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ROLE OF AGRICULTURAL EXTENSION SERVICE IN CREATING DECISION-MAKING ENVIRONMENT FOR THE FARMERS TO REALIZE SUSTAINABLE AGRICULTURE IN AL-QASSIM AND AL-KHARJ REGIONS - SAUDI ARABIA

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ABSTRACT

Due to its arid climate, scarce water resources and sandy soils, the Kingdom of Saudi Arabia is not an ideal state to practice mass-scale agriculture. The regions of Al-Qassim and Al-Kharj, however, show significant suitability for agriculture. Due to several constraints that prompted this study, neither region has realized potential agricultural yields. Speculative in the development of agriculture in the Al-Qassim and Al-Kharj regions is the role of Agricultural Extension Service (AES). This study estimates the degree of benefit farmers have received and how much AES has contributed to a decision making environment for them. Data were collected through well-structured and pre-tested questionnaires given by experienced interviewers. Some 51.6% of farmers reported the degree of benefit received through extension services was low; whereas about 13.2% of farmers considered the benefit of extension advice high. Although the degree of benefit from the Agricultural Extension Service for veterinary issues attained the highest mean, as high as 66.1% believe the benefit was low. Respondents suggested an increase in the number of Agricultural Extension professionals, subject specialists, officers and field staff. The study will help extension service planners and the policy-makers make improvements and tailor their programs to accommodate farmers' needs.

Key words: Arid Climate, Extension Advice, Quality of Information, Sources of Information, Decision-Making, Farmers' Needs, Sustainable Agriculture.

INTRODUCTION

The Kingdom of Saudi Arabia spreads over an area of 2.25 million km^2 (UNDP, 2010) with a population density of 15 (CDSI, 2014), sustaining some 28.8 million people (World Bank, 2014). The Kingdom cannot be listed among the agriculturally ideal countries due to harsh climate, physiography and limited water resources. The government fully realizes the importance of sustainable agriculture, food security and improved livelihoods of its rural dwellers. Peasants have benefitted from farmer-friendly policies granting them soft and interest free loans, free land and efficient agricultural extension services to their door steps. By employing modern agricultural technologies farmers have grown many cereal crops like wheat, sorghum, maize and others (GIEWS, 2014) as well as vegetables and fruits to bring self-sufficiency to the Kingdom (Baig and Straquadine, 2014). Agricultural development has not only resulted in self-sufficiency in various commodities for some regions but has allowed them to export surplus food products to neighboring countries (Al-Shayaa *et al*., 2012).

Among the agricultural regions, Al-Qassim and Al-Kharj occupy fundamental positions for their significant share toward production and economy. Covering an area of 17,800 km^2, with its 84,000 hectares of arable lands, Al-Qassim has emerged as the second largest agricultural region in the Kingdom. Representing about 18 percent of all cultivated land in the Kingdom, the region remains among the top three regions, producing vegetables, cereals, and fruits. Similarly, Al-Kharj is a very promising agricultural region of the central province. Spreading over an area of 18,000 km^2, the region produces agricultural crops including wheat, sorghum, alfalfa, and barley; fruit crops like date palm, citrus, watermelon and some vegetable crops such as tomato, onions, cucumbers, brinjal, pepper and cauliflower (Sher and Al-Yemeny, 2011) on arable 18,060 ha. While sustaining more than 120,000 cattle heads, its livestock rearing, poultry farming and horse breeding industries are also among the most valuable economic activities. About 80 percent of dairy products produced in Saudi Arabia come from the Al-Kharj area.

Recently the Kingdom has adopted a roll back policy to conserve its scarce water resources (Baig and Straquadine, 2014). In spite of farmer-friendly policies designed by the Kingdom, scarce water resources has led to food shortages, price hikes and closure of some fodder producing farms. Realizing the gravity of these problems, the state is making serious and concerted efforts to

maintain a fair balance among the decreasing number of farms, ensure sustainability and maintain a reasonable number of farmers to grow reasonable levels of food crops to ensure food security and feed an ever-increasing population in the Kingdom (Al-Shayya, 2012; Baig and Straquadine, 2014). As a vehicle for development and prosperity (Iftikhar, 2014) agriculture development increases food security, improves livelihoods and contributes to the national economy. In short, agriculture ensures the survival and existence of nations, and Saudi Arabia is no exception. Past agricultural plans for the Kingdom have focused on fair distribution of resources and services to benefit all farming communities and realize sustainable agriculture (Muneer 2014; Baig and Straquadine, 2014). In the most recent plan (the 9th development plan) the primary focus is on restructuring the agricultural sector in order to improve the role of agriculture in economic, social and environmental development. Efforts are under way to identify highly water efficient crops and develop and advance the efficiency of agricultural markets. The plan stresses greater emphasis on improving the level of support and effectiveness of extension services, particularly for small farmers to overcome the prevailing challenges and stresses (Ministry of Economy and Planning, 2010).

Many researchers (Al-Subaiee *et al*. 2006; Allahyari, 2009; Baig and Straquadine 2014) promote sustainable agriculture as one of the most valid options to keep farming productive and profitable. In order to implement sustainable agriculture, however, it is essential to educate farmers, extension staff, planners, and stakeholders. Many researchers such as Al-Subaiee (2006); Ministry of Economy and Planning, (2010); Al-Subaiee *et al*., (2011); Al-Zahrani *et al*., (2012); MOA (2012); Al-Subaiee *et al*., (2013); and Al-Zahrani *et al*., (2013) have emphasized the significance and potential of agricultural extension to educate farmers, enhance crop yields, employ modern farming technologies, and improve judicious use of natural resources like land and water. Extension education is an efficient and effective way to disseminate principles and practices of sustainable agriculture based on environmental friendly farming technologies to help farmers realize profitable crop yields. Extension education brings about positive behavioral changes in rural farming communities. While undertaking many activities to benefit farmers, extension professionals also help producers increase their knowledge of farming, upgrade their technical skills, run their farms efficiently and improve their livelihoods (Qamar, 2005; Allahyari, 2009; Baig *et al*., 2009; Al-Shayya *et al*., 2012; Al-Subaiee *et al*., 2013). As compared to traditional practices, agricultural extension transfers superior, economical, effective, and efficient research based technologies. Such technologies, including irrigation systems, reduce production costs, protect the environment and conserve natural resources (FAO, 2005) resulting sustainable rural communities. Agricultural extension services not only provide information on various aspects of crop production and protection but help secure agricultural related services from banks, organizations and companies. The most important functions of agriculture extension services, however, are transfer of technologies and agricultural education of farmers to equip them with sufficient and suitable alternatives and solutions and place them in a decision making environment.

Factors such as lack of accurate information and its efficient integration into farming communities prevent farmers making decisions and obstruct agricultural development in the Kingdom. To overcome the problem Baig and Straquadine (2014) stress for in-service training of extension staff to refresh their knowledge and upgrade their skills as a regular feature. Unfortunately, the Agricultural Extension Service (AES) has not been able to make desired impacts in suburbs of the Kingdom (Baig and Straquadine, 2014; Muneer, 2014). The present study was undertaken to re-assess the role and significance of the Agricultural Extension Service (AES) in the Kingdom with the prime objective of improvement. The theory of the present study is that sustainable agriculture can be realized in the two most promising regions of the Kingdom through effective and efficient agricultural extension services that place farmers in a decision making environment. At this juncture, it is imperative to assess the level and the qualities of services provided to farmers, explore farmer expectations and enlist their suggestions. Study outcomes are expected to strengthen the Agricultural Education Service and help farmers by placing them in a favorable decision-making environment.

Study objectives: The primary objective of the study was to identify services offered by the current extension system that place farmers in the decision-making environment in the regions of Al-Qassim and Al-Kharj. The four study objectives are as follows:

1. Explore the degree of improved decision making ability derived from agricultural extension services as reported by farmers,
2. Evaluate the quality of needed services that aided farmers in making decisions,
3. Identify sources of information used by farmers to help them make decisions,
4. Develop a vision for creation of an environment conducive to decision making from the farmer's point of view.

MATERIALS AND METHODS

Study area: The study was conducted in Al-Qassim and Al-Kharj, the most agriculturally significant regions in the Kingdom of Saudi Arabia. These regions produce most of the crops, including 26% of the vegetable

production, and sustain the largest dairy and poultry companies, in addition to cultivated areas with different types of date palm. Productions from these regions reach native markets.

Al-Qassim Region: Al-Qassim, which covers about 18 percent (84,000 hectares) of all the land brought under cultivation and spreads over 17,800 square kilometers, is the second largest agricultural region in Saudi Arabia. The region gained greater agricultural prominence in 1953 with the discovery of artesian water estimated sufficient to meet irrigation needs of arable lands for some time. Due to its potential to produce cereals, fruit and vegetables, Al-Qassim remains among the Kingdom's top three agricultural regions. However, present groundwater reserves are on decline necessitating redesign of prevalent farming systems.

Al-Kharj Region: With coordinates 24° 10`N 47°24`E and an elevation of 430 m.a s.l, the Al-Kharj region is located about 80 km south east of Riyadh, capital of the Kingdom. The region has a desert-like climate, receives low rainfall (mean 67 mm year^{-1}) and is exposed to high maximum temperatures (from 22.9 to 45.5°C); whereas monthly mean relative humidity ranges from 15.7 to 45.1%. Situated around a series of deepwater pools, Al-Kharj was selected for an agricultural experimental farm in 1938. Since then it has grown into a flourishing agricultural oasis, producing cereals, dates, vegetables, and fruits. http://global.britannica.com/ EBchecked/topic/316409/Al-Kharj

Data collection and analysis: In order to conduct the study, a well-structured questionnaire was designed with the help of several faculty members working in various departments at the College of Food and Agriculture Sciences at the King Saud University. Content validity of the questionnaire was pre-tested by conducting interviews with 27 farmers from the two regions. Consequently, necessary amendments were made to meet study objectives before interviewing selected respondents.

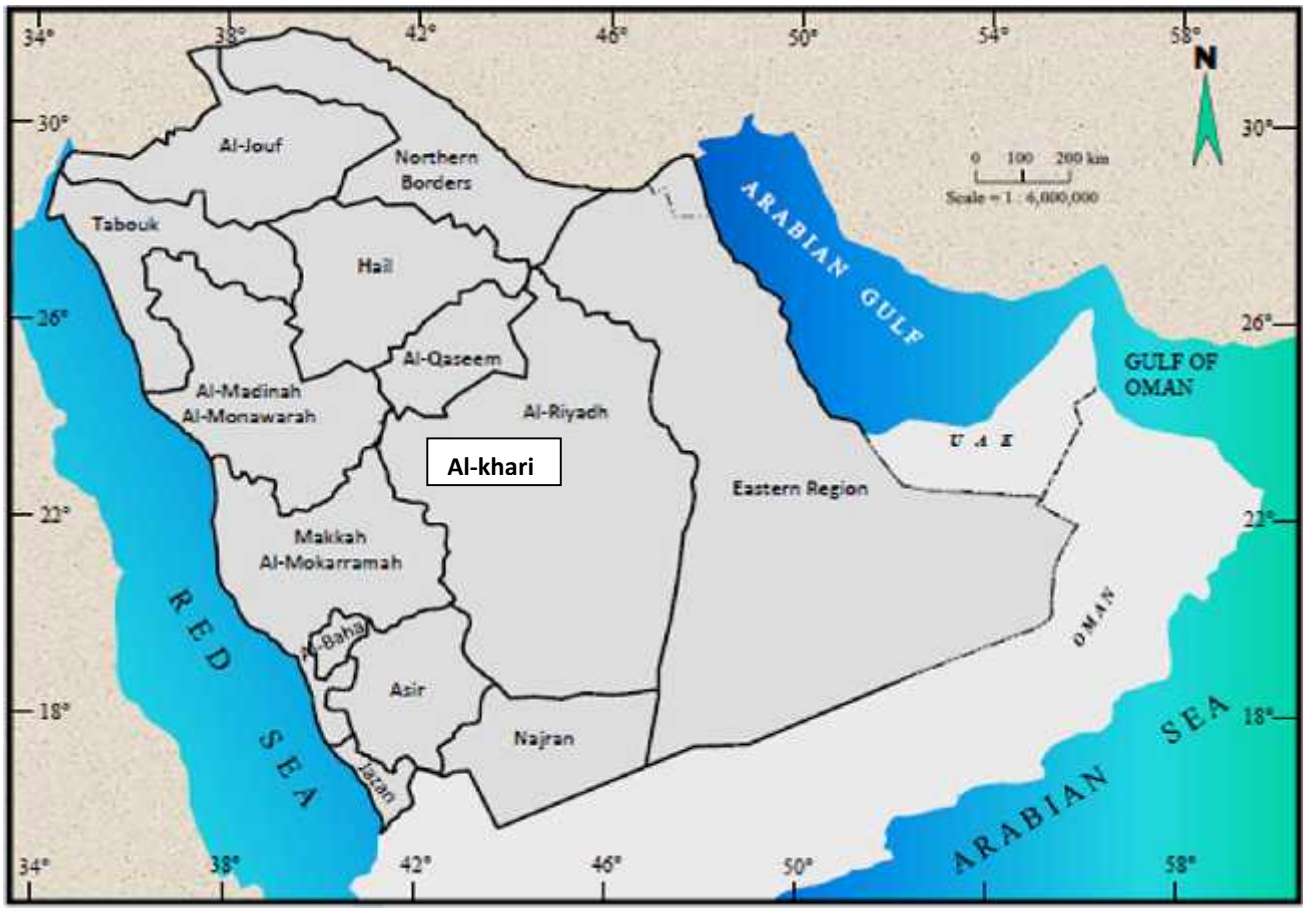

Fig – 1 Location of different regions in Saudi Arabia

Overall sample: In order to fairly represent the different groups of farmers, a random sample of 258 farmers (177 from Al-Qassim region and 71 from the Al-Kharj region) was drawn to conduct the study. The study population represents 12% of the total targeted farmers. After collection, data were subjected to several statistical

methods. To make the collected information presentable and meaningful, data are presented in percentages, frequency tables, arithmetic means and simple correlation coefficients.

RESULTS AND DISCUSSION

Respondent's distribution according to the degree of benefit received from agricultural extension services to make decisions: The first objective of the study was to determine the degree of advantage farmers received from agricultural extension services in the form of advice and guidance that helped them make decisions at their farms. Findings of the study on the degree of benefit received by the respondents (farmers) from the Agricultural Extension Services (AES) to place them in a decision making environment in the regions of Al-Qassim and Al-Kharj was estimated to be medium (2.7 degrees) with a standard deviation of 0.53. The degree of benefit was based on the number of visits made by the extension staff to a particular farm that placed them in the decision-making environment. The degree of benefit was designated as low (0-5 visits); medium (5<15 visits) and high (15 or more visits per year). As revealed in Table 1, some 52% of respondents reported that the Agricultural Extension Services (AES) provided a low degree of benefit in helping them make decisions at their farms while about 35% of them reported that the benefit they received was medium. Only 13% respondents reported that due to a high degree of benefit offered by the Agricultural Extension Services (AES) they were able to make decisions related to their farming systems. Findings of the present study are in agreement with the results reported by Sjah *et al*., (2006). Their study found a lack of consensus between extension advice and farmer needs and perceptions. For extension to be more help towards an increased farm productivity and profitability, this disagreement needs to be addressed. Greater involvement of the farmers in solving of farm level problems will facilitate their decision-making towards the formulation of relevant and applicable solutions. In order to achieve this, extension has to make shift from top-down to a more collaborative and interactive form of communication. To them, better understanding of farmers on the major constraints would enable them to design of effective solutions.

As evident in Table 1, about 86.8% of the respondents fall into the low to medium categories in terms of the benefit they received from AES. Findings indicate a weak role of the Agricultural Extension Services (AES) in providing guidance to farmers making decisions or solving problems which they are exposed to during the production process at their farms.

Table 1. Distribution of respondents according to the degree of the benefit from Agriculture Extension staff visits

The degree of benefit from the visit	Number	%
Low (From zero to less than 5 visits) per year	133	51.6
Medium (From 5 to less than 15 visits) per year	91	35.2
High (15 or more visits) per year	34	13.2
Total	**258**	**100**

Distribution of respondents according to the degree of benefit they received from the Agriculture Extension Service (AES): The second study objective relates to guidance provided by the Agriculture Extension Service (ASE) on various aspects of agriculture and the degree to which respondents (farmers) take advantage of such services that support decision making and solving problems at their farms. Advice and guidance offered by the extension staff to farmers and their attained ranking for each (based on the degree of their usefulness/benefit) is presented in Table 2. Findings of the study, as evident in Table 2, indicate that most activities and services provided by Agriculture Extension were inadequate and provided a low degree of benefit. Although it was ranked first in terms of the degree of benefit farmers received, 66.1% of respondents rated the benefit from extension services related to veterinary services as weak, and only 10.2% of respondents were able to access a large degree of benefit related to veterinary services. About 69.9% of respondents regarded the degree of benefit they received from Agricultural Extension Service in responding to their inquiries and making information available was low and weak, while only 6.2% of the respondents considered the extension advice they received as of great benefit, enabling them in the decision-making environment.

The study revealed that about 99% of farmers did not consider water application and irrigation of crops as important as it should be in water-deficit country like Saudi Arabia. That opinion needs to be set, juxtapose, to what Al-Zahrani *et al* (2012) reported that there is great potential for ensuring food and water security in the Saudi Arabia by replacing existing high water-consuming with the less water-consuming and efficient cropping patterns. They reported that all crops cannot be grown in all farming regions, and there is a need to identify suitable crops for each region. Farming should be practiced in a particular region for a particular crop based on its suitable ecological and environmental conditions

and the availability of water resources. Bowmer (2014) conducted a study to identify ways farmers could utilize water more economically. He believes critical decision-making would require greater emphasis on inclusive agricultural, eco-centric and technological thinking that includes (a) an understanding of the water cycle; (b) consideration of interaction between stressors and use of systems approaches; (c) better methods to value the aquatic environment; (d) assessment of land use impacts on water resources; (e) use of incentives to change farmers' behavior; and (f) community involvement to create sustainable futures through transformation and resilience practice.

Table 2. Distribution of respondents according to the degree of benefit from the Agriculture Extension Service.

Services	Low Benefit		Medium Benefit		High Benefit		Mean
	No	%	No	%	No	%	
Veterinary Services	171	66.1	61	23.7	26	10.2	5.6
Responses to inquiries and information	180	69.9	62	23.9	16	6.2	4.5
Diagnosis and treatment of plant diseases and pests	188	73.2	51	19.4	19	7.4	4.3
Technical advice	207	80.1	42	16.3	9	7.4	3.1
Provide inputs for production	235	90.9	15	6	8	3.1	1.7
Training on pest control measures	241	93.3	14	5.4	3	1.3	1.1
Help on solving problems related productivity and production	246	95.5	10	4	2	0.5	0.77
Help solving administrative problems	246	95.6	11	4.1	1	0.3	0.6
Agricultural mechanization services	251	97.4	7	2.6	-	-	0.4
Assistance in the marketing of agricultural products	253	98.2	4	1.6	1	0.2	0.4
Water Analysis	256	99.3	2	0.7	-	-	0.2
Modern irrigation systems services	256	99.2	2	0.8	-	-	0.2
Soil Analysis	255	99.0	2	0.8	1	0.2	0.2

Quality of extension services needed by the farmers for making decisions at the farms: To achieve the second goal of the study, researchers asked questions about the quality of services that help respondents make decisions. Information from respondents was also gathered on the lack of access to the services that negatively affects their decisions on their farms. As is evident from Table 3, there is a wide range of services that respondents needed but were unable to access, which had a negative impact on their decision-making. Veterinary services ranked first as 76.3% respondents were in severe need of extension services and the degree of benefits for this specific service was medium as an average 7.4 visits a year were made by the staff of AES to farmers. Ranked in the second position, 72.8% respondents noticed lack of availability of inputs for farm production and with an average of 5.7 visits a year the degree of benefits was of medium quality. Achieving the third position among quality extension services desired by the farmers, 74.5% of respondents reported a need for quality extension service related to the diagnosis and treatment of diseases. Based on the mean of 5.3 visits a year, farmers were able to realize a medium degree of benefits for this particular service from ASE.

Keshavarz and Karami (2014) conducted a survey with 255 farmers. They concluded that farmers' decisions are based on the complex web of natural, economic, structural, and cognitive factors to address the issues faced at the farms. Further analysis of decision models revealed that farmers were adopting different solutions to address their issues. Patterns of coping solutions to address an issue at different stages also differed -- keeping in view the short-term adjustment to long-term adaptation. Furthermore, a decision tree analysis demonstrated that although a large percentage of farmers made some adjustments to address drought, they were not able to overcome increasing impacts of drought. In order to address issues faced by farmers and assist farmers in making appropriate decisions at their farms, the researchers recommended the Agricultural Extension Services consider offering them various economic incentives, promoting affordable coping strategies, and combining agricultural interventions with social support services to place farmers in the decision-making environment. According to the ranking on quality of extension services required by respondents, the second lowest needs were expressed for help resolving administrative problems and beekeeping by 49.4% and 33.1% of respondents, respectively. The degree of benefit received by respondent farmers for these services was extremely low as on average only 1.6 and 1.2 visits a year were made by AES staff.

The degree of benefit farmers received for diagnosing pests and crop diseases and assistance

received undertaking preventive and treatment measures was ranked in third place. Yet, an overwhelming majority of the 73.2% of respondents received a weak degree of benefit. Only 7.4% of respondents were of the view that they sensed great advantage from extension services. The study revealed that the AES was not beneficial enough on most services to place farmers in a decision-making environment as the degree of benefit was extremely low. Such services include: technical advice, provision of farm inputs needed for production, training on pest control measures, help solving problems related productivity and production, help with administrative issues and problems, agricultural mechanization services, assistance in marketing agricultural products, water analysis, modern irrigation systems and soil analysis.

Table 3. Distribution of respondents according to the quality of extension services desired.

Services	Quality of service		Average number of visits/year
	Number	%	
Veterinary Services	197	76.3	7.4
Lack of availability of production inputs	188	72.8	5.7
Diagnosis and treatment of diseases and plant pests	192	74.5	5.1
Assist in the marketing of agricultural products	208	80.7	5.1
Specialized training to fight against date palm red weevil	176	68.2	4.3
Soil Analysis	207	80.1	4.1
Well water analysis	204	79	4.1
Agricultural Mechanization Services	173	66.9	3.2
Modern irrigation systems services	210	81.5	3.1
Help resolve administrative problems	127	49.4	1.6
Extension advice on bee keeping	85	33.1	1.2

Mandryk *et al*., (2014) conducted a study to assess how farmers' stated objectives translate into their farming practices and to preferred adaptation options. They reported that farmers' stated preferences in objectives were often not fully realized in their farming practices. The study revealed that farmers accord greater importance to their economic returns when making decisions although complementary or competing objectives may exist. The researchers reported that for strategic decision-making farmers also value long-term sustainability of their farms. Therefore, the AES also must take into account the importance of enhancing economic margins for produce and ensuring long-term sustainability of farms. In order to make agriculture sustainable and keep farmers in the farming business, it is imperative for the Agricultural Extension Service to revisit its weak components, strengthen its capacity to extend preferred services to farmers, diversify its programs, and initiate training and capacity building programs for the regions that happen to be the hub and center of agricultural activities.

Sources of information that placed farmers in decision-making environment and helped them solve problems: The third objective of the study was to identify information sources that placed farmers in a decision-making environment and helped them solve problems. Ranking for each source of information available to farmers based on its degree of usefulness/benefits is presented in Table 4. Some 37.1% and 29.3% respondents believe that their visits to the office of the Agricultural Extension Service (AES) and the visits of professionals from the Agricultural Extension Service to their farms were the best sources of quality information that enabled their decision making.

Despite the high ranks for these sources of information, the degree of benefit to farmers for making decisions on their farms was low as the number of visits a year from extension staff to the farmers were 4.3 and 2.9, respectively. The findings for this study are in agreement with the reported by Muneer (2014). He concluded that even though agricultural extension in Saudi Arabia made sufficient resources available to farming communities, small farmers (due to their limited resources) could not undertake advised practices and that agricultural extension was not successful in motivating "progressive farmers" to enhance adoption rates of modern agricultural technologies. Whereas Sjah *et al*. (2006) reported the outcomes of their studies on decision-making in Indonesia and found both behaviors and motivation, were quite import effective in both describing farmer decisions and eliciting decision processes.

Brochures, booklets, leaflets and handouts as sources of extension information and advice attained third place for helping farmers making decisions at their farms, yet the resultant benefit was low based on the low number of visits (i.e. 2.8 were made by the extension staff in a particular year). Farmers of both the regions are of the opinions that farmers' field visits, agricultural exhibitions, field demonstrations, film/video/movies, relatives and neighbors, agricultural companies and

related institutions were not helpful sources of information to them in making decisions at their farms. The study suggested Agriculture Extension Service (AES), planners and the policy makers make extension more accessible and responsive to farmers' needs.

Farmers' viewpoint on making the Agricultural Extension Service more responsive to their needs and place them in a decision making environment at their farms: The fourth and last objective of the study was to learn farmers' views related to how to create a decision-making environment at their farms. As shown in Table 5, the farmers made many very important recommendations which include the need for more extension subject specialists (39.7% of respondents) followed by availability of sufficient agricultural specialists (agronomists) in order to provide them with the necessary information on farming systems as desired by the 38% of the respondents. Approximately 37% of respondents believe that if Agricultural Extension Service (AES) made agricultural inputs and their prices available to them, it would certainly place them in a better decision making environment, help them enhance agricultural production, and achieve food security. Farmers believe that such initiatives would improve and enhance the working of Agricultural Extension Service.

Table 4. Distribution of respondents according to the quality of information farmers are exposed to and how much they helped support their decisions

Sources of information	Quality of service		Average number of visits/year
	Number	%	
Farmers visits to the office of the Agricultural Extension Service	96	37.1	4.3
Visit of agricultural extension workers to the farmers	76	29.3	2.9
Brochures, booklets, leaflets, handouts as the source of extension information and advices	64	24.9	2.8
Articles published in agricultural magazines	49	19.0	1.6
Telephonic contact with agricultural extension officers and specialists	44	17.2	1.6
Extension service and advices through Radio programs	46	17.9	1.4
Television programs on agricultural	34	13.3	1.1
Extension meetings and seminars	33	13.0	1.1
Farmers' fields visits	27	10.3	0.9
Agricultural exhibitions	34	13.1	0.9
Field demonstration	21	8.2	0.8
Film/video movies	15	5.8	0.4
Relatives and neighbors	20	7.9	0.2
Agricultural companies and institutions	3	1.1	0.1

Table 5. Distribution of respondents according to their suggestions to initiate services that would create the decision-making environment at the farms

Proposals	Number	%
There is need to increase the number of agricultural extension workers specialists/experts/professional	102	39.7
Availability of the required number of agricultural specialists is important and would support and provide them with the necessary information to make decisions at the farms	98	38.0
Provision of agricultural inputs and their prices would be encouraging farmers to make decisions towards agricultural production and to achieve food security	96	37.2
Broadcasting of radio and television programs as these sources of are available with the majority of the farmers	91	35.4
It is extremely important to arrange an increased number of seminars and meetings on Extension services	91	35.4
Provide adequate facilities to different branches of agricultural departments to enable them to carry out their activities	83	32.0
Interest in marketing services and the provision of market information in a timely manner.	48	18.7
Expansion of the establishment of more branches of agriculture to serve more farmers due to the breadth of the geographic range of the agricultural areas	8	3.2

Provision and equitable distribution of resources and services to lessen the disparities among the different regions and social groups remained the main objective of all development plans in Saudi Arabia (Ministry of Economy and Planning, 2005). However, there is a general belief that fewer benefits are directed to the small, poor farmers and the benefits received by the large farmers from agricultural extension services are usually expected to be much higher (Muneer, 2014). Alzaidi and Ahmed, (2004) believe that such a disparity could be the result of an inappropriate institutional framework and intrinsic weaknesses and problems associated with the agricultural extension service. About 18.7% of respondents expected less help from Agricultural Extension Service and attached low importance to services like marketing their produce and the provision of market information in a timely manner. Baig and Aldosari (2013) maintain that the need for an up-to-date Extension advice to the farmers on farming systems and marketing linkages is becoming increasingly important. Furthermore, as low as 3.2% respondents expected the least from Agricultural Extension Service on "expansion of the establishment of more branches of agriculture to serve more farmers due to the geographic breadth of the range of the agricultural areas to be served".

Conclusions and Recommendations: Results of this study indicate that farmers were in need of enhanced quality information to make sound and timely decisions. Farmers indicated, through survey and interview research, that there are deficiencies associated with activities undertaken by the Agricultural Extension Service (AES) and its staff in providing information and technology to make sustainable production practices decisions on their farms. The study also shows that the Agricultural Extension Service (AES) in Saudi Arabia is constrained by irrelevancies and inefficiencies and revisiting agricultural extension is imperative to achieve sustainable agricultural and rural development in Saudi Arabia. Agricultural extension in Saudi Arabia needs to be analyzed and redesigned to provide quality agricultural extension education and capacity-building programs that will improve skills of extension professionals to help them create decision-making environments for farmers. From the findings of study, it is anticipated that AES planners and decision makers must pay attention to revitalization of the Agricultural Extension Service (AES) by increasing visits to farmers and providing them with quality and timely information through reliable sources and effective modes of delivery. Farmers in both the regions have strong farming systems. The Al-Qassim region has a strong base for crop production and more agricultural specialists (agronomists) are needed in this area. The Al-Kharaj region is very productive in terms of its vibrant dairy farms and meat production and farmers in this region are badly in need of veterinary extension services. The take-home message is that vibrant extension services providing beneficial and sound advice to the farmers would help realizing sustainable farming systems and ensuring food security - enough food for all citizens of the Kingdom.

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REFERENCES

Allahyari, M. S. (2009). Agricultural sustainability: Implications for extension systems. African J. Agr. Res. 4 (9): 781 -786.Available at: http://www.academicjournals.org/ajar

Al-Shayaa, M.A., M. B. Baig, and G.S. Straquadine. (2012). Agricultural extension in the Kingdom of Saudi Arabia: Difficult present and demanding future. The J. Anim. Plant Sci. 22(1): 239-246.

Al-Subaiee, F.S., E.P. Yoder, and J. S. Thomson. (2005). Extension agents' perceptions of sustainable agriculture in the Riyadh Region of Saudi Arabia. J. Int. Agri. Ext. Edu. 12: 5-14.

Al-Subaiee, S.S., (2006). Farmers' attitudes toward sustainable agriculture in Al-Kharj Governorate of Saudi Arabia. A Pub of Cairo University., Bull. Fac. Agr., 57(2): 199-213.

Al-Subaiee, F.S., H.M. Al-Ghobari, M.B. Baig, E.A. El-Hag and M.T. Abu-Riziga. (2013). Studies on adoption of irrigation methods by the date palm farmers in Al-Qassim area – Kingdom of Saudi Arabia. Bul. J. Agr. Sci., 19(6):1337-1345.

Al-Zahrani, K.H. and Mirza B. Baig. (2011). Water in the Kingdom of Saudi Arabia: Sustainable management options. The J. Anim. Plant Sci., 21(3): 601-604.

Al-Zahrani, K.H., M.S. Al-Shayaa and Mirza B. Baig. 2011. Water conservation in the Kingdom of Saudi Arabia for better environment: Implications for extension and education. Bul. J. Agr. Sci., 17(3): 389-395.

Al-Zahrani, K.H., Siddig E. Muneer, Alla S. Taha and Mirza B. Baig. (2012). Appropriate cropping pattern as an approach to enhancing irrigation water efficiency in the Kingdom of Saudi Arabia. The J. Anim. Plant Sci., 22(1): 224-232

Al-Zahrani, K.H., Mirza B. Baig and Gary S. Straquadine. (2013). Consumption Behavior and Water Demand Management in the Kingdom of Saudi Arabia: Implications for Extension and

Education. Arab Gulf J. Sci. Res., 31 No. (2-3): 79-89.

Al-Zaidi, A. A., and E. Ahmed. (2004). An analytical study to the compatibility between the institutional framework of agricultural extension services in Riyadh area (Saudi Arabia) and its activities. The Agricultural Research Center, King Saud University, Saudi Arabia.

Al-Zaidi, A. A., E. A. Elhag, S. H. Al-Otaibi and M. B. Baig. (2011). Negative effects of pesticides on the environment and the farmer's awareness in Saudi Arabia: A case study. The J. Anim. Plant Sci., 21(3): 605-611.

Al-Zaidi, A. A., M. B. Baig and E. A. Elhag. (2013). An investigation into the farmers' attitudes towards organic farming in Riyadh Region – Kingdom of Saudi Arabia. Bul. J. Agr. Sci., 19 (3): 426-431.

Baig, Mirza B., F.S. Al-Subaiee and G.S. Straquadine. (2009). Role of agricultural extension in sustainable rural development in Pakistan. Banat University of Agricultural Sciences and Veterinary Medicine, Timisoara, Romania. Lucrări Ştiinţifice: Management Agricol. Seria I, 11 (1): 291-308.

Baig, Mirza B. and F. Aldosari. (2013). Agricultural Extension in Asia: Constraints and Options for Improvement. The J. Anim. Plant Sci., 23(2): 619-632.

Baig, Mirza B., and G. S. Straquadine. (2014). Sustainable agriculture and rural development in the Kingdom of Saudi Arabia: Implications for agricultural extension and education. Book Chapter 7. M. Behnassi *et al*. (eds.), Vulnerability of agriculture, water and fisheries to climate change: toward sustainable adaptation strategies, DOI 10.1007/978-94-017-8962-2_7, Springer Science+Business Media Dordrecht 2014

Bowmer, K. H. (2014). Water resources in Australia: deliberation on options for protection and management. Australasian J. Env. Mgt. 21 (3): 228-240

CDSI (2014). Central Department of Statistics and Information. Key indicators - Available at: http://www.cdsi.gov.sa/english/index.php; assessed on May 21, 2014

FAO, (2005). Modernizing national agricultural extension systems: A practical guide for policy makers of developing countries. Research, Extension and Training Division, Sustainable Development Department, Food and Agriculture Organization of the United Nations, Rome. Italy.

FAOSTAT. FAO estimate, 2012. Key statistics – Saudi Arabia http://www.fao.org/countryprofiles/index/en/?iso3=SAU

GIEWS (2014). Global information and early warning system on food and agriculture. Country Brief Saudi Arabia. Reference Date: 27-October-2014. Available at: http: //www.fao.org/giews /countrybrief/country/SAU/pdf/SAU.pdf

Iftikhar, M. (2014). Ag-Extension needs new pathways for sustainable rural development. Int. J. Agr. Ext. 1(3): 1-2.

Keshavarz, M., and E. Karami. (2014). Farmers' decision-making process under drought. J. Arid Env. 108 :43-56.

Mandryk, Maryia., Reidsma, Pytrik., Kanellopoulos, Argyris. (2014). The role of farmers' objectives in current farm practices and adaptation preferences: a case study in Flevoland, the Netherlands. Reg. Env. Change., 144: 1463-1478.

Ministry of Economy and Planning, (2005). The 8th development plan. Ministry of Economy and Planning. Riyadh (Saudi Arabia).

Ministry of Economy and Planning (2010). Chapter 28, Agriculture. The 9th development plan. Ministry of Economy and Planning. Riyadh (Saudi Arabia).

Muneer, S. E. (2014). Agricultural extension and the continuous progressive farmers' bias and laggards blame: the case of date palm producers in Saudi Arabia. Int. J. Agr. Ext. 2(3): 177-182.

Qamar, K.M. (2005). Modernizing national agricultural extension systems: A practical guide for policy makers of developing countries. Rome: FAO of the United Nations.

Sjah, T., D. Cameron and K. Woodford. (2006). Extension service and farmer decision making on new cropping lands in East Lombok Indonesia. J. Int. Agr. Ext. Edu. 13(2): 39-55.

Sher, H., and M. N. Al-Yemeny. (2011). Ecological investigation of the weed flora in arable and non-arable lands of Al-Kharj Area, Saudi Arabia. Afr. J. Agri. Res. 6(4): 901-906.

UNDP (2010). MDGs -Arab Kingdoms –Saudi Arabia progress towards environmental sustainability. United Nations Development Program Accessed on 30 Mar 2009. Available at: http: //www.undp.org/energyandenvironment/sustainabledifference/PDFs/ArabKingdomKingdoms/SaudiArabia.pdf

World Bank. (2014). World Development Indicators: Rural environment and land use. Environment. Available at: http://wdi.worldbank.org/ table /3.1. Assessed on Jan 03, 2015.