

REALIZING SUSTAINABLE AGRICULTURE THROUGH RURAL EXTENSION AND ENVIRONMENTAL FRIENDLY FARMING TECHNOLOGIES: BASIC INGREDIENTS

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Abstract

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With an only 3% percent farming area, Egypt is still an agricultural country. Its development primarily depends upon agricultural resources. Agriculture contributes approximately 14% of the GDP and absorbs about 31% of workforce. About 53% population lives in rural areas where directly or indirectly their livelihood depends upon agricultural sector. Despite its positive and significant contributions to food security/supply, economy, employment, export earnings, ecological balance, agriculture faces many threats and challenges which, in turn, result unsustainable crop productions. The prominent challenges faced include land and water issues; high degree of land fragmentations; old cultivation techniques, low yields with old traditional varieties, lack of information on marketing; post-harvest losses; degradation of natural resources and environmental issues; inadequate support services; framework and institutional constraints; and lack of agricultural development policies etc. In the present scenario, it seems imperative for agriculture sector to adopt new environmental friendly farming systems primarily based on the principles of sustainable agriculture. On the other hand, the role of rural extension has also been changed due to the low contributions made by old primitive cultivation techniques, the promising emerging new farming technologies, and the declining socio-economic conditions of rural etc. This article examines the changing scenarios, possibility of employing environmental friendly farming practices and elevating the working capabilities of the extension workers through well-planned capacity building programs. An effort has been made to identify and enlist the basic ingredients essential for the sustainable farming and efficient rural extension.

Key words: capacity building, extension and education, environmental issues, farming systems, inputs availability, low yields, population growth

Introduction

In Egypt, like other developing countries, agriculture remains the most viable economic sectors and considerably contributes towards production, employment and environment. About an area of 8.0 million feddans

(about 3.5 million ha) is being utilized for farming and allied agricultural activities. The sector employs about 31% of the labor force (Kruseman and Vullings, 2007) and agricultural production generates about 14% of the GDP (Handoussa, 2010; Morgan, 2010). Egypt has been successfully producing a variety of agricultural crops,

vegetables and fruits to feed its own population and earning sufficient foreign exchange through exports due to the favorable factors like suitable agro-climatic conditions, perennial water supplies and rich and fertile soils in the Nile valley (Ministry of Agriculture, 2011).

Traditional agriculture and the prevailing farming practices have almost become obsolete and the country seems unable to realize potential yields. The agricultural growth in the country is on the decline, environment is deteriorating due to non-sustainable practices employed in farming and could be attributed to factors like: high dependency on pesticides and insecticides, a growing population, limited arable land, increasingly deterioration of natural resources, soil erosion and degradation, water pollution, decreasing ground water tables, bio-system degradation, air pollution, excessive use of chemical inputs and loss of jobs in agricultural sectors etc. Besides the constraints faced by the Egyptian agriculture, water and soil - the basic resources for agriculture also seem under severe stress, their conservation and sustainability require immediate, focused and due attention (Faham et al., 2008; Chaudhry et al., 2006). These factors combine to covert Egyptian agriculture from sustainable to unsustainable. In response to these conditions, programs, policies and strategies are essential to be developed for realizing sustainable agriculture and conservation of natural resources. The prevalent situation clearly establishes the necessity of making immediate changes in the production systems. However, first, the country needs to identify the issues associated with the farming; enlist the viable farming technologies and examine the possible role of rural extension in the overall crop production system of the country. In this article, an attempt has been made to identify the essential and basic ingredients needed to realize sustainable agriculture by launching vibrant rural extension programs and employing environmental friendly farming technologies in Egypt. The aim of the article is to equip the rural extension system with the essential ingredients needed to realize sustainable agriculture through environmental friendly technologies.

Agriculture in Egypt

Agriculture is viewed as the way of life, an engine for growth and remains very crucial for socio-econom-

ic development (Handoussa, 2010). Egyptian agriculture remained one of the prime sectors of the economy, contributing about 18% towards domestic production (GDP). About 31% of labor is engaged in the agricultural sector (El-Din, 2007). Agricultural sector is primarily responsible for achieving national food security, providing jobs proximately to 55% of the total population, providing many of the major raw materials required for a number of important industries (IFAD (2011). The country is ambitious to initiate horizontal expansion to increase agricultural by increasing cultivation areas through reclamation of new lands in the desert. IFAD (2011) reported that agricultural activities are undertaken in the areas comprising Nile Valley and Delta and their desert fringes, commonly known as the old lands – which make up only 3 per cent of the total land area. In the Nile Valley, soils are fertile, climate is suitable for year-round growing seasons, and irrigation water is available for the crops throughout the year (Handoussa, 2010). Due to these favorable conditions, yields of several cereal and horticultural crops in the old lands are the highest in the world. However, Egypt remains a food-deficit country.

Potential of Environmental Friendly Farming Technologies

Sustainable agriculture aims at increasing food production in a sustainable manner, ensuring and enhancing food security and improving rural livelihoods. In order to realize this goal, efforts should be made towards efficient utilization of the available resources and the development of appropriate and new technologies. Such efforts will ensure stable supplies of nutritionally adequate food, natural resource management and environmental protection. However, conserving and rehabilitating the natural resources on marginal or lower potential lands in order to maintain sustainable man/land ratios is extremely important (Kruseman and Vullings, 2007). The following are some of the examples of unique projects employing environmental friendly farming technologies that resulted sustainable agriculture:

Importance of scientific research

Farmers readily adopt the farming technologies evolved by the universities and research institutions

(such as Agricultural Research Centers) after sufficient scientific evidences. Therefore, for realizing the agricultural development in Egypt, it is imperative for extension to advocate the innovations that have the science-based foundations. The following are the unique illustrative examples of the projects that adopted environmental friendly technologies to demonstrate their potential of making important contributions:

- Farmers can economize their fertilizer applications and control pollution if they adopt rational fertilizer recommendations based on soil testing.
- By adopting the concepts and practices of “Integrated Pest Management”, farmers can enhance their crop yields and minimize pollution.
- Remote sensing is a great tool to assess land capability, monitor sand dune movements and determine the extent of urban encroachment on cultivated lands. Such tools could be used for managing farmlands based on their capability.
- By putting into practices like drip irrigation and other water conservation technologies on the new reclaimed lands, farmers can grow more while using less water.

Integrated pest management in agriculture (IPM)

Recognizing IPM as a valuable component of a sustainable agricultural system, the current national policy has been based on less dependence on agricultural pesticides, more on cultural practices, combined with proved biological and alternative control technologies. The future national development strategy for IPM focuses on the efficient use of natural enemies, new innovative approaches through molecular biology in the critical identification of pest strains, development of induced resistance plant varieties through biotechnology, the establishment of computerized IPM website and the assessment of pesticide risks and benefits (Johannesburg Report, 2002).

Modernization of the Egyptian agriculture in the Nile Valley and Delta

Realizing the importance of innovations, the state has launched programs on the modernization of the agriculture in the areas of Nile Valley and Delta with the aim of enhancing agricultural productivity, prioritizing suitable and environmental technologies related to ef-

ficient irrigation. The initiative has been successful in raising awareness and improving the socio-economic conditions of the rural and farming communities (Johannesburg Report, 2002).

Sustainable resource management of the North West coastal zone

The project primarily has been launched in the North-West coastal zone with an objective of managing resources of the area sustainably by involving and integrating the rurals and the farming community. The project focused on developing the area by increasing the water harvesting, storage and efficient water use. Efforts were made to create public awareness and capacity building also received due attention. It is worth to replicate such initiatives in other ecological regions and the ecosystems of the country (Johannesburg Report, 2002).

Stabilization of sand dunes

Encroaching sand dunes pose an eminent threat to the indigenous crops. Among the highly vulnerable regions, the most prominent areas include the Western portion of Aswan, settlements of El Farafra and El Dakhla Oasis, Nile Valley between Minya and Assiut, human settlements in the northern delta region and the newly constructed El Salam Canal and Kantra-Rafah railroad in Sinai in the country. Efforts have been made to establish a national system for combating the adverse effects of sand dunes. The initiatives included undertaking of interdisciplinary space imagery to show dune characteristics; defining appropriate methods and procedures, and establishing an early warning system.

Afforestation in Egypt

Although the country does not have the areas, that fall under the definition of forests yet planting trees and afforestation initiatives have received sufficient attention as they are capable of enhancing fertility status of lands and protect them against erosion. Trees can potentially provide raw materials and additional source of income for the rural people. Trees certainly help improving microclimate conditions and sequestering of CO₂. Such projects can help propagating endangered plant species in the national parks (Johannesburg Report, 2002).

Problems Associated with Agriculture and Farming Communities

The agricultural sector and rural areas of Egypt are faced by many threats and challenges. Egypt is an agrarian based rural country and society. Agriculture has been an economic activity for the last many decades. Its rich cultural heritage is associated with its irrigated fertile lands. Unfortunately, despite the remarkable progress made because of agriculture, rurals remained under-developed. A detailed account of threats and challenges prevailing in the country is presented in the following paragraphs.

Small and fragmented landholdings

Egyptian agriculture is characterized by small landholdings (Aquastat, 2005). Farmers in Egypt have small landholdings and fragmented land ownership. Some 80% of the total landowners own agricultural lands less than or equal to 5 feddans (Kruseman and Vullings, 2007). According to Aquastat (2005) about 50% of all landholdings cover an area less than 0.4 ha (1.0 Feddan).

Natural resources and environment under stress

Environmental degradation, particularly water pollution, has created unhealthy conditions, and the change in the ecology of the Nile River has resulted in decreasing fish catch and biodiversity, and loss of income among fishermen (FAO, 1995). Natural resources, including land, water and the environment, are deteriorating in the country due to natural processes and anthropogenic activities. The prominent constraints include a fragile land-base, declining soil fertility, increasing salinity of the soil and water, limited water resources, and frequent climatic shocks. The natural resources base is also deteriorating due to burgeoning population pressure, inappropriate agricultural practices, overstocking, deforestation and consequent upon the soil erosion, and destruction of habitats for wild fauna. The environment is under severe stress, biodiversity is vanishing. Irrigation waters have been contaminated at several points with pollutants, which will in turn adversely affect the land qualities (Johannesburg Report, 2002).

Land issues

Activities like farmland urbanization, civil construction and sprawling are consuming fertile lands and posing a serious threat to Egyptian agriculture (Aquastat, 2005). Agricultural land in the Delta and the Nile Valley regions declined due to continued encroachment on agricultural land and diverting it from agricultural to non-agricultural uses at an annual rate of 20,000 feddans, and soil fertility also declined due to continued cultivation (Handoussa, 2010). Land productivity is also on decline due to salinization of irrigated areas; water logging and wind and water erosion. Farmers have inadequate access to productive resources, particularly agricultural land. They face difficulties in expanding the cultivated areas (Kruseman and Vullings, 2007). About 80 percent of the land affected by salinity and water logging has been successfully reclaimed and made productive (Aquastat, 2005).

Water shortage and drought

With a continuously increasing population since the Nile Water Agreement, presently per capita share of renewable water resources in Egypt is around 750 m³/year and it is expected to reach 250 m³/year in 2050, which is well below the water poverty limit internationally known as 1000 m³/year of renewable water resources. The increasing gap between the available renewable water resources for Egypt and the water needs has been met by water re-use, use of non-renewable groundwater, desalination, and imports of virtual water embedded in many food products such as wheat, maize, table oils, meat etc. In order to meet the future water demands in Egypt, attention must be paid to the increasing population densities near the waterways, which will eventually affect the available cross sections for water flows (Handoussa, 2010). On the other hand, often water shortages are aggravated when it is being used wastefully, unwisely and inefficiently in agriculture, as well as by the municipal, industrial and commercial users. The conveyance losses of water in irrigation are huge and enormous. In Egypt, there are areas that receive enough water to practice modern agriculture while other areas suffer from drought and water shortage (FAO (2009). Present farming systems are unable to cope with drought and water shortage and

the country lacks enough suitable farming technologies that could adjust the cropping systems/patterns in various zones according to the availability and supply of water. Therefore, it seems imperative for the country to modify its cropping patterns and farmers immediately need to shift to crops that require less water, such as wheat and cotton. Abou Hadid (2010) reports that Egypt has recently adopted participatory approaches for managing irrigation water use, with the technical support of international development agencies.

Water for agriculture

Egypt depends largely on Nile River water for its agriculture. Rains are not effective enough to depend upon for production. Rainfed agriculture is practiced in only 2% of the total area. The Egypt's quota of Nile water is 55.5 billion cubic meters. Combined with other sources, there is a total available of 63.5 billion cubic meters. The per capita rate is nearly 850 cubic meters a year - under the water scarcity - whereas the minimum should be per capita needs to one thousand meters cubic meters. Egypt is among 35 water deficit countries in the world. In Egypt 87.7% of the total water is being consumed by agriculture, 5.4% by industry while the total human consumption 6.8% of the total water (Shalaby, 2005). For the irrigation of the new land, each drop of water has become the focus of the state in Egypt. Efforts are being made to focus in the future on the development of irrigation systems, the introduction of real irrigation technologies that could be successfully employed to irrigate the newly reclaimed agricultural areas. Modern irrigation methods such as sprinkler and drip irrigation need to be applied to overcome the water shortage and scarcity. The irrigation technologies would lead to the production of crops of high quality for export (Elgandy, 2001).

Climate Change and agriculture

Egypt has experienced the potential impacts of climate change, in the form of rise in sea level, inundation of the low-lying lands in the Nile Delta that could reach 10-12% of the total area, impacts on water resources and agricultural productivity and associated social and economic effects. Moreover, some 57% of the Egyptian population living in rural areas seems more vulnerable

to climate change, with an expected shortage of basic food items (Handoussa, 2010).

Poor policy framework and institutional constraints

In the country, agriculture policy is not considered farmer-friendly. For example, unequal land distribution and insecurity of land tenure exists. Factors like lack of organizational and institutional coordination make the extension work weak and prevent realizing sustainable initiatives. The country has poor marketing and buying policies and market prices for some strategic crops are low. Information about the needs of exportable markets is not available to the farmers through either the government or Extension Service. An adjustment in agricultural, environmental and economic policy can improve the working of farming sectors and the livelihood of all farmers (Kruseman and Vullings, 2007).

Some Important Ingredients to Strengthen Agriculture

Keeping abreast of modern and advanced techniques that support the economic efficiency of agricultural production would result in sustainable agriculture. It is anticipated that if following measures are adopted and made the part of farming business, tangible results can be achieved.

The prime ingredients for realizing sustainable agriculture include:

- use compost for land reclamation, contributing to addition of new cultivated areas;
- rationalization of water irrigation, for water needed of reclaimed lands;
- foster organic agriculture would promote exports;
- reduce the use of both chemical fertilizers and pesticides;
- substitute for fodder production, thus reduce imports of feedstuffs;
- protect the environment from pollution establishing quality standards for agricultural products;
- employ the modern information and communication techniques that serve the agricultural sector;
- develop marketing facilities and services and agricultural markets in general;

- developing pre- and post-harvest practices for improving product quality;
- adopt modern techniques in monitoring, analyzing, and forecasting natural, technical and marketing risks, through a special unit for the management of agricultural risks;
- link the farmers, particularly small farmers, with the markets, including the development of marketing systems and channels;
- activate and strengthen the role of the government in exercising supervision on quality standards of both inputs and outputs, banning monopoly and adulteration, and consumer protection;
- strengthen the institutional and organizational mechanisms that support the linkages between local and external marketing;
- take all possible measures to reduce losses throughout the value chain
- more research must be conducted on horticulture and field crops.
- improved resistant varieties to pests; tolerant to environmental stress and that are more water use efficient are to be developed.
- research in genetics and biotechnology can help achieving enormous accomplishments.

Source: Handoussa, 2010; Lewis, 2012

Extension in Egypt

Agricultural extension system in Egypt is primarily responsible for transferring agricultural information to its clientele, mainly rural and farming communities. Today Extension activities are offered in a one-direction transfer of knowledge practice, where farmers are considered recipients not participants. However, the Agricultural Extension Services will have to move from supply-led information to information customized to a farmer's actual needs. For example, Egyptian production levels could be improved if Extension workers and farmers work together with the common goals and objectives (Shalaby et al., 2011). Drawing from a review of secondary sources and their personal experiences, the authors suggest that the public sector extension system is in a transition phase, characterized by decentralization of programming decisions and operations, and a shift from an agricultural performance orientation to

a more comprehensive, community development perspective (Rivera et al., 1997).

Agricultural Extension in Egypt not only focuses on increasing agricultural production and transferring modern agricultural technologies, but also undertakes many activities leading to rural development. Agricultural Extension exploits and explores all possible opportunities and resources and the potential of natural and human resources, delivers educational and awareness-raising programs and evaluates development capabilities to improve skills and ways of thinking. Extension activities are based on the sound and careful planning and cooperation among several departments. An integrated planning and formulation of programs is done at the central level, through the cooperation between Specialized Research Institutes and Agricultural Extension Centers. Researchers and Extension Specialists work together to address the problems faced by the farmers by implementing suitable extension activities (Shalaby et al., 2011).

Rural Extension can Promote Sustainable Agriculture

Recently, much development has occurred in crop production in Egypt, with some crops, such as rice, moving up in worldwide rankings of areas cultivated. This development is the direct result of efforts and planning that depend on specialized roles and tasks. Agricultural Extensionists' role is to provide advice on agricultural and animal production and to promote rural and environmental development. Therefore, the Extension worker is the main axis from which the development process expands (Abdelhakam, 2005). Extension has a significant role in addressing issues associated with the agricultural sector in addition to enhancing crop yields. Higher crops production can improve the rural infrastructure and livelihoods. By launching strong Extension programs and by adopting participatory approach, crop yields, profit margins and income levels can be enhanced. Such practices will result in the development of rural areas depend upon sustainable agriculture. Sustainable rural development is viewed as the product of sustainable agriculture in the developing world (Shalaby et al., 2011).

According to Lewis (2012), Extension system and technology transfer capabilities are still immature and need improvement. Therefore, Extension needs to enable rural people to take full advantage of scientific and technological advances in agriculture. These initiatives result in higher standards of living and elevate the social and economic status of the communities. The authors believe that Rural Extension has the great potential to achieving sustainable agriculture by:

- Providing the solutions to field-based problems by linking agricultural research;
- Creating awareness, educating farmers to change their old traditional trends with new environmental friendly technologies;
- Developing community resources to reduce agricultural preservation by preventing destruction or pollution;
- Increasing agricultural productivity through the better use of Agricultural Extension;
- Developing the productive process based on scientific economic lines to increase production while reducing costs.
- Attaching special attention to women and rural youth for improving farming (Tonobi, 1998).

Problems Associated with Agricultural Extension in Egypt

The Extension system has been playing a very significant role in enhancing agricultural production in Egypt. At present, the replacement of old practices with the new modern scientific farming technologies poses the prime challenge for Extension. Despite its good work on occasions, it is constrained by several issues and problems, limiting its efficiency and effectiveness. Extension Service of Egypt faces many constraints and problems, making the Extension work ineffective and less important. Currently, agricultural Extension activities are carried out only for transfer of knowledge, where farmers were considered recipients not participants. According to Abdelhakam, (2005), not enough qualified Extension staff are available to impact the remote areas. Extension workers lack transport facilities and have low incomes. Poor and uncomfortable working conditions and harsh environment certainly lower

the already low motivational level of many Extension workers. Therefore, better facilities, suitable rewards, achievable targets and increased budgets are needed to provide Extension professionals in areas where they are facing shortage, especially remote areas. Shalaby et al. (2010) note that farmers are not provided with sufficient support services regarding the availability of farm inputs like seeds, fertilizers, and credit. They usually have inadequate access to basic farm services such as the Extension Services and technology transfer. They also believe that farmers are provided low-level technologies that do not make much difference. However, Extension in the country is poorly organized and Extension service does not enjoy empowerment.

Prime issues in extension service and organization

Within the extension organization, a wide communication gap prevails;

- Extension Serves faces difficulties in bringing behavioral change among the farmers to adopt modern farming technologies geared towards enhanced crop yields;
- Often Extension workers are not well educated enough; they are not equipped with modern technical skills and do not have appropriate qualifications to do the extension work;
- Extension workers are hired on low salaries; they are not with transport facilities, and due to poor working conditions, they lack motivation, and they do not feel pride in their work and most often, the change agents deliver extension messages without inculcating missionary spirit.

Essential Ingredients Making Rural Extension Efficient and Effective

Use of Electronic Media

Now, Agricultural TV broadcasts two programs namely "Secret of the Land" and "Our Green Land" to enhance the technical skills of the farmers and provide information on the innovations. These programs are aired twice a week and each program runs for 30 minutes but such programs must be greater in number and more frequent. Agricultural Extension department organizes the field meetings with specialists and farm-

ers to describe the various aspects of innovations. It is important to eliminate the farmers' fears and doubts about the innovations by using an appropriate mix of electronic media (Shalaby et al., 2010; Shalaby et al., 2011).

Print Media – for educated farmers

Farmers who can read and write, specialized research centers and extension department the publications and pamphlets to provide the technical information on the innovations. Egyptian Extension Service publishes a bi-monthly Agricultural Extension Magazine, providing information on agricultural practices and aspects. Another magazine named "The New Land" is also published specially to provide information on all aspects of farming on new reclaimed lands like the cultivation of new crops, the recommended cultivation methods and irrigation (sprinkler and drip irrigation) and other farm operations (Shalaby et al., 2010; Shalaby et al., 2011).

Mobile Vans – an effective source of delivering extension messages in remote areas

Shalaby et al. (2010) reported that the country is successfully disseminating the technical knowledge to the farmers and rural citizens by using the mobile vans. The extension service uses a number of vehicles equipped with TV, video and microphones to create awareness and educate farmers in the villages. Videos have been prepared for each crop; these videos explain technical information in a plain and simple language and provide ample information on planting, land preparation, harvesting etc. They also highlight the various recommendations made for each crop.

Extension through Information Technology (IT)

It is important to improve and upgrade the Extension workers' technical and communication skills to enhance the efficiency of the Extension staff. There is a dire need to make extension agents familiarize with the possible applications of ICT, Geographic Information Systems (GIS), Computers and Remote sensing etc. Internet has been introduced and employed by the Extension service of the country. The country has also launched 2 websites namely VERCON and RADCON. "The Virtual Extension and Research Communication Network (VERCON)" is the network that is success-

fully disseminating desired information to the desired quarters and among the interested parties. Its prime goal is to provide information, solve problems immediately and establish professional links for realizing a meaningful cooperation between extension and research organizations. The other website namely, RADCON seems more comprehensive than the first one as it focuses mainly on the overall farming process and rural development that addresses all the issues related to agriculture and problems faced by the society. In order to make full use of IT, Extension service now presents recommendations on all the valuable major crops, disseminates and makes available modern scientific and technical agricultural information to all the potential users on CDs (Shalaby et al., 2010).

Development of extension staff and their professional growth

In order to enhance the efficiency of the extension staff, a dire need exists to enhance extension workers' technical and communication skills to enable them to help farmers learn new agricultural practices. Developing a capacity-building program targeting extension agents, by improving their technical knowledge and enhancing their communication and facilitation skills is needed. Participatory approach has proved quite effective in introducing new innovative farming technologies. There is a need to establish local professionals capable of providing assistance and training to extension workers on the implementation of participatory approaches (Shalaby et al., 2010; Shalaby et al., 2011).

Capacity building programs

Capacity building programs for the extension agents, community leaders and progressive farmers can improve their technical knowledge and enhance their communication and facilitation skills. Extension workers are very eager to learn about innovations in agriculture. They seem quite willing to invest their own time on learning and improving their skills. This feature is highly valuable to their work and clearly indicates the extension workers' sense of responsibility, commitment and ownership of the approach.

Adopt the participatory approach

Participatory approach endorsed and advocated by many international organizations like the World Bank,

Asian Development Bank etc. has been well received in both the developed and the underdeveloped countries due to its promising benefits and Egypt is not an exception. At some occasions, old traditional Extension methods have been replaced with the participatory approach. Participatory approach has proven an effective Extension method in introducing new innovative farming technologies. In addition, it is crucial that the extension workers learn to communicate technical information to the farmers (Shalaby et al., 2010; Shalaby et al., 2011). Preferably, it should be achieved by mixing typical instructing techniques with the newly acquired participatory methods. There is a need to form a group of able professionals capable of providing assistance and to train the Extension workers on the implementation of participatory approach. The critical review of the projects on infrastructure launched with the help of the community by adopting participatory approach have resulted sustainability and the sense of ownerships as noted by the project designers and managers (Soliman, 2007). Extension department needs assistance on organizing training courses for the extension workers on the implementation of participatory approaches.

Clear job description for Extension Staff

Extension staff is usually entrusted with the multiple duties to perform. Each extension professional must have clear job description and be held responsible for his actions. Sometimes they are involved in the non-professional activities that are not desired by their organization. Such activities prevent them from responding to the real issues of farmers, resulting waste of time, money, resources and loss of effectiveness. Clear description of the tasks required from an extension worker would help him to stay focused (Shalaby et al., 2010; Shalaby et al., 2011).

Extension services for women and youth

Women extensively participate in almost all the farming operations starting from crop cultivation, pest control and harvesting until the disposal of the produce. Women seem an essential part of the active labor force in the rural areas; unfortunately, suffer the most because of illiteracy, poor nutrition, poor health, high birth rates and unacknowledged labor. No doubt,

women play a greater role in the farming operations by their extensive participation in all the farm operations yet, capacity building programs are not available for women Extension Agents (Shalaby et al., 2010; Shalaby et al., 2011).

Conclusions and Recommendations

Agriculture is a significant contributor to the economy and development of Egypt. However, under the existing set of limitations of small-holdings, labor intensive cultivation and farming methods, and traditional irrigation water application, the current small scale agriculture seems under stress due to population growth, land fragmentation and low quality agricultural production. Currently, about 80 percent of the landholdings are smaller than 5 feddans in the traditional areas (El-Din, 2007) and the operational conditions for the farmers are quite harsh. Initiatives are needed to increase agricultural production while decreasing land fragmentation.

Planners and Policy makers need to address issues to evolve farming practices and technologies that would increase agricultural production without damaging environment. To realize economic yields; it is recommended that these small landholdings must be cultivated with high value crops. Sustainable Agriculture can be achieved through vibrant rural extension and environmental friendly farming technologies with the following components:

- Make agriculture more attractive, and focus on producing of more valuable crops that could generate jobs to reduce and prevent urbanization.
- Create awareness and launch campaigns to make the principles and practices of “Sustainable Agriculture” so that farmers could adopt them.
- The concepts and practices of sustainable agriculture need to be backed and supported by the environmental friendly technologies and Agricultural Extension in order to realize sustainable development.
- Farmers and their families, if provided with technical education and financial assistance, can improve the quality and levels of their production. This can certainly grow more while protecting the environment at the same time.

- Water remains a scarce commodity, therefore, its quality and quantity needs wise management and consumption. A significant challenge for the sustainable management of water resources is to control water pollution.
- For realizing development and practicing sustainable agriculture, it is imperative to formulate vibrant agricultural, economic and environmental policies. Above all, there is a need to better coordination, cooperation and accommodate policies framed towards sustainable development.
- Egypt have tried sufficient suitable farming technologies in past and now they seem obsolete, however, it seems imperative to evaluate new sustainable and modern environmental friendly technologies and be adjusted in the cropping systems/patterns in various zones according based on their suitability for the area and availability and ensured supply of water. Therefore, farmers need to shift to the crops that require less water, such as wheat and cotton.
- There is a need to popularize and focus on the diversification of higher value crops; this can be achieved by the use of the efficient and environmental friendly farming technologies.
- However, factors like clear description of the tasks required from an extension worker; coordination among different departments to assure effective exchange of information; clarity about policy directions and accountability are quite important to make extension work successfully.

Today Egyptian agriculture, rural areas and rural extension are experiencing serious issues and emerging negative trends. The country faces several environmental issues, pollution problems and degradation of the natural resources. In the situation, rural extension has the great potential to improve the situation and realize the sustainable crop productions. However, the current extension systems of the country do not have the sufficient competency for addressing prevalent issues and achieving sustainability. Certainly, the system needs to paradigm shift toward new approaches and models based on modern technical knowledge. Allahyari and Chizari, (2008) suggest that for realizing sustainability, it is imperative for the agricultural extension systems to give up old traditional cultivation

techniques and put into practice the new environmental friendly farming technologies. Further, they are of the view that rural extension must focus on holistic and systematic perspectives.

There is a need to develop the capacity building programs for both the male and female Extension Agents, to improve their technical knowledge levels and enhance their communication and facilitation skills. Farmers might know about new “technologies” but often misuse them due to their inappropriateness application. Women extensively participate in almost all the farming operations -- from crop cultivation, pest control and harvesting to the sale or consumption of the product.

It is concluded when environmental friendly farming technologies are advocated through a vibrant Extension Service, Egypt can practice, popularize and promote the concepts of sustainable agriculture in order to improve rural livelihoods and achieve the cleaner environment. Certainly, Agricultural Extension Service can help in realizing sustainable agriculture, economic yields without harming the environment.

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