many countries around the world shifting towards the privatization of extension services. Current challenges in Jordan, particularly those related to the need for use of non-conventional water resources, as well as the pressures for feeding and employing many Syrian refugees are critical factors limiting the potential for moving towards full privatization. How the government can channel some of the international

funds directed towards the care of refugees towards more effective extension and advisory services is an urgent matter for policy dialogue both nationally as well as within international aid communities;

3. Much attention is being paid to reform of the educational system at all levels, but little is being directed specifically towards the reform of agricultural education at tertiary (university) level. Universities in Jordan continue to have a significant concentration on agricultural education, with national universities maintaining faculties of agricultural education, despite a decline in production and shortages in water resources to support a thriving sector. Internationally recognized curriculums for agricultural extension do not exist, and particularly in terms of the notion that agricultural extension is as much a discipline within the realm of social work as it is a discipline of communication methodologies to foster traditional transfer of technology mandates. In light of the ongoing Syrian refugee crisis, and international demands for employing Syrians refugees within Jordan, a gradual move towards incorporating elements of social service and care into the mandate of agricultural extension would appear to be timely; and with the potential for significant efficacy in developmental outcomes.

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