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Power to the partners? Public Private Partnerships (PPPs) as an approach for more pluralistic agricultural extension service in Egypt

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Agriculture remains a key and sensitive economic sector in Egypt. Given contemporary geo-political concerns that limit access to international markets, it continues to remain responsible for the production of food and fiber needed for a growing population. Efficacy in agricultural Extension Services (AES), within the broader scope of an agricultural innovation system, has the potential to assist in the government's mandate, and particularly so given historical levels of high public investment and attention to this institution. Our focus is on current limitations in both access to, and delivery of, effective public extension services; as well as on opportunities for enhancing the delivery of more pluralistic and equitable extension services through public private partnerships (PPPs). The methodological framework is largely qualitative, guided by a review of both historical and contemporary literature. Recommendations for reviving efficacy in public provision of AES in Egypt include: (i) establishment of non-parastatal CSOs, or representative farmers' and producers' NGOs and associations, (ii) recruitment of new village extension workers (VEWs) as an urgent requirement to fill the gap resulting from retirement of an aged population of extension agents, and (iii) enhancing organizational and institutional arrangements required to facilitate better linkages between researchers and end users of knowledge generated.

Key words: Public Private Partnerships, Pluralistic Agricultural Extension Service, policy reform, innovation system, Egypt.

INTRODUCTION

Agriculture is a key economic sector in Egypt. It employs close to 30% of the labor force, and contributes for about 15% to the GDP. More importantly, however, and given contemporary geo-political concerns that have restricted access to traditional markets, Egyptian agriculture is increasingly responsible for feeding a large and growing population, - 87 million (resident in February, 2014) and

increasing by an average of 2.5% annually (Dhehibi et al., 2016). Modernization of Egyptian agriculture has therefore become an urgent necessity for securing wellbeing and reducing rural poverty. Transforming conventional agricultural practices and technologies to those underpinned by sound environmental, economic and social underpinning, and backed by science, can significantly contribute to the empowering of the marginalized and vulnerable communities, and individuals therein.

Within this need for a paradigm shift in agricultural pro-

duction practices, conventional wisdom suggests that Agricultural Extension Services (AESs) can contribute to goals for reducing rural poverty and improving quality of life within rural villages through (El-Shafie et al., 2011): (a) moving towards food security (initially self-sufficiency in key commodities such as wheat) through enhancing productivity and efficiency in production, (b) human resource / capital development, through improving the Knowledge, Attitudes, Aspirations and Practices or Skills (KAAP / KAAS) of individual farmers, (c) enhancing social capital through more effective and well-functioning rural institutions (e.g. voluntarily formed NGO's with equitable access to services and returns) that are linked to more efficient value and supply chains, and (d) reductions in the degradation of soil health and water quality, through greater attention to and broad uptake of sustainable land use management practices.

The AESs of Egypt started in 1953 as a part of the Ministry of Agriculture and Land Reclamation (MALR, 2014). As reported by El-Shafie et al., (2011), the agricultural extension system in Egypt is one of seven sectors within the organizational structure of the agricultural ministry, and includes four main central administrations: Central Administration for Agricultural Extension and Environment (CAAEE, 2011), Central Administration for Horticulture and Agricultural Crops, Central Administration for Soils and Water, and Central Administration for Nurseries and Environment (www.agr-Egypt.gov.eg).

The government of Egypt gives priority to creating employment opportunities as the surest way to combat poverty (Abdel-Ghany and Diab, 2013). This strategy includes: economic growth to increase income and job opportunities; human resource development; women's advancement for more gender equality; safety net measures for the poor and participatory governance. Prior to the current Sustainable Agricultural Development Strategy towards 2030 (SADS2030), three Agricultural Development Strategies (ADS) were previously implemented: (i) the 1980 ADS, (ii) the 1990 ADS, and (iii) the ADS towards 2017 (Arab Republic of Egypt, 2009). These were successful in attaining significant achievements related to: increasing land under cultivation, enhancing land and livestock productivity and increasing average annual growth rates within the sector. The SADS2030, developed a vision for a comprehensive economic and social development in Egypt based on a dynamic agricultural sector, and a mission for modernizing Egyptian agriculture production systems. It identified six strategic objectives covering the main areas of sustainable use of resources; increasing agricultural productivity and food security; increasing the competitiveness of agricultural products; improving the climate of agricultural investment and raising the rural quality of life through poverty reduction. It is worth noting that, based on the SADS (2030), a vision, mission and

strategic objective for Egyptian AES is still in need of participatory development, through effective participation of all relevant stakeholders.

The conceptual framework for this study is underpinned by the notion of an Agricultural Innovation System (AIS) comprised of, but not limited to, 6 main components within contemporary Egypt: (i) agricultural research; (ii) agricultural education; (iii) agricultural extension & advisory services; (iv) agricultural finance; (v) private services (knowledge, access to markets); (vi) rural institutions (farmer organizations, syndicates, self-help groups, welfare organizations, et cetera). All of these components are critically influenced by the strategies and policies mandated nationally, and influenced by recent regional events, and thereby with implications for quality of life within rural communities as well as implications for urban communities that rely on a stable and affordable source of food and nutrition.

Attention to public extension systems have generally been absent within the wider Middle East and North Africa Region, and particularly so by international agricultural research organizations. Conventional approaches to the development and dissemination of agricultural technologies have generally proceeded on the lines of a very linear approach of classical technology development within structured laboratories and field stations; with dissemination based on handover to public agencies for dissemination to farmers. Growing global concern over diminishing public resources to support effective AES has not escaped Egypt. These concerns, coupled with heightened security on ensuring that organizations within rural areas are not engaging in political activism, in the guise of agricultural support service organizations, complicate the development of effective agricultural innovation systems. It is within this framework that this paper deals with an in-depth assessment of the agricultural extension system in Egypt, with special emphasis on institutions and the provision of public extension services. The latter is likely to remain the key source of support to farmers for some time to come given heightened sensitivity to contemporary security concerns regionally. Issues discussed within this paper will be of significant interest to a growing need and desire for policy dialogue on how best to reform/restructure the current system of public agricultural extension services in Egypt.

Agricultural Extension System in Egypt: An Overview

From 1950 to the mid-1980s, the Egyptian economy operated within a policy framework that was heavily geared toward state control of production and marketing (Fleischer et al., 2004). Within the agricultural sector, most crops were produced under a centrally planned quota system in targeted areas. This policy resulted in stagnating, sometimes even declining production, increased dependency on food imports, and a negative

sectoral trade balance given reduced agricultural exports (Christiansen et al., 2011). The extension system played a dual role of providing advisory functions, while at the same time exercising control in the achievement of national and regional production targets. Since the mid-1980s, agricultural production and input distribution operations have been progressively privatized and markets liberalized. Public and private sector investments have increasingly been directed at improving farm productivity. The sector responded positively to new incentives provided at the time. Total cropped area grew by 17% between 1985 and 1994, with cropping intensity of 180 percent (El Shafie et al., 2011). Fruit and vegetable production specifically grew considerably, responding to signals from, both domestic and export markets and thereby attaining of a comparative advantage in horticultural production.

In contrast to the horticultural sector, productivity of basic food crops (grains in particular) have struggled to achieve similar increases, with experts warning that if the current situation continues to deteriorate, it will result in massive food shortages that could turn seven million Egyptians into “climate refugees” by the end of the century (Nkrumah, 2013). Egyptians have traditionally had an innate aversion to the desert. During the 1970s, despite substantial investment in land reclamation, agriculture lost its position as the dominant economic sector. Agricultural exports, which accounted for 87 per cent of all merchandise export value in 1960, fell to 35 per cent in 1974 and 11 per cent by 2001. In 2000, agriculture accounted for 17 per cent of GDP and 34 per cent of employment (El Shafie et al., 2011).

As reported by Fleischer *et al.*, (2004), the extension system itself grew over time into a large, centrally managed bureaucracy within the agricultural ministry. At one time, it had over 35,000 staff. By the mid-1990s, the extension system was under pressure to adapt to the new environment of market liberalization. Involvement of the private sector in input supply, product marketing, and general services delivery, as well as the structural change toward high-value crops for domestic and export markets put the relevance of the traditional extension delivery system into question. It was recommended that private extension services should be encouraged and public services gradually withdrawn from high-value and export crops (El Shafie et al., 2011).

As shown in Table 1, the Egyptian public extension system has witnessed an ever-decreasing cadre of agents, from around 35000 in 1980s, to 25000 in 1997 (29% decrease), then to 8842 in 2007 (66% decrease) and 7421 in 2011 (16% decrease). The total number of village extension workers (VEW), who represent the grass roots level of extension workers, communicating directly with farmers, producers and rural actors has also decreased from 2805 in 2007 to less than 800 in 2014 (71% decrease). The total number of subject matter

Specialists (SMSs), who provide essential technical backup and support to VEWs has also decreased from 4528 in 2007 to 2506 in 2011 (45% decrease).

The chronic problem of sharp and ever-decreasing size of important categories of extension workers needs to be addressed through institutional arrangements. For example, a critical review of the extension personnel, from different types, at different levels, reveals some points of weaknesses and threats that need specific arrangement to improve the overall structure and functions within Egyptian AES (El-Shafie et al., 2011). Key points within this argument include:

- The number of extension workers working closely with farmers is relatively low, with cultivated land area served by 1 Male VEW of more than 3000 feddans, which is too large to be served considering constraints on transportation facilities and thereby access to the field. The ratio is more acute when considering that total cropped area served by 1 Male VEW is greater than 5000 feddans. With respect to female VEWs, the situation is worse since each 1 female VEW serve, on average, 61,000 feddan (cultivated area), and 109,000 feddans (cropping area).
- Concerning VEWs/ land holder's ratio, each male VEW services 1400 land holders, whereas each female VEW more than 27000 land holders.
- The number of SMSs providing technical support and back-up to VEWs is extremely low since each 1 male SMS services more than 2,000 feddans of cultivated area, and 4,000 feddans of cropped area. Regarding female SMSs the situation is also worse since each 1 female SMS services more than 13,000 feddan (cultivated area), and around 23,000 feddans (cropping area).
- Concerning SMSs/ land holder's ratio, each male SMS services 1000 land holders, whereas each female SMS , 6000 land holders on average.
- The number of SMSs is more than the number of VEWs, which could be confusing, and should be interpreted by the tendency to direct more specialized and highly qualified personnel for working as SMSs within different areas.

The structure of the AES of Egypt, from an ideal point of view, is highly comprehensive to cover all the administrative levels starting from the central level at Cairo, and moving down different layers of governance, passing through Governorates, Districts, and ultimately reaching grass root institutions (mother Villages and Villages). In spite of the comprehensive geographic coverage, from the Capital of the country to the village basins, the low efficiency and effectiveness of the extension system is attributed to: (i) non-implementation of the Sustainable Agricultural Development Strategy (Toward 2030); (ii) an ever-decreasing number of extension personnel; (iii) lack of response to rural people's

problems; (iv) slow or non-implementation of extension work; (v) imbalance of training of extension workers; and (vi) lack of effective communication and coordination.

The AES in Egypt: An Appraisal

Theoretical background

The extension organization is represented at all administrative levels, starting from the central level in Cairo (represented by the CAAEE), and Directorates of Agriculture at Governorate and District levels down to the grass roots (the Village level). Yet, the governmental extension is highly criticized for being ineffective and irrelevant (El Shafie et al., 2011). Village Extension Workers (VEWs), being the most important at grass roots, working closely with farmers and their families, suffer from several problems related to: low socio-economic status due to poor salaries, lack of incentives and promotion opportunities, lack of sufficient educational qualifications and training, insufficient transportation facilities. The importance of AES for farmers, rural families and rural communities of Egypt stems from the importance of agriculture within rural livelihood systems, where 55% of the population reside and 30% of the labor force employed directly within the sector (IFAD, 2012).

Rapid advancements in agricultural research and sciences have resulted in an ever-increasing wealth of agricultural knowledge, new improved practices and better technologies for agricultural production and marketing. Agriculture, therefore, has become a knowledge-intensive and highly sophisticated industry or business. Yet, the availability of new agricultural technologies and best-fit practices does not guarantee application by farmers and end users due to several economic and socio-cultural challenges and problems. These challenges could be effectively faced and addressed when analyzed and understood by the extension workers at all administrative levels. Farmers and end users of new agricultural scientific knowledge and technologies have their own local indigenous knowledge, skills and experiences that have been developed by farmers themselves over the course of repeated implementation of agricultural practices. Extension workers, therefore, try to integrate these two different types of knowledge and experiences through assessing them and thereby selecting those that are technically valid and economically viable; with support from scientific knowledge and experience from other regions – national and international. Consequently, agricultural extension systems, as organizational arrangements to link agricultural research and educational institutions with farmers, producers and end users, bridge an information gap, through integrating

these two different types of knowledge, skills and experiences.

Agricultural extension systems could be considered as tools or approaches, utilized by governmental ministries to achieve the goals and objectives of agricultural development through enhancing the application of research and scientific knowledge within the agricultural community (Paudel, 2013). Extension organizations could effectively improve access to knowledge, through regular and continuous provision of new, timely and relevant agricultural information, knowledge and best-fit practices. Symptomatic of cultural inheritance norms, many farms (as production units) are relatively small, dispersed and lacking in access to supportive services (e.g. transportation and other marketing facilities, maintenance and repair of farming tools and machinery). While vestiges of previous policies to support farmers in the production of nationally strategic commodities exist, in the form of parastatal cooperatives supplying seed and fertilizer (in rationed quantities), these small units generally lack effective organization in the marketing of those crops that are not considered strategic from a national perspective, but which are of critical importance to local production systems.

Agricultural extension systems are social systems in so far as human interactions and relationships are concerned. As such, one key function for extension agents is to enhance the networking process among individual farmers by encouraging them to establish collaborative production and marketing relationships in win-win scenarios, in addition to encouraging groups of producers to establish their production and / or marketing NGOs, CBOs, FOs (e.g. Cooperatives, Associations, etc.) for the promotion of specific crops or agricultural commodities that have high relative advantage within their local production environments. This is accompanied by relatively large amounts of budgets allocated to, and utilized by agricultural research and educational institutions (as new agricultural knowledge and technology generators). These significant budgets are generally of very low investment value if not accompanied with a parallel investment in agricultural extension and development of rural infrastructure (soft in the form of institutions as well as hard in terms of roads and supportive marketing facilities). Taken together, they form a function of innovation involving two essential components – invention of technologies or practices and transmission of knowledge aimed at enhancing adoption and critical mass in the continued process of innovation.

Conceptual framework

The existence, accumulation and articulation of contemporary challenges to Egyptian agricultural production, together with opportunities for addressing these continue to lead to a central point – access to know-

ledge and fit for purpose technologies as well as effective (contemporary) production practices. An extremely low ratio of extension agents to cultivated land areas, held in small parcels continues to raise concerns within the agricultural community. Considering that only 800 village extension workers (VEW) (grass roots extension), are charged with provision of services to 8 million feddan, many of which are under a state mandated crop (wheat), the ratio is 1 extension worker for 1000 feddan. Converted into a ratio of VEW to farm households, this is roughly equivalent to 1 VEW to 1,250 farm households. Without significant support from private service providers, the dissemination of knowledge, embodied in a hard technology (seed, equipment) or in soft form (organizational structures, training, information) lacks efficacy when left solely in the hands of an under resourced and declining public extension system (Mwada et al., 2016).

The AES of Egypt works within a larger comprehensive system, the Agricultural Innovation System (AIS). As reviewed by El-Shafieet *al.*, (2011), and show in figure 1, the AIS of Egypt involves the following 6 main components:

- **Agricultural Research:** Research component includes 1) Desert Research Center (DRC), 2) Agriculture division within National Research Center (NRC), 3) Agricultural Research Center (ARC), and 4) National Water Research Center (NWRC).
- **Agricultural Education:** The Agricultural education in Egypt comprises of technical schools under the Ministry of Education, higher institutes and colleges under the Ministry of Higher Education.
- **Agricultural Extension & Advisory Services (AE&AS):** Agricultural extension in Egypt is represented in the organizational structure of the Ministry of Agriculture and Land Reclamation (MALR) as a sector among 7 sectors. This sector includes four main central administrations, namely Central Administration for Agricultural Extension and Environment (CAEAE), Central Administration for Horticulture and Agricultural Crops, Central Administration for Soils and Water, and Central Administration for Nurseries and Environment.
- **Agricultural finance:** The Central Bank of Development and Agricultural Credit is responsible for providing loans to farmers and rural people, with relatively easier access to finance in the production of state mandated crops such as wheat.
- **Agricultural Private Sector:** Egypt has been moving gradually towards a market based economy since 1986. Liberalization and privatization are the two main elements of the economic reform program but more recent regional events since 2011 have significantly set back this agenda.
- **Farmers, Farmers' Organizations (FOs), NGOs, CSOs, and Cooperatives (Coops):** There are many established FOs in Egypt responsible for products

marketing or exporting, in addition to agricultural cooperatives. The Central Agricultural Cooperative Union is the responsible for supervising the cooperative structure of Egypt and generally provides support in the production of key national strategic crops (eg. access to seeds, fertilizer, and where possible, equipment service).

All the previous components of the AIS are affected and directed by the strategies, policies and culture of the country that are organized and regulated by different relevant Ministries, namely: Ministry of Agriculture and Land Reform, Ministry of Water Resources and Irrigation, Ministry of Finance, Ministry of Trade and Industry, Ministry of Education, Ministry of Higher Education and Ministry of Social Solidarity. Each of these ministries has several operational committees and commissions that perform specific tasks to support the formulation of agricultural policy in general and agricultural research policy in particular. Culture of the country, in terms of the way of life, belief systems, informal structures and institutions are naturally also in play in terms of affecting the effective functioning of AIS.

RESULTS AND DISCUSSION

Analysis of Private Provision of AES in Egypt

Emerging roles for the private sector in providing agricultural advisory services AESs is usually fostered by the decline in public AES; a withdrawal that created a vacuumed information and knowledge gaps that could be covered or bridged by private firms (Krell et al., 2016; Demisse et al., 2016). For the Egyptian case and based on the in-depth interviews with 4 private sector agricultural companies, working mainly at the village and district levels, the following examples represent different forms of the AESs provided by the private sector:

- **Diagnosing and resolving such production problems as plant diseases and pest control.** Sometimes this service is associated with teaching farmers how to avoid future infection of the same disease or pest. But, in the majority of cases, farmers and producers reported that the private extension agent avoids providing them with detailed information or knowledge, in order, from their point of view, to be highly dependent on the agent since services are provided for on the basis of fee for service. This was particularly true in terms of statement made in relation to veterinary services;
- **Some private companies and firms (e.g. selling improved new seed varieties) provide comprehensive programs for crop management, through which producers purchase new seed varieties and related timely information;**
- **Private companies for exporting of specific crops (e.g. grapes, potatoes, medicinal and aromatic crops) provide producers with an integrated and comprehensive technological package for crop production.**

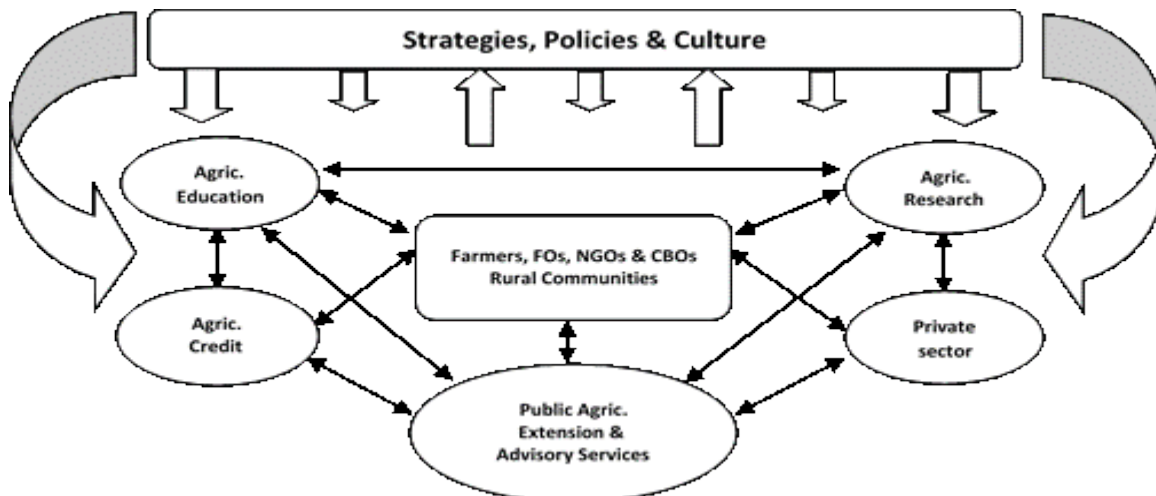


Figure1. Components of AIS of Egypt, Adapted from: El-Shafie *et al.*, (2011).

Table 1. Evolution of the number of extension personnel in the Governmental extension organization of Egypt.

Extension personnel categories	Male		Female		Total
	No.	%	No.	%	
No. of extension personnel (1980s)	NA	NA	NA	NA	35000
No. of extension personnel (1997)	NA	NA	NA	NA	25000
No. of extension personnel (2007)	7406	88	1036	12	8442
No. of extension personnel (2011)	5263	83	1115	17	6378
No. of VEWs (2007)	2669	95	136	5	2805
No. of VEWs (2011)	2743	84	531	16	3274
Estimated No. of VEWs (April, 2014)	NA	NA	NA	NA	760
No. of SMSs (2007)	3897	86	631	14	4528
No. of SMSs (2011)	2159	86	347	14	2506
No. of VEWs (March, 2014 estimates.)	NA	NA	NA	NA	800

Note: NA = Not Available

* Source: Central Administration of Agricultural Extension and Environment (CAAE), Information Technology Administration, 2007, 2009 and 2011 data.

Crops in this case are planted and managed according to the specifications and standards dictated by the target export country or regions. The private exporting company represents the first party in the contract, while the crop producers, as members of a CSO or NGO or Cooperative, represent the second party.

Some private companies working in selling new improved seeds or seedlings undertake simple demonstrations on farmers' fields through providing each farmer with improved seedlings (80 - 100 seedlings), at no cost, to be planted in a separate line alongside the traditional variety. Under the supervision of the extension agent, the farmer observes differences between the traditional variety and that under demonstration with the anticipation that farmers will be convinced of the benefits and thereby express their willingness to purchase the new variety.

Significant private providers of AES

In 2011, there were 1865 private companies engaged in the provision of agricultural advisory services, with a total issued capital of US\$ 448640 (El-Shafie *et al.*, 2011). The main advantages of private sector extension are as follows:

i) Immediacy and easy accessibility, since private companies and shops in rural areas work for relatively long hours within the week (relative to governmental offices' and personnel's restricted working hours and days, which are 6 hours per each of the 5 governmental working days of the week). This means that farmers could access the private company at any time within the 84 hours / week (12 daily work hours x 7 work days) compared

with only 30 hours of governmental services (6 daily work hours x 5 work days).

ii) Highly diversified services provided by the private shops since their owners work hard to multiply their profit through a range of production requirements and services available to any person who can afford to pay;

iii) Private shops' owners are usually smart in developing win-win interest-based commercial networks of friendly relationships with surrounding rural people. To maintain farmers as permanent customers, owners of the private shops, especially at the village level, establish and maintain friendly relationships with farmers of the area, and consequently could provide farmers with their needs on installments basis, so farmers who lack cash money can get their needs and pay in future;

There are several limitations or disadvantages that hinder or might make it difficult to serve and satisfy the needs of marginalized farm households (e.g. small land holders, poor farmers and women farmers (Birner et al., 2006; Birner and Anderson, 2007; and Feder et al., 2011). Among the most important of these limitations or disadvantages are the following:

- All the activities of the private sector are largely profit-oriented, in case of the availability of different options the private company, firm or shop tend to sell the option that maximizes its net profit;
- The majority of private sector firms, shops and companies are not aware about their social responsibility related to upgrading farmers' behavior;
- The possibility of lack of know-how and knowledge among considerable proportions of input suppliers, especially with latest modern technologies, materials and practices;
- Lack of transparency, since some essential information or precautions, related to the negative or side effects of some agricultural chemicals, might be hidden;
- The possibility of monopoly of selling some important production requirements (e.g. vaccines or medicines for animal care, fertilizers, pesticides, etc.), and, consequently selling these requirements at relatively high and uncompetitive prices;
- The possibility of manipulating / controlling the amounts of supply of specific production and marketing requirements in order to increase its selling prices, in case of stabilized or increasing demands;
- The possibility of cheating when a private shop mixes original material with any cheap material especially when the original material is provided in relatively large packages or containers which mismatch the demands of farmers and producers. This aspect is particularly egregious in the case of Egyptian fertilizer and specifically nitrogen based fertilizer that is supplied at a heavily subsidized rate.

New priorities and needs for AESs have been emerging during the last few years. One of the most important

priorities is the adaptation of the farm households to the negative impacts of climate change. It is very clear now, as reported by Smith *et al.*, (2013, p126), that Egypt faces serious short to long term risks from climate change. The potential risks from climate change suggest the following priorities for adaptation:

- More efficient use of water resources;
- Development of heat and drought tolerant and saline tolerant crops;
- Development of new supplies of water (desalination and reuse are among the technologies and management techniques that can either increase supplies (desalination) or effectively increase supplies (reuse));
- Reduction of air and water pollution, which have been estimated to cause losses to human health and productivity equivalent to 3 to 6% of GDP (El Shafie et al., 2011). Climate change can increase particulate concentrations, leading to further equivalent losses of billions of EGP per year. It is already imperative that Egypt limits air and water pollution to reduce harm to human health and the environment. Climate change may mean that even stricter controls would be needed to meet the same levels of air and water pollution.

DISCUSSION

According to IFAD (2012), the Egyptian agriculture's high sensitivity to climate change, which could reduce production of some major crops by 20 per cent within 40 years, the rural poor people in Egypt include tenant and small-scale farmers, landless laborers, unemployed youth and women – particularly the women who head one in five Egyptian households. Therefore enhancing and sustaining economic growth is another serious challenge that is of high priority for Egypt. These new priorities and needs indicate the importance of focusing on the poor farmers and rural people, and especially rural women. These new priorities also represent important educational opportunities for all categories of farmers. Therefore environmental extension educational programs and projects are becoming of extremely high priority for the Egyptian AES.

VEWs in rural Egypt, are demanded to provide farmers and rural people with a relatively broad-spectrum information and knowledge. Areas of services could include all the areas related to agricultural production and marketing of the crops and commodities that prevail in their work areas in addition to rural home economics. For example, female extension workers are responsible for providing information, knowledge and advice related to nutrition (how to prepare balanced meals and child care in addition to helping rural women manage their limited budgets, and how to establish an income-generating small projects for enhancing the income of poor rural women, especially those who are heading their families). The

AESs of Egypt now include essential information, knowledge and practices related to helping rural people adapt with the negative impacts of climate change. Some researchers and agricultural extension specialists are advocating for adopting a concept of "Rural Extension and Advisory Services (REAS)" assuming that the extension worker should be responsible for helping rural people in all the areas of their rural life (Birner and Anderson, 2007). Yet, some specialists reject that logic assuming that the functions of the VEWs should not intersect with other Ministries (of Social Affairs or Solidarity, Education, and Health) areas of work and interests

Rural poverty means deprivation or lack of many critical assets (land; capital; timely information and knowledge; credit; markets, etc.). Poverty of the majority of rural people leads to the prevailing of the culture of silence, where rural people feel that they are very weak, and, consequently keep silent. This culture is one of the challenges facing effective provision of AESs since poor farmers and rural people never express their needs and problems. This also creates a wide gap in the provision of AESs that tend to service relatively more affluent farmers and large landholders. This wide gap also justifies accusing AES systems in many LDCs of being biased to the rich, which, in turn makes the rich richer and the poor poorer.

Civil Society Organizations (CSOs) represent the third dimension of the triangle of sustainable Agricultural and Rural Development (SARD) actors (including the Government, the Private Sector and CSOs). In fact each actor is functioning for its own interest in trying to achieve its own objectives. CSOs, in Egypt, as in all LDCs, have very high potential, and promising roles, for providing effective and high quality AESs for free or for reasonable prices, based on real or discounted costs. These CSOs might function under different names or titles, for example they might be called Non-Governmental Organizations (NGOs), Community Based Organizations (CBOs), Farmers' or Producers Organizations (FOs or POs) and Farmers' or Producers Associations (FAs or PAs) or welfare societies within rural communities. As reported by El-Shafie *et al.*, (2011), there are around 40,000 NGOs, in addition to 5,689 agricultural cooperatives. How many are active is not clear, yet cooperatives and NGOs in addition to other CSOs (such as Syndicates and Farmers Unions) must be encouraged to play their potential roles of collecting and bringing farmers and producers together and enable them to be better organized to face the challenges of SARD. Institutional arrangements, in terms of more innovative laws and regulations, are needed to encourage and facilitate the establishment of different types of CSOs (NGOs, CBOs, FAs and FOs).

CSOs could, and must, work as highly effective and active actors within the ambit of formal or informal Public Private Partnerships (PPPs), according to the relative

advantage of each actor. PPPs must be arranged according to contractual basis in which the rights and duties of each partner are precisely identified, written and approved by all partners. The Government must remain the overall power who could be the reference and the judge in case of any dispute, disagreement or complain claimed by any partner.

Considering the nature of the relationship between public AES and NGO's (as well as international development organizations) in terms of collaborating on the delivery of agricultural extension (Paudel, 2013), several NGOs, local and international are engaged in providing farmers and rural people with AES – typically working with groups, rather than individual farmers. AESs in many cases are provided for free to the members of CSO's. Sometimes, to develop and encourage the self-help CSO's members are encouraged to pay a part of the real costs. In some cases, to secure the sustainability of the service, farmers pay a gradually increasing part of the cost (e.g. 20% of the actual costs of the service in the first year, and then 40%, 60%, 80% in the second, third and fourth years respectively), then by the fifth year the producer pay the total actual costs of the AES. This mechanism is assumed reasonable, from the point of views of both the CSO and the donor. Through gradually increasing proportion of the actual costs paid by the member, the farmer is hopefully convinced about the high value of the service and will be ready to pay the total actual costs after the termination of the externally funded initiative. It also represent an innovative method for developing self- help or self-reliant rural groups.

Agricultural Research Systems (ARS) and AES represent two important sub-systems, working within the AIS of Egypt. Being parts of the MALR of Egypt, the ARS is the Agricultural Knowledge and Technology (AK&T) generator while, AES is the transmitter of the generated AK&T to farmers and rural people as end users and beneficiaries. Linking ARS with AES is an essential requirement, and necessary prior condition, for modernizing and shifting Egyptian agricultural production systems from a tradition-based focus to a commercial business based on the application of science and research. Linking mechanisms of ARS and AES are key and determinant factors for achieving the functions / objectives of the two sub-systems.

The links between Agricultural Research Systems (ARS) and AES of Egypt need critical rethinking, revisiting and reconsideration. ARS and AES represent two important connected sub-systems (Sadighi, 2005; Al Rimawi *et al.*, 2013), working within the AIS of Egypt. Being parts of the MALR of Egypt, the ARS is the Knowledge and Technology (K&T) generator while, AES is the transmitter of the generated A&T to farmers and rural people as end users and beneficiaries. In order to secure highly effective links, collaboration and coordination, between the two sub-systems, they are merged within one

institution- the Agricultural Research Center (ARC) of Egypt. Yet, the main challenge facing this merge is the competition, between the two sub-systems, to acquire, as much they can, a fair share of the budget allocated to the MALR, with AES historically receiving a much smaller share. This merge could also be viewed as working against the wise administrative rule that "ARS and AES should be independent but linked". Yet, in practical situations, within the Ministries of Agriculture, the largest proportion of the budgets could be swallowed by the ARS. Therefore, increasing numbers of extension researchers and specialists started to advocate for increasing independence of the AES of Egypt. This advocacy is based on the need to change the administrative affiliation of the Agricultural Extension Sector, to be directly under the supervision of the Minister of Agriculture.

There are several potential avenues for reducing the cost of providing AES services to smallholder farmers (particularly women and youth farmers). Reaching the vulnerable and marginalized categories of the rural poor, (including landless, small land holders, jobless, farm land laborers), is one of the serious challenges facing the AESs of Egypt. The most important examples of these, highly cost-effective, avenues include:

- i) Focusing on utilizing mass media communication channels (especially radio and television), that could cover very wide, if not all, geographical areas and reach to all rural people in a relatively very short time;
- ii) Depending on the utilization of the influence of local leaders who are highly respected by the majority of people in rural communities. To activate this approach, influential local leaders need to be identified, selected for specific extension missions, trained to implement the mission under VEW supervision and support;
- iii) Supporting and encouraging Farmer-To-Farmer (FTF) extension. FTF is described as a horizontal communication and dissemination of appropriate technology and new best-fit practices among rural people, through convincing few number of opinion leaders who, in a relatively short time, transmit what they have acquired / learned to their relatives, friends, neighbors and other farmers and rural people.
- iv) Using ICTs (such as cellular / mobile phones, which is wide spread among all rural people, even the poor) for information sharing and exchange. Information could send as short messages to a very large numbers of rural people;

Gender-Sensitive Extension is increasingly becoming of high importance in the world, in general (Ponnusamy et al., 2014), and, in Egypt, in particular, where turn into a priority. The number of female-headed families are increasing in Egypt (around 25% of rural families are female-headed). This is combined with the feminization of agriculture, the emerging phenomenon, where women have to assume ever- increasing agricultural

responsibilities. This phenomenon is associated with the absence of men, for different and highly diversified reasons. Therefore, Rural Female Extension Work (RFEW) has become, and in future will be, more important. Yet, the numbers of female VEWs, SMSs, and total extension personnel, are considerably very low. According to CAAE(2011), the total extension personnel was 6378 out of which only 1115 (representing 17.5%) were female. The number of VEWs reached to 3274 out of which only 531 (representing 16.2% were female. The number of SMSs reached to 2506 out of which only 347 (representing 13.8%) were female. These facts indicate the urgent need to recruit more females to work as SMSs and VEWs. This could be achieved through several administrative procedures; among which applying the de-concentration mechanism, through which considerable numbers of females working in the Agricultural Directorates could be shifted to work both at the District and/ or the Village levels. This mechanism needs to provide those females with appropriate transportation facilities in addition to some monetary incentives; recruiting some female graduates of the Regional Faculties of Agriculture to work in providing AESs to the rural people of their Governorates, after providing them with sufficient training. This recruitment could be implemented on a contractual basis; and recruiting some female staff members, of the Regional Faculties of Agriculture to work, as part-timers, in providing AESs to the rural people of their Governorates, after providing them with sufficient training. For this mechanism to be institutional, a partnership, between the Regional University and the MALR will need to be established. Other mechanisms could be, locally initiated and arranged, according the specific situation of each Governorate.

Training of all AESs providers in Egypt is one of keys of capacity building and upgrading of the knowledge and technical capabilities of all categories of extension personnel, especially at the grass roots level, who work directly with farmers and rural people before graduation from the faculties, institutes and high schools of agriculture, the educational curricula needs be regularly adapted to fit job markets' needs. This is a serious and urgent priority since many private agricultural companies and agri-business owners complain that they cannot find graduates who are highly prepared and efficient to join their business. They claim that the quality and skills of the graduates of educational institutions do not fit the demanded requirements of their expected employees.

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Concluding remarks, recommendations, and policy implications

In order to improve the structure, function, and effectiveness of the Egyptian AESs, the following recommendations are suggested:

First, encouraging the establishment of Civil Society Organizations CSOs, or farmers' and producers' NGOs and associations. These entities must be free from direct governmental authority or control, except in case of disputes or conflicts among members. This arrangement will need to issue the new cooperation law, or a Prime-Ministerial decree, in coordination with the MALR and other relevant institutions (such as the syndicate of agriculture, the Ministry Local Development, etc.).

Secondly, recruitment of new VEWs is an urgent requirement to fill the gap resulting from retirement of the old aged extension workers, associated with the application of governmental policies, since mid-eighties, of avoiding new appointments in the MALR. The current conditions are convenient for testing new mechanisms of contractual extension, through NGOs (such as farmers' associations and organizations), in which farmers will be willing and capable for paying some, or all, of the costs of extension services. In addition to licensing arrangements for new EWs, this arrangement will need a Prime-Ministerial decree, in coordination with the MALR and other relevant institutions (such as the syndicate of agriculture, the Ministry of Labor Force, etc.).

Lastly, several policy, organizational and institutional arrangements are needed to facilitate and activate the processes, efforts and programs of making research and sciences reach farmers and end users. Among the most important of these arrangements are the following:

- Establishing and activating PPPs as well as the links and partnerships among basic actors and service providers.
- Establishing knowledge sharing and exchange mechanisms among researchers, Extension Workers (EWs) and farmers.
- Activating horizontal diffusion of technology through Farmer-To-Farmer (FTF) extension and utilizing the power of influential local community leaders.
- Establishing local platforms for a more pluralistic extension systems and approaches that coordinate and integrate extension efforts and programs provided, jointly, by the government, private sector and Civil Society Organizations (CSOs).
- Successful dissemination of modern knowledge and technology to farmers and end users needs effective VEWs. Yet, many countries lack sufficient numbers of EWs. Therefore, attention should be paid to training, capacity building and motivating of the governmental EWs in addition to recruiting new EWs to improve the EW/ farmers ratios.
- Using ICTs could compensate the insufficient numbers of EWs. Consequently, utilizing both modern and traditional ICTs (e.g. mobile phones and local radios), for knowledge sharing and exchange, could contribute significantly to effective reaching to farmers and end users.
- The private sector is, increasingly, providing extension education services(e.g. input suppliers providing post-selling know-how information to farmers). This role needs to be incorporated with both governmental and CSOs' arrangements, within new local, regional and national platforms.
- Decentralization of some extension services could help in declining the loads of the central government through delegating some of the central level authorities and responsibilities to lower administrative levels. This mechanism needs empowering (through effective training) of the local / grass root levels of extension personnel.

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