



Acceleration of Transfer of Findings as a New Strategy the Iranian National Innovation System Lessons from Agricultural Extension in Iran

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Abstract:

The main approach of Transfer of findings plan is based on the work and cooperation of research, extension, education and executive subdivisions, integration and application of the available resources, accelerating transfer of technical advice and findings of research performed in the form of integrated approach taken from participatory and conventional approaches. The plan of acceleration of Transfer of findings using participatory methods and participation of (farmers) in all stages of the program from (assessment) to evaluation leads to fill the gap between extension, research and farmer. Its purpose is generation, adaptation and dissemination of new technologies among farmers and it is one of the subsystems of agricultural knowledge and information system that also considers improvement of different levels of human resource development for farmers. So the aim of this study is to introduce the plan of accelerating Transfer of Findings in the agricultural sector. Information in this article are obtained from review of research done by researchers on agricultural extension system of Iran with a combined review and meta-analytical approach through study of literature, articles, research and other scientific resources.

Keywords: Transfer of Findings, Agricultural Extension, Iranian National Innovation System.

Introduction:

Rapid changes in agricultural knowledge and information and also new approaches in the field of global agriculture including global market liberalization and development of using new information and communication technologies, binds activists in various areas of agriculture particularly farmers to continually engage in learning and teaching for playing a better role in agricultural development. Adoption of the perspective of continuous learning requires learning of new skills, changed attitudes and new ways to collaborate and exchange information (Zamani Miandashti and Malek Mohammadi, 2009). This is realized only with availability and application of consistent research findings as a result of connection between agricultural research and extension in the form of agricultural knowledge and information system (Norouzi et al, 2006). Experts believe that in addition to rapid transfer of innovation from research stations and pilot farms to farmers, especially business farmers (Miller, 2006), the connection between the two parts results in discovery of new problems, making decisions about process and analysis of knowledge, data management, and evaluation of outcomes and extensional activities (Katz, 2005).

The plans of transfer of research findings is one of subsystems of agricultural knowledge and information system in Iran that leads to a deep linkage between elements such as farmers, administrative, research, and educational staff, expert farmers, production associations, and consulting, technical, and agricultural engineering companies. The projects of research Transfer of Findings are executed with partnership of researchers, agricultural extension agents, or farmers for development of technology or its adaptation with farmers' conditions in the form of a plan or project and include research – comparative projects, research – extensional projects and plans of acceleration of Transfer of Findings. (Malek Mohammadi, 2009). The overall goal of the plan is accelerating the transfer of research findings, increase in quantity and quality and sustainable production of agricultural products by accelerating the delivery of

results and technical points, improving productivity and conservation of natural resources in order to produce healthy and clean products. The dominant approach in this plan is based on the work and cooperation of subdivisions, integration and use of available resources, accelerating the transfer of technical advice and research findings that are performed in the framework of an integrated approach taken from the conventional and participatory approaches (Kalantari et al, 2008).

This plan consists of some methods including workshops, training and visits, representative and model farmers' fields and also directive methodology. On the other hand participation of beneficiaries in the process of assessment, planning, implementation and evaluation of programs manifests the use of participatory approaches and methods. Assistance to farmers, especially peasant farmers with performance below average, is realized with the help of expert and advanced farmers using participatory methods such as field school and participatory technology development. In this approach, farmers and researchers, and promoters participate in all stages and activities (Norouziet al, 2006). Therefore the main aim of this paper is to introduce a plan to accelerate the transfer of findings in agriculture and its different aspects.

Agricultural extension system in Iran:

Since the beginning of agricultural activities, there has been a transfer of information from one generation to another. However, systematic and organized extensional activities in improvement of knowledge and skills of farmers are new ones. Today, the process of transferring information happens through a particular organization and this action which once was done only by local and incoherent operations, now has turned into systematic and organized activities (Nourollah Noorivandy and Omani, 2009). In today's conditions, agricultural extension is defined as a system as well as a set of functions. Functions of the extension system includes technology transfer for

sustainable agricultural production, management transfer to mobilize and organize farmers and rural communities and transfer of capabilities for training, human resources development and strengthening local capacities (Ponniahet al., 2008).

Agricultural extension system is a bilinear training - interactive process that uses adults learning techniques with the aim of improving knowledge, change in attitudes and behavior of farmers. This leads to the adoption of new technologies and improvement of skills both for farmers and extension staff, and ultimately, sustainable improvement of farmers' income and productivity (Speranzaet al., 2009). Agricultural extension System is a complete set of organizations that supports and facilitates participation of people in agricultural production in order to solve problems, and acquire information, skills and technologies to promote their welfare and livelihood (Birneret al., 2006). Qamar (2005) argues that agricultural extension system means supply of demand-driven skills and knowledge to men, women and youth using participatory and informal methods to improve their quality of life. At the same definition, agricultural extension system is defined as an informal educational system that meets technical and skill and informational needs of villagers by providing extension al, technical and insight trainings and paves the way to empower and enhance their quality of life and efficient management of production resources (Secretariat of Development of Comprehensive Plan for extension System in Iran, 2002).

Agricultural research extension linkages in innovation systems:

Agricultural research and extension functions are parts of agricultural knowledge and information system or agricultural innovation systems in any country. The effect of relationship between agricultural research and extension staff based on mutual respect and trust in each other's efforts is critical to the success of agricultural production and technology assessment. Extension staff should cooperate with investigators in identification of issues and providing feedback to determine how technology can be

developed in the field (Assadi et al, 2009). Traditionally, agricultural research and extension functions include governmental official research institutions that develop innovation or governmental extension organizations that transfer this innovation to farmers. Over the past decades, considering the variations occurred, broader concepts of extension and agricultural research have been developed. So that a wide range of public and private actors have been involved in these activities. Today beneficiaries such as educational institutions and non-governmental organizations play a vital role in interactions of agricultural research and extension (Plusset et al., 2008).

Different studies and theories about rural and agricultural development indicate the presence of multiple elements in the development process. In all these theories and studies first, the components are connected and second, extension and research agents and farmers are mentioned in all theories. Therefore it can be said that necessary condition for achieving agricultural and rural development is a consistent relationship between extension, research and farmer (Zamanipour, 2001). Agricultural research and extension are components of a similar system that practice within different organizational frameworks. If there is no appropriate and strong link between extension, research and farmers, relying on its means and information, agricultural extension will attempt to implement its own training programs and on the other hand, research sector tries to plan and run its own research projects and producers of agricultural products keep on dealing with their long-standing problems (Assadi et al, 2009). The importance of the relationship between research and agricultural extension sectors to inform farmers and also to find solutions to their problems, in the spreading of innovations to increase agricultural and horticultural products and thus to escape from the trap of dependency and achieve economic independence in agricultural production is obvious. Linking agricultural research and agricultural extension activities should be considered as one of the most important principles of agricultural programs because any failure to

establish any correlation means failure in the transfer and spread of results of research activities outside their borders (Monfared, 2004).

The importance of the relationship between research and agricultural extension as the two sub-systems of agricultural knowledge and information system is to the extent that today efficiency of the whole system depends on better communication between the system elements, in particular, two-way interaction between research institutions and agricultural extension. In other words, in the new definition of the relationship between research and agricultural extension, agricultural research is not the exclusive producer of agricultural knowledge and agricultural extension is not the only deliverer of agricultural knowledge. The interaction between the two bodies and performing related tasks through close cooperation between practitioners of these two sectors are very important (Malek Mohammadi, 2007). Miller (2006) argues that focus on agricultural extension and research is important for three reasons:

- Agricultural research is the platform of increase in agricultural products and food security;
- Fast transfer of innovations from research stations and pilot farms to commercial farmers depends on many factors in the course of research work from researchers and policy makers to farmers;
- Farmers are the main key to all systems;

Katz (2005) describes reasons for the link between research and agricultural extension as follows:

- Collaboration between research and extension to find new things to act;
- Making decision about what should be researched;
- Making decision about process and analysis of knowledge;
- Access to the means of agricultural production;
- Information management;

- Evaluation of the outcomes and impact of extensional activities.

According to Hosseini and Eskandari (2008) the relationship between research and agricultural extension in developing countries is weak and mainly due to the following factors:

A) Political reasons: in developing countries, external pressures (policy makers in government, international organizations, farmers, and private sector) on agricultural extension and research institutions to communicate effectively are at a very low level. Governmental policy makers involve in agricultural research and extension activities only in the crisis and in other cases the intervention is minimal. Farmers of these countries are mainly so poor that are not able to take collective and group actions and do not put pressure on agricultural research and extension for dynamic communication. Private sector in these countries is not so developed that can affect decisions made in agricultural research and extension.

B) Technical reasons: Some of the most important reasons in this regard include low ability of agricultural extension and research staff to produce and develop technology appropriate to farmers' conditions, lack of infrastructure for work in rural areas, weaknesses of agricultural research and extension facilities, research and different methods of agricultural research and extension during production and development of technology.

C) Organizational reasons: The most important organizational barriers include issues related to the organizational structure of agricultural research and extension, topics related to motivation of research and agricultural extension staff, lack of facilities and resources in agricultural research and extension and attitudes and skills of agricultural extension and research staff regarding communication with each other, value of agricultural extension and research work from the perspective of these practitioners. Norouzi and Malek Mohammadi (2007) identified the most important communication

barriers to agricultural research and extension internationally and in developing countries as follows:

- Negligence in creating an effective balance between agricultural research on one hand, and agricultural extension and education on the other hand;
- Failure in recognizing the need to extension initiative in maintaining linkages with research;
- Insufficient number of thematic specialists in the extensional organizations in terms of quality and quantity;
- Cultural gap between researchers and agricultural promoters;
- Centralization of agricultural research and extension organizations in separate ministries or agencies;
- Lack of common units between agricultural research and extension;
- Lack of motivation or poor privileges for cooperation between agricultural research and extension staff in the two bodies; and
- Overly centralized system of agricultural extension.

Mechanisms to strengthening the relationship between agricultural research and extension system:

Mohammadzadeh and Sedighi (2002) argue that two main mechanisms can be proposed to enhance the relationship between agricultural research and extension:

- Organizational and institutional integration between agricultural research and extension;
- Coordination of professional relationships and activities between researchers and extension practitioners.

They went on to argue that although this organizational and institutional integration is necessary, it solely can not solve all problems. Therefore, coordinated and joint

activities between extension and research staff to develop a coherent and systematic business contact between the two sectors is urgently needed. Perhaps the most popular and best way to communicate between agricultural research and extension is union of the two bodies. Such integration of agricultural research and extension is justified so that communication and mutual understanding between research and agricultural extension staff increase due to their proximity. Another explanation is that the relationship and proximity of agricultural research and extension units appear as formation of a joint team between research and agricultural extension (Ali Beigi et al, 2011).

Pezeshkirad and Karamidehkordi(2006) state that in addition to the organizational and institutional integration, we can also use participatory planning and management of research and extension, participatory units, staff contact and coordination, cooperative projects such as meetings, appointments, field days, preparation and production of corporate materials and publications, training of extension staff by researchers and vice versa, farm-level research programs and research / extension systems of the field to strengthen the relationship between the two institutions.

Norouzi and Malek Mohammadi (2007) name organizational integration of research and extension, creation of interfaces, senior researchers involvement in in-service training of extension staff, creation of a common organizational unit, to perform joint field experiments, common locations for both institutions and periodical movement of agricultural extension and research staff as the most important mechanism of communication between these two entities. Hosseini and Eskandari (2008) identified twelve communicative mechanisms of the two agricultural research and extension systems as follows:

Research – extension projects, field days, research Transfer of Findings week, research-comparative plans, collaborative meetings and seminars, the liaison and coordinator officers, co-publishing programs, joint research and agricultural extension meetings,

informal contacts between agricultural research and extension staff, joint workshops, committees for coordination of agricultural research and extension professionals' involvement in research projects.

Research Transfer of Findings Plans:

Research Transfer of Findings plans are executed with the participation of researchers, extension experts or extension agents and farmers to produce technology under title of plan or project and include research – comparative projects, research - extensional projects and plans of accelerating the transfer of research findings that are performed to produce, adopt and spread new technologies among farmers and are considered as subsystems of agricultural knowledge and information system that consider improvement of different levels of human resource development for farmers. Ali Beigiet al (2011) suggest that research – comparative projects, research - extensional projects and field day are considered as projects of research Transfer of Findings.

- 1) Research - Extensional Projects: Joint research - extensional project is a plan in which the results of research projects are completed (in different fields of agriculture) or the results of local research plans are reviewed with cooperation of researchers, extension expert and related executive expert in fields of farmers (in 2 or 3 different farms and different cities) (Kalantari et al, 2008) and its aim is introduction of new research findings to extensional experts and practitioners and also introduction of the problems of production in the agricultural fields to researchers (Department of Agricultural Extension Coordination in Tehran Province, 2012). Department of Agricultural Extension Coordination in Isfahan Province (2010) states the main objectives of the research –extensional projects as follows:

- 1) Economic evaluation of research findings in terms of current production in the region, 2) knowledge of experts and administrative staff and extensional workers of new

projects or discoveries, 3) The researcher's familiarity with the superiority of the new findings with respect to the conventional case in the area and its accordance with the results obtained in research stations and investigation of causes of possible preference or lack of preference and revision in future research projects, and 4) the researcher's familiarity with the issues in terms of farm production and its use in planning new research projects.

- 2) Research - Comparative plan: These plans include tests to determine the applicability of research findings and evaluation of agronomic improvement, breeding, live stresses and environmental stresses on the farm products in order to transfer technology and research findings to farmers in addition to testing the effects of positive and practical recommendations. In other words, the final stage of research occurs in the farm as a single phase or set of factors of breeding and agronomic improvement (Department of Agricultural Extension Coordination in Isfahan Province, 2010) or it might be a plan that is conducted one stage before the end of research with cooperation of extensional agents and research center in the farm conditions in an area of at least 1,000 square meters. The goal is to adapt with the farm conditions (Department of Agricultural Extension Coordination in Tehran Province (2012).
- 3) Field Day: The field day event is held for various agricultural and livestock products and like that with coordination of extension sector and research center at presence of more than 40 farmers of subsidiary cities in order to acquaint farmers with the latest research findings by researchers at research centers. Investigator(s), after presentation as question and answer, respond to the audience questions (Department of Agricultural Extension Coordination in Tehran Province, 2012). Shabanali Fami (2009) defines the field day as a day or days when a successive agricultural area could welcome public visit. The purpose of the field day is providing an opportunity for the agricultural

extension client to personally observe successive farming methods and ask questions.

- 4) Ceremony of Transfer of Findings Week: The ceremony of presentation by the investigator(s) on different topics of agriculture will be held for experts of subsidiary cities and administrative units of the organization in the gathering hall of research center with coordination of the extension and research center of the province in order to raise knowledge of administrative and extensional experts about the latest research findings of agricultural and natural resources research centers (usually one ceremony is held per week)(Department of Agricultural Extension Coordination in Tehran Province, 2012).

The Plan of Accelerating Transfer of Research Findings:

The dominant approach in this plan is based on the work and cooperation of research, extension, education and executive subdivisions, integration and use of available resources, accelerating the transfer of technical advice and research findings that are performed in the framework of an integrated approach taken from the conventional and participatory approaches (Kalantari et al, 2008).The overall objective of this plan is to improve quantity and quality and sustainable production of agricultural products by facilitating the transfer of results and technical points, promoting productivity of production resources and conservation of natural resources in order to produce healthy and clean products, to improve and reform in transferring research and practical findings and make farmers to achieve and believe in the possibility of increasing production through increased knowledge and skills (Department of Agricultural Extension Coordination in Tehran Province, 2012). To accomplish this goal overall objectives of this project are as follows (Norouzi et al, 2006):

- Facilitating the transfer of results and technical points through preparation of local technical guidelines and recommendations and their implementation in large model scale;
- Improvement in the farm management, agricultural productivity and average improvement of agricultural performance;
- Problem detection and identification of needs;
- Stability and continuity of production in the operation units;
- Improving the transfer methods of research and practical findings;
- Making farmers (target group) believe in the possibility of increasing production by increasing knowledge and skills; and
- Considering regional aspirations, focusing on strategic products, regional comparative advantages, marketing and employment.

Methods used to accelerate the transfer of research findings:

This plan consists of some methods including workshops, extensional visits, representative and model fields and also directive methodology. On the other hand participation of beneficiaries in the process of assessment, planning, implementation and evaluation of programs manifests the use of participatory approaches and methods. Assistance to farmers, especially peasant farmers with performance below average, is realized with the help of expert and advanced farmers using participatory methods such as field school and participatory technology development (Norouzi et al, 2006). The methods proposed for transfer of findings in this plan are expressed as follows:

- Use of methods based on information technology: Internet, Teledex, IVR, SMS and etc.(Department of Agricultural Extension Coordination in Tehran Province, 2012);

- Technical -field visits: Technical visits of working groups and farmers will develop transfer of findings towards capacity building and practical learning of methods implemented in the target operation units (ibid);
- Utopian plans (delivered on a large scale) (Shabanali Fami, 2009);
- Workshops: A type of congress in which people come together and discuss about new skills and apply them in practice besides learning them. At a workshop, skill, technique and operation is taught to the participants so that they can immediately put it to work (ibid);
- Educational packages (use of audio-visual means): Toolkit is composed of one or more media in which each media has its own personality. Taking advantage of various properties of media in a learning style and all-round help in upgrading knowledge and skills to specific audiences and extension with an emphasis on self-study, are the main purposes of the educational packages (Norouziet al, 2006);
- Technical - Vocational Trainings: formal or informal trainings to enhance the capability and efficiency of producers and farmers or development of expertise and skill in the subject people in order to provide a suitable basis for obtaining specific job or profession (ibid).

General classification of methods used in the plan of accelerating the transfer of findings:

A) School at Farmer's Field

School at farmers' field is one of the most participative methods used in the rapid transfer of agricultural findings. School at farmers' field is a participatory approach that uses adults learning methods based on experimental and participative learning techniques. Also in this approach, farmers' indigenous and scientific knowledge are combined and it focuses on learning through practice (Davis, 2006).Din Panah et al

(2009) suggest that the school at farmers' field is a new approach in agricultural extension that helps farmers to have full and consistent participation in all stages of innovation and become an expert in their fields. Unlike traditional approaches of extension that concentrate on technology packages for farmers, the school at farmers' field approach includes participatory concepts and considers farmer as a partner to promoter and researcher. Vandenben (2004) knows the school at farmers' field as a form of adult education in which farmers acquire the highest level of learning through observation and experiment (experience) that is usually designed to help farmers in integrated pest management. Neighboring farmers observe and discuss about agro-ecosystems in the meetings that take from planting to harvesting. The simple experiment will help farmers to understand the functional relationships (for example relationships of pests' damage and yield) and in this process farmers develop their own decision-making skills.

Weekly meetings are the main components of this approach that usually take 12 to 16 sessions. The process starts with a short description of the course by the facilitator. Farmers participating in this process are divided into several groups and each group leads what they observe in their learning. Based on the observed results, field analysis is performed and product management decisions are taken together (Hosseiniand SharifZadeh, 2007). Hosseini and Sharif Zadeh(2007) count the following characteristics for this approach:

- All primary learning takes place in the farm;
- Extension staff play the role of facilitators not educators;
- Curriculum is integrated;
- Trainings are subject to seasonal cycles of crops;
- Group meetings are held regularly;
- Group dynamics: team up.

Department of Agricultural Extension Coordination in Isfahan Province(2010) states that the executive methodology of Field School involves three key steps 1) participatory field research, 2) learning agro-ecosystems with the strategy of ecosystem analysis, and 3) management of participatory technology development.

The system of field research is a scientific method based on focus on agricultural environment with the aim of involving farmers in the research process. The process of research and execution in the field research causes other farmers to show willingness to cooperate and implement the plan and take effective steps. In general, the main issue in the field research is that it encourages farmers to cooperate in doing research in their field and makes them informed of collaborative research and increase in the efficiency of their own farm. Unlike the theory of livestock and crops specialists, researchers in the field research management should consider the whole farm as one production system in which factors like biological, agricultural, economic, social, and communication factors are involved (Ghanbari and Golmohammadi, 2006).

B) Participatory Technology Development:

To disseminate innovation and technology transfer, several models and approaches have been proposed that generally can be classified as vertical dissemination pattern and horizontal dissemination pattern. Vertical dissemination pattern is a linear or trickle-down model that some of its sub-patterns are dissemination of selected information that provide specific individuals with specific information and the technology produced at the macro level is transferred to the micro level in order to be applied. In this model, the process of production and transfer of technology is a one-way process. Technology is produced by researchers and provided for agricultural extension in order to be transferred to the users. Weakness of this model is that farmers are not involved in identifying problems and adaptation of the research procedure to the local conditions (Assadiet al, 2009).

To eliminate the above shortcomings the horizontal model and patterns were used. Horizontal dissemination pattern is a systematic model also called interactive or participatory dissemination model. Some of its sub-patterns are the first and the last pattern of farmer or technology transfer from farmer to farmer. Indeed, participatory technology development means recognition of agricultural systems, local knowledge and farmers' prioritized problems in order to avoid mechanical application of participatory approaches (Assadiet al, 2007). The participatory technology development is based on the involvement of beneficiaries in the process of research and development. Goals of empowering participants, increasing the producers' confidence, expanding capacity of innovation and creativity and their ability to experiment and adapt with changes are followed (Shabanali Fami et al, 2004). This approach focuses on efforts aimed at strengthening local abilities for experimentation and innovation, and its methodology consists of (Assadiet al, 2009);

- Achievement of a common understanding of the main features and changes in particular agro-ecosystem;
- Addressing prioritized issues;
- Local test of options derived from indigenous knowledge; and
- Strengthening empirical capability of farmers and relationship between the farmers.

Shabanali Fami et al (2004) expressed the main steps and actions of participatory technology development as follows:

- Diagnosis of the problem: At presence of the producers, real problems of rural communities are reviewed, causal relationships among the issues are determined, measures to reduce the impact of any problems are described, the highest priority is chosen, actions or solutions are recommended for the future.
- Experimentation: The selected solution is implemented in practice. This is done at farms of research institutes or in the farmers' fields.

- Evaluation: Producers will determine which technology is appropriate and tailored to their circumstances and identify its causes.

Content and subject of the research findings in the plan of accelerating of findings the content of the intended activities in the rapid transfer of data includes the results of applied research or technical experiences or adapted and tested local knowledge. It is tried to divide a set of findings and technical recommendations in the context of a theme or product based on regional priorities and needs of beneficiaries and put them in practice in the target operational unit. It is evident that the effect of several factors or technical advice and research findings is more than one factor in increase of quantity and improvement of quality of products and increase in productivity and efficiency, and this is one of the most important indicators of this plan in comparison with previous methods of Transfer of Findings. Subject and product are determined based on the priorities of the sub-sectors agriculture, horticulture, cattle breeding, processing and complementary industries, natural resources and fisheries and considering regional priorities and capacities. Technical advice and contents are determined according to needs of utilization units of each region (Norouzi et al, 2006).

Conclusion:

Agricultural extension is a term with broad interpretations. In fact, it can be stated that extension is a dynamic concept i.e. its interpretation is always changing. What is understood from agricultural extension is science of changing behavior, knowledge, attitudes and skills of farmers to adopt new agricultural techniques or technology. Relation of agricultural extension and research is a bed for effective performance of agricultural extension. This communication takes place through different models from traditional models, without participation of farmers, to participatory models. What makes participatory models important in this field is farmers' participation in all stages

of research and its dissemination and loss of excellence vision in agricultural researchers. The plan of accelerating transfer of research findings using participatory methods and participation of beneficiaries in all stages of the program from assessment to evaluation leads to fill the gap between extension, research and farmer. The plan of transfer of research findings includes research-extensional projects, research – comparative project, field day, Transfer of Findings week, and plan of acceleration of Transfer of Findings. In the plan of acceleration of Transfer of Findings, extension and research agents and farmers work together and coordinate their activities from start to the end. So that cooperation and coordination of these three factors lead to the desired result like new farming methods or technologies that will extend throughout the region. Methods used in the plan of acceleration of Transfer of Findings include school at farmer's field approach that uses methods and techniques of adults' education to turn farmers into skilled thematic managers in the field. In this approach farmers, along with researchers and extension agents, are involved in the activities from the beginning to the end. For this reason, this approach is based on farmers' indigenous knowledge and modern research knowledge. Also participatory technology developments horizontal or participatory dissemination pattern that leads to development of appropriate and practical technologies by agriculture participatory research. In this type of development, farmers provide their indigenous knowledge about local farming systems and practical skills and on the other hand, researchers share their scientific knowledge and expertise.

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