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Agricultural Knowledge and Information System from Extension Window: the Turkish Case

Yayım Penceresinden Tarımsal Bilgi ve Enformasyon Sistemi:
Türkiye Örneği

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ABSTRACT

In this study, public extension service was examined through interpretation of data collected from 1104 extension workers in Turkey. Extension as a one of the most important component in an AKIS is concerned with inducing people to change their voluntary behavior through the dissemination of information and adoption of new technologies. An AKIS is a network consisted of the different actors and multidimensional perspectives. This study investigates the linkages, integration and compatibility levels of extension in Turkish AKIS, and defines the bottlenecks in the system. The components of the AKIS such as factors affecting extension performance, information sources, extension methods, actor effectiveness and compatibility were used in the multidimensional scaling (MDS) analysis. According to the findings low technology adoption levels, mostly focusing on production increases, limited local participation were emphasized as the common disorders in Turkish AKIS. Extension activities must be based on the objective oriented programming approach. Besides, empowering of local actors, multi-stakeholder programming and evaluation process should be employed for allowing to articulation of actors' relations in the AKIS.

ÖZET

Bu çalışmada, Türkiye'deki 1104 yayımcıdan derlenen verilerin yorumlanmasıyla kamu yayım hizmetleri incelenmiştir. Bilgi ile yeni teknolojilerin benimsenmesi ve yayılması yoluyla insanların davranışlarını gönüllü olarak değiştirmelerini sağlayan yayım, Tarımsal Bilgi ve Enformasyon Sistemi'nin önemli bir parçasıdır. TBES farklı aktörler ve çok boyutlu bakış açılarından oluşan bir ağıdır. Bu çalışma Türk TBES'deki yayımın bağlantı, bütünleşme ve uyum düzeyleri ile sistemdeki tikanlıkları tanımlamaktadır. TBES bileşenleri olan yayımın başarısını etkileyen unsurlar, bilgi kaynakları, yayım yöntemleri, aktör etkinliği ve uyumu Çok Boyutlu Ölçekleme Analizinde kullanılmıştır. Bulgulara göre, teknoloji benimseme düzeyinin düşüklüğü, çoğunlukla verimlilik artışına odaklanması, yerel katılımın sınırlı olması Türk TBES'deki genel aksaklıklar olarak belirlenmiştir. Yayım etkinlikleri hedefe yönelik programlama yaklaşımına dayandırılmalıdır. TBES'de yerel aktörlerin güçlendirilmesi yanında, aktörler arası ilişkilerinin eklenmesi için izin veren çok paydaşlı programlama ve değerlendirme süreci kullanılmalıdır.

INTRODUCTION

During the past century, agricultural extension largely contributed to agricultural production and development all over the world. Today, rural life and agricultural production systems face many new challenges on domestic and global context such as

higher awareness of ecological impacts and the need for conservation of non-renewable resources, increased concerns about quality, consistency, and safety of products, public health, and international trade competition etc. On the other hand the last few decades governments and development agencies have

placed much emphasis on discovering and diffusing new knowledge and technologies to improve agricultural production for the benefit of small farmers in developing countries. These challenges demand a higher level of integration of knowledge, information, and services than is required for on-farm problems and encourage the local participation, decentralization, client oriented, and digitalized structures in extension services (Csaki, 1999; Werrij, 2005; Hartwich and Scheidegger, 2010; Falloon, 2011).

Extension as a one of the most important component in an AKIS is concerned with inducing people to change their voluntary behavior through the dissemination of information and adoption of new technologies (Blum, 1995). Visible extension efforts started during 1900s as rural development initiatives for development of individuals. Until 1970's public extension dominated almost all the developed and developing countries. This 'monopoly' of public extension is slowly diminishing from 1980's with the emerging elements of privatization and diversification in the supply of extension services. Recent years 'pluralistic extension' is widely recognized in most countries (Raj, 2010; Babu et al., 2015).

The traditional transfer of technology model is being eclipsed by newer models which acknowledge the overlapping of researchers, extensionists and farmers. The approach recognizes that information and knowledge provide a common denominator among farmers, extensionists and researchers. Agricultural Knowledge and Information System (AKIS) model describes the two-way flow of information and knowledge among the research, extension organizations and farmers. In this sense, the AKIS goes against the existing linear information dissemination systems which were developed in most national agricultural research systems under the transfer of technology model. As a consequence, the role of extension has been reformulated from a one-way transfer of technology persuasive channel into a two way channel for requests and answers which facilitates the learning process for farmers, extension staff and researchers. But the change from disseminating to facilitating requires staff with fundamentally different attitudes, skills and knowledge. From the point of view of the AKIS, and of participatory research, the facilitator can be described as a broker of information demands and supplies. The model is aimed at supporting decision making, problem solving and innovation in agriculture (Christoplos and Nitsch, 1993).

Collaboration, bottom-up information flow and horizontal linkages among the contributors should characterize the model for sustaining the agricultural extension information system. Collaboration with the other organizations and institutions can enrich the agricultural extension information system and their capacity to enhance agricultural development (Munyua et al., 2002).

Agricultural development of any country depends on its AKIS performance. An AKIS is a network consisted of the different actors/stakeholders and multidimensional perspectives which include relations, policies, sources of knowledge, methods of communication, knowledge creating and information sharing and exchanging, and decision making for development (Islam, 2010).

The private sector has a role to support AKIS in ways consistent with business objectives and government policy is complementary with private sector support for AKIS. Demand and supply on knowledge market needs to match the activity of 'traditional' AKIS parties (research, extension) and independent organizations (e.g., innovation centers, within science parks, related to incubators) in today's agriculture (O'Reilly, 2010).

According to Perez, et al (2010), innovation is not a linear process, in which research results are just transferred to farmers by extension services. Innovation is both about technology development and institutional and organizational developments, and thus can be considered an effective combination of hardware, software and "orgware" Hardware refers to technological part of innovations, whereas software is the different types of knowledge that are shared by different actors that participate in shaping the innovation. "Orgware" refers to the "social and institutional conditions that influence the development of an invention into an innovation and the actual functioning of an innovation", where the other dimensions are organized, shaped and negotiated, thus the importance of a dynamic and tailored management of innovation networks at different organizational levels.

AKIS has reached more pluralistic structure through the different stakeholders from public, private and NGOs especially in the developed and some developing countries. AKIS has started to transform "locked into old paradigms based on linear approaches and conventional assumptions" into agricultural innovation systems: knowledge to innovation. The transformation increasingly requires the effectiveness of existing public sector activities

and articulation of relations among the actors in the system (Blandford, 2011).

Agricultural extension is the primary delivery system for information to farmers. Improving agricultural production may not be achieved without relevant and reliable agricultural information. Extension organizations have the important role of linking farmers to information on improved agricultural technologies. This study describes the linkages, integration and compatibility levels of extension in Turkish AKIS which exists in agricultural systems, and assesses their performance in order to recognize and remedy bottlenecks in the system.

Agriculture takes a considerable part in Turkish economy with a 7.5% share in GNP, 21.0% share in employment, and 4.0% share in the export value. Historical roots of agricultural services in Turkey go back to middle 1800s (Anonymous, 1938; TUIK, 2015). Extension activities in Turkey are dominated and conducted by Ministry of Agriculture and Rural Affairs (MARA) with its structure spread in provinces as 81 dependent directorates and 802 county directorates. The structure of the MARA, which was reorganized in 1991, serves about 7,000,000 farmers with 6,965 agricultural engineers, 2,441 veterinarians, 3,828 agricultural and 1,819 veterinarian technicians, and 908 home economists (MARA, 2009). The public agricultural extension service is expected to act as a central mechanism in the rural development process. Well organized and operated AKIS can help to reach the agricultural development goals of Turkey. The bottlenecks of Turkish AKIS have been investigated and by considering the challenges in the world agenda the solutions have been presented in this study for increasing the effectiveness of Turkish AKIS.

MATERIAL and METHODS

The data of the two previous researches (*Boyaci 2007; Boyaci and Yildiz 2007*) were matched in the study. There were two group extension workers as public and contracted ones in public extension services in Turkey. Integer and purposive sampling methods were employed for defining the sample size in these researches. Purposive sampling was used for the selection of provinces according to the agricultural zones for public extension services and integer was used for interviewing with the extension workers in these provinces. Three are seven geographical regions and nine agricultural zones in Turkey. In this study the data has been matched under the geographical regions during the data analysis. Nine provinces were selected from the zones

according to their agricultural production values for designating the public extension workers. In addition to the public extension workers, the other group was the contracted extensionists and all were targeted in the study, too. While there were 1154 public extension workers in these provinces, on the other hand the numbers of contracted advisors reached 1023 in countrywide. Although, all 2177 extension workers in the groups were planned to include in both researches; but 538 public and 566 contracted totally 1104 extension workers participated in the researches (Table 1). The rate of return of questionnaires is about 51%. The advisors were employed as the contracted base in public extension services for rural development and extension project by Ministry of Agriculture and Rural Affairs in Turkey in between 2004-2007. Following the project (after 2007) all contracted advisors were appointed as the regular extension staff in public extension services.

Table 1. Extension workers interviewed by the regions

Regions	Frequency	Percent
Marmara	146	13.2
Aegean	222	20.1
Mediterranean	83	7.5
Central Anatolia	158	14.3
Black Sea	236	21.4
Eastern Anatolia	107	9.7
South-Eastern Anatolia	150	13.6
Total	1102	100
Missing	2	--
Total	1104	--

Copies of the questionnaire were posted to the advisors' addresses and/or extension organizations. Furthermore, up to 650 copies of the questionnaire were filled in through face to face interviews. All field level technical staff who works to enhance the living standards of rural people was identified as extensionist/extension worker in the study. The data, including a Likert scale (a score ranging between 1 and 5) was analyzed and interpreted by using some basic descriptive statistics, reliability analysis and multidimensional scaling analysis. SPSS 11.0 was employed for data analyzing in the study. Collected data and the analysis results have been presented as tables in the study.

Multidimensional scaling (MDS) analysis is a class of procedures for representing perceptions and preferences of respondents spatially by means of a visual display. Perceived relationships among stimuli are represented as geometric relationships among points in a multidimensional space. MDS can be used

to identify the positioning of current actors/elements on these dimensions, the positioning of ideal actors/elements on these dimensions (Malhotra, 1996).

In this study, the important components of an AKIS such as actor relations/linkages, compatibility of actors, extension methods for communicating with the farmers and extension works were compared by using the existing situations of the regional, national structures and the ideal/intended model through multidimensional scaling (MDS) analysis. Different variables such as factors affecting the extension performance, information sources, extension methods, actor effectiveness and compatibility (*relevance of information and work with the actors*) were used in the analysis. During the formulation of ideal AKIS model the values of Likert scale variables were recoded as 5 points (*1 point was only given to being faced with pressures during extension activities*). Adopter farmers and time devoted to extension activities are the important

indicators for the success of an AKIS. In the modeling, the rate of adopter farmers and time devoted to extension were accepted as 80%, and time devoted to bureaucratic works and self training of extension workers were defined as 10% for each in the ideal AKIS. The number of farm visits remained the same as the national mean in the model.

RESULTS and DISCUSSION

General information on extension

According to the findings, in Turkey, the average age of extensionists is 34.7, 26.2% are women and about 69% of the extension staff graduated from agricultural faculties and 15.3% of them also have a master's and/or Ph degrees. English is widely spoken as a foreign language by the extensionists (Table 2). Level of language proficiencies was found as 2.3 out of five. This low level has a negative effect on following the world agenda.

Table 2. Some personal characteristics of extension workers

	Personal characteristics	Frequency	Percent
Extension workers	Public	538	48.7
	Contracted in public	566	51.3
	Total	1104	100.0
Gender	Male	806	73.1
	Female	296	26.2
Faculty graduated	Agriculture	758	68.7
	Veterinarian	134	12.1
	Others	212	19.2
Master or Ph Degrees	Yes	169	15.3
	No	935	84.7
Spoken languages	English	858	86.2
	German, French and others	138	13.8

Table 3. Reliability analysis

Variables	Factors affecting the performance	Extension methods	Information sources	Effective actors	Actors compatibility	All variables
Items	12	10	8	13	9	52
Alpha*	.8314	.8781	.7091	.8394	.8269	.7079
Number	1104	1104	1104	1104	1104	1104

*Cronbach's Alpha > 0.7

According to the test results variables and scales were found as reliable in the study (Table 3). Following the reliability test the multidimensional analysis was done by using the variables at the Table 4. The variables were divided into five groups such as factors affecting the extension performance, extension methods employed, information sources, effective actors, and cooperation and harmonization during the extension activities (Table 4). While factors affecting extension performance, the effectiveness and relevance of actors were examined separately, all five variable groups were

also used for comparing regional and national AKISs with the ideal model in the study.

Occupational and economical satisfactions of extension staff were found low levels. Furthermore, a considerable number of extensionists face social and political pressures during their activities. This situation causes on performance decreasing in extension services in Turkey. Extension staff should devote almost all their working time exclusively to agricultural extension activities. In this context, the number of farm visits and time spent for farmer

training are important indicators on performance evaluation in extension organizations. The number of farmers covered by an extension worker and the numbers of farm visits vary considerably from place to place, along with the density of population, roads, the intensity of cropping, and the diversity of crops grown. For example, more than 100 farm visits (Expere, 1974), or 8-20 farm visits in a week (MARA, 1987) are reported as well enough by different sources. On the other hand, extension staff in European Union member states spends 75% of their working time for extension activities (Boyaci, 1996). According to the findings, extension workers spend 16.1 days for farm visits per month; devote up to 49% of their time for farmer training in Turkey.

According to the extensionists, only 52.7% of the farmers accept the extension advices in Turkey. Traditionalism, low education levels and insufficient information of farmers were mentioned by extension workers in the study as the reasons for this low adoption rate.

The public extension services have a dominant role in the system. The extension services have been influenced by general and training-visit approaches

which were employed in Turkey in the past few decades. Public research institutes have dominantly directed the priorities and the information flows in developing countries (Rogers, 1993). According to the findings, top-down approaches, limited farmer participation, production oriented objectives and intensive non agricultural responsibilities summarized the current situation of public extension services in Turkey. The initial focus of extension services in all developing countries as well in Turkey is the improvement of basic agricultural practices for increasing yield and production. The farmers mostly consult on conventional agricultural production techniques. Unfortunately, the little space is given to the human resources development or capacity building topics in Turkish AKIS.

Although, the program helps to sustain coordination of different actors in agriculture (Oakley and Garforth, 1992), program preparing tendencies were not found at the intended level in Turkey. Negligence of objective oriented programming causes to weak performance and irregular work loans and disorders in the systems.

Table 4. The variables and national means for Multidimensional Scaling (MDS)

Factors affecting the extension performance	Mean	Extension methods	Mean	Information sources	Mean	Effective actors	Mean	Actors compatibility	Mean
Occupational satisfaction	2.9	Individual interviews	3.9	Books	4.0	Province extension service	3.7	Province extension service	3.9
Economical satisfaction	2.4	Farmers meetings	3.2	Journals, magazines	3.2	County extension service	3.2	County extension service	3.3
Time for Extension activities*	49.0	Visits	3.0	Internet	3.8	Head official of a district	2.3	Head official of a district	2.5
Time for bureaucratic work*	29.0	Brochures	2.4	Other extension workers	3.0	Chambers of agriculture	1.7	Chambers of agriculture	2.0
Time for self-development*	14.0	Posters	2.0	Subject matter specialists	3.5	Farmers' cooperative	1.9	Farmers' cooperatives	2.2
numbers of farm visits**	16.1	Demonstrations	2.3	Research	2.8	Head official of a village	2.4	Head official of a village	2.8
Extension objectives	2.1	Radio, TV	1.6	University	2.5	Farmers	3.8	Farmers expectations	3.3
Issues consulted by farmers	2.4	Notice boards	2.0	Farmers	2.2	Observation of extension worker	4.0	Farmers circumstances	3.1
Rate of adopter farmers*	52.7	Telephone	2.0			Research institutes	2.3	Governmental policies	2.5
Program preparing	3.4	Mobile phone	2.0			universities	2.0		
Facing with pressure	2.6					Input sellers	1.8		
Extension approaches	2.8					Private companies	1.8		
						Traders	1.6		

*percentage; **numbers

The study puts forth that face to face communication methods are intensively utilized, but digital aids have limited use. There are some weekly programs on local radio and television channels for informing farmers about farming practices. The notice

boards are mostly located in public places such as coffeehouses, village administration offices. The plant protection applications are mostly declared via the notice boards in the villages. Recently, cell phones and mobile phone text messages were became the

important instrument for informing farmers about plant protection applications, the weather reports in some extension services.

Information and Communication Technologies (ICTs) have considerable potential to deliver a number of benefits that enhance the process of lifelong. The digital extension methods such as internet, e-mail, mobile phone, local radio-TV have limited usage in Turkish extension services.

The actor linkages and collaborations are vital for AKISs. Especially, interaction between research-extension has been weak and is an institutional problem yet to be resolved. According to the findings extension workers mostly interaction with the department of public extension organizations but, they have limited collaboration with farmer organizations, private firms, traders, universities during their activities. NGOs are recognized in developing countries for reaching the poor. NGOs also encourage empowering the local people in rural development efforts (ISNAR, 1998).

Integration of extension services with other AKIS actors

The public extension system generally perceived as an agency for technology transfer, training, increasing income of the rural people through timely supply and services which in turn increases the nation’s agricultural production and also it acts as a two way channel through which it brings farmers problems, needs to the research system for finding solution and developing appropriate technology for the farming community. Whereas, agribusiness firms mostly concentrates on specific crops, which will be useful for their export/processing industries and they concentrate technology transfer to the particular crops with assured market intervention (Christoplos and Nitsch, 1993). An AKIS links all actors to promote mutual learning and generate, share and utilize agriculture-related technology, knowledge and information with the purpose of working synergically to support decision making, problem solving and innovation in a country's agriculture (Roling, 1989; Perez, et al, 2010; Abudu, 2015). Some criteria such as **system integration** (strong linkages between actors), **availability** (knowledge and inputs available to the farmers), **relevance** (adequate information for users) and **institutional sustainability** (sustaining performance over time) can be mentioned as the measures of an AKIS performance (Anonymous, 1990).

According to the MDS analysis, the perception of actor effectiveness in the regional and the national AKISs are quite far from the ideal model (*Stress = .01688*,

RSQ = ,99957 as shown in Figure 1). The pluralistic structure was not established in the systems. Because of weak cooperation and poor linkages among the actors activities, from programming to conducting extension activities are based on the central and top-down structure of public mechanisms in the system. The actors follow their own priorities rather than jointly planning and action. Limited local participation and interruptions on the integration with the markets and private actors are the most important bottlenecks for reaching the ideal AKIS in Turkey.

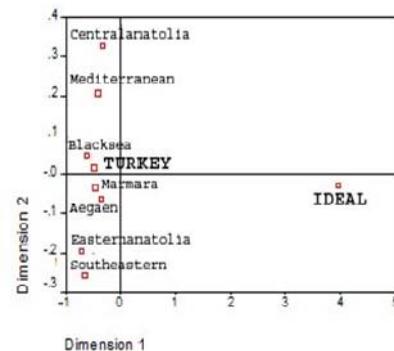


Figure 1. Effective actors in AKIS

Compatibility and the current view of the AKIS

Actor compatibility is another vital element for an AKIS. In the system all the components must act in harmony for increasing performance and creating synergic effects. According to MDS analysis, although, the regional and national structures are similar to each other and all systems are far from ideal model (Figure 2).

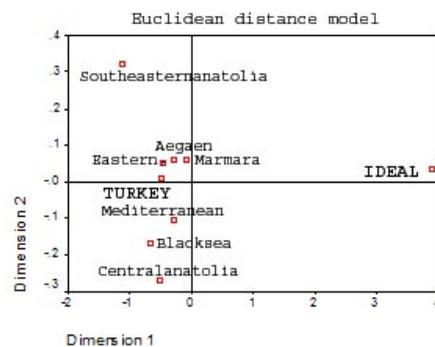


Figure 2. Actor compatibility in AKIS

Priorities of extension services and farmer organizations were found as incompatible in the AKISs. Because of the differences on organizational priorities the actors are moving in the different directions even though they are in the same train compartments. This tendency is decreasing the collaborative and complementary actions, and the performance in Turkish AKIS.

By considering the factors affecting the extension performance, extension methods, information sources,

effective actors and actor compatibility were also investigated in the study. According to the findings the regional and national systems are far from the ideal situation (Figure 3).

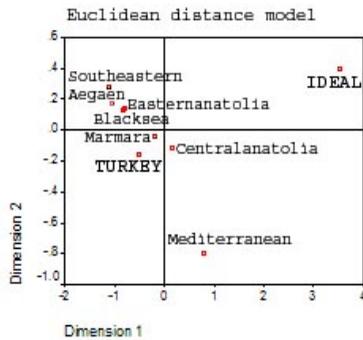


Figure 3. Existing situation in AKIS

Unfortunately, actor relations and cooperation are not at intended level in Turkish systems. Information sources are mostly limited with the public specialists. Top down information flows bound the systems with public research institutes and extension organizations. Leading powers of innovative economies as the universities and other private actors have limited roles and collaborations in the system. According to the information sources of extension workers universities and research organizations were not sufficiently articulated into the systems in Turkey.

Extension methods employed are mostly traditional such as individual, farmers meetings, etc. Limited local participation as a significant bottleneck in the AKISs causes low level adoption and poor linkages between the actors. There are not regular bottom-up processes for defining extension and research agendas. According to Rölting (1988), the best extension systems in the world develop where farmers are organized and able to lobby for the technical assistance which they consider priorital. Farmers have a wealth of agricultural knowledge used in many farm operations that extension rarely tapped. Recognizing and officially acknowledging farmer input in agricultural extension information system can be significant in extension program planning efforts. According to Munyua, Adams, and Thomson (2002), effective partnerships will need to be supported by extension policy that recognizes the potential contribution of each institution in the agricultural development process.

CONCLUSIONS

The improvements in agricultural development approaches and alternative systems are not just a question of technology there are important social, economic and institutional issues as well. Extension's

mission is to develop a holistic and multidisciplinary plan that focuses on agricultural development. In addition, extension must design collective programs by considering the voices from different actors with different expectations.

According to the findings low technology adoption levels, focusing on only production increase, limited farmer/local participation have been emphasized as the common disorders in Turkish AKIS. The important weaknesses of Turkish AKIS can be summarized as below:

- Low occupational satisfaction and motivation levels of the extension workers
- Social and political pressures during the extension activities
- Limited farmer visits
- Weak links between the actors
- Extension activities mostly based on top-down approach
- Farmers, NGOs and private actors have limited effects on preparing and evaluating extension programs
- Actors act with the different priorities
- Extension activities mostly focus on yield and production increases but, limited efforts for capacity building and empowering the local actors in rural

Based upon the findings and recent improvements in the world agenda, some suggestions can be made for articulation of actor relations in AKIS as follows:

- Reaching to the ideal situation, individually extension must employ well educated staff on communication and participatory extension approaches.
- Creating a favorable reward system for the staff motivation.
- By considering the locations more flexible and participatory approaches must be employed in the systems.
- Capacity building must be the priority for creating interactive and sustainable AKIS.
- The recent improvements in agriculture such as sustainable farming practices, health and safety farming skills must be addressed as top priorities during in the planning phase.
- Extension activities must be based on the objective oriented programming approach. This planning procedure will help to define the collaboration and responsibilities of the actors in the system. The work loans of extension staff can be described in the planning phase, too.
- Partnership involving farmers and farmers' organizations between extension services.

- Forming of local advisory committee will support to cooperation between the actors. This structure will create an extensive consultation and cooperation atmosphere in the AKIS.
- Horizontal linkages can entail collaborative arrangements between public and private actors to strengthen their relative advantage in specific information areas.
- Extension is a long term process and needs regular monitoring of the results of activities. Forming an appropriate and multi-stakeholder planning and evaluation process will also encourage the interactions and linkages in the AKIS.
- Usage of information and communication technologies (ICTs) must be supported for

facilitating to participation and collaboration in the system.

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