

TECNOLOGY TRANSFER FOR SUSTAINABLE WATER RESEARCH DEVELOPMENT IN DEVELOPING COUNTRIES

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ABSTRACT

The importance of introducing efficient and sustainable use of water for irrigation has been recognized for a considerable time and a range of technologies has been developed to improve water use efficiency at farm and system level and to ensure the sustainability of irrigated agriculture. The introduction of appropriate irrigation techniques and practices both at scheme and farm level will require a major focus, in which not only the technique and technology itself will be important but much more the process of introducing the technology into the farmers' fields. In this paper, agricultural extension services and technology transfer strategies used in Turkey and developing countries have been evaluated and suggestions are made for successful technology transfer programs and extension services.

GELİŞMEKTE OLAN ÜLKELERDE SU KAYNAKLARININ GELİŞİMİ İÇİN TEKNOLOJİ TRANSFERİ

ÖZET

Suyun etkin kullanımının önemi uzun yıllardır bilinmektedir. Sulu tarımın sürdürülebilir olması bakımından suyun gerek tarla ve gerekse şebeke düzeyinde etkin kullanılmasına yönelik çok sayıda teknoloji geliştirilmiştir. Şebeke ve çiftlik düzeyinde uygun sulama teknikleri ve uygulamaları önemli olmakla birlikte yeni tekniklerin ve uygulamaların çiftçilere ulaştırılmasında kullanılan yöntemler de çok önemlidir. Bu makalede Türkiye'de ve gelişmekte olan ülkelerde uygulanan teknoloji transfer stratejileriyle yayım hizmetleri gözden geçirilmiş ve sulu tarımın sürdürülebilirliği bakımından bu konularda alınması gerekli önlemler verilmiştir.

INTRODUCTION

The introduction of appropriate irrigation techniques and practices both at scheme and farm level will require a major focus, in which not only the technique and technology itself will be important but much more the process of introducing the technology into the farmer's fields.

Technology Transfer Programs in Irrigation

The importance of introducing efficient and sustainable use of water for irrigation has been recognized for a considerable time and a range of technologies has been developed to improve water use efficiency at farm and system level and to ensure

the sustainability of the irrigation system. Such improvements typically include system improvements by canal lining and regulating structures, appropriate field irrigation methods, the development of irrigation water delivery models at field and system level, salinity control measures and drainage systems, and crop diversification and intensification programs. Various research institutes and numerous projects have developed and tested a range of potentially promising approaches and technologies.

Even if the results have proven their value and relevance in the experimental field or pilot area, their application and adoption in the farmers' field have been often disappointing (1).

Unless an adequate mechanism and appropriate procedures are established to introduce, test, demonstrate and adopt the use of promising new technologies at system and field level, most efforts to achieve a greater sustainability water resources utilization are doomed to fail.

Unfortunately, too few irrigation scientists are interested, trained or given the means to become involved in the often cumbersome procedures of introducing new techniques in the field. This problem is particularly pronounced in developing countries, efforts have been made to introduce better water management techniques at farm level. Four different categories of such technology transfer programs may be distinguished (2):

- The agricultural extension approach.
- The on-farm water management approach,
- The participatory water users approach,
- The irrigation research approach.

THE AGRICULTURAL EXTENSION

Agricultural extension services over the past 30 years have played an important role for disseminating new agricultural technologies to farmers. There is no doubt that agricultural extension has played a crucial role in the often impressive increase in agricultural production. For example, Farmers Training Service, ÇES, has played considerably important role in irrigated agriculture in the Lower Seyhan Plain in Turkey (3).

The extension service seldom takes new irrigation techniques and technologies as a topic to be introduced through its extension program. One reason is that the agricultural extension services already short of adequately trained subject matter specialists have in general no or few staff adequately trained in water management, even in cases where water management is recognized as an essential element in agriculture.

Another important reason is that in many cases the irrigation department, responsible for irrigation development but often situated in a different ministry, is considered the competent agency for these types of activities. Inter-departmental competition often excludes the extension service from effectively participating in an irrigation technology transfer program.

ON-FARM WATER MANAGEMENT PROGRAMS

A number of on-farm water management projects were implemented in several countries with the specific aim of introducing better water management techniques and

practices at farm level. For various reasons, however, in many of the on-farm water management programs the main emphasis was left on the physical aspects of irrigation development. Construction of hydraulic structures and land leveling implemented by engineers and construction companies formed the core of activities. Systematic efforts to ensure and sustain the introduction of improved water management practices were unfortunately few.

WATER USERS' PARTICIPATORY PROGRAMS

Low performance of irrigation projects was increasingly linked with inadequate involvement of farmers in the design and implementation process. The establishment of water users' groups or water users' associations (WUJA) as a representative body for farmers evolved as the more successful procedure to involve farmers and to secure their co-operation and participation in the irrigation development process.

The transfer of responsibility to farmers' groups of at least part of the operation and maintenance of the scheme became an important additional consideration for the promotion of the WUA, as increasing burden for O&M of the irrigation system on public funds proved increasingly difficult to maintain. Realizing the financial independence and satisfactory performance of traditional irrigation systems, governments have increasingly promoted the establishment of WUA, as in transferring management and maintenance responsibilities to the users with the aim of reducing public expenditures in irrigation and improving the performance of the irrigation systems by a greater farmers' involvement (4).

Good results have been reported from areas where farmers, mostly under specific pilot programs and with adequate socio-technical support, have been able to form viable WUAs.

Expanding such programs successfully on a wider and national scale has proved to be a more difficult task. Sustained support to farmers' associations, a strong legislative framework and a consistent national policy are essential conditions to bring about a sustainable transfer of responsibilities on a national scale.

The main emphasis in the water users' programs has been on the institutional and management aspects of the associations; less attention has been paid to the introduction of good water management techniques as part of the effort to transfer responsibilities to the farmer-controlled irrigation system.

IRRIGATION RESEARCH PROGRAMS

The main task of irrigation research institutes and projects lie in the development of appropriate techniques and technologies in irrigation and water management. Where researchers are also purposely involved in the process of introduction of the techniques in the farmers' fields, they can play a very successful role in the process of technology transfer.

The process of adaptive research where new technologies are tested and adapted to local conditions and the farming system should be seen as an essential aspect of irrigation research.

The beneficial role of involving research and educational institutes in the technology transfer is successfully applied in the USA where universities may assign their staff the triple task of research teaching and extension. Here the essential link between research and extension is fully exploited as the researcher is directly confronted with the need for appropriate technologies and the constraints adopting these at the field level. The benefits are clear for both parties, as farmers will directly profit from new research findings while the researchers will be confronted with realities and problems in the farmers' field and direct their research efforts to solve these problems.

Large irrigation and water distribution authorities may also employ their own research staff, ensuring that the adoption of new technologies is integrated into the development of new techniques and technologies.

Commercial firms, providing agricultural inputs to irrigated agriculture, including irrigation equipment, or producing commodities from irrigated agriculture, can be successfully involved in the development and introduction of improved irrigation and water management practices. The link between adaptive research and irrigation extension is clearly established here, too, as efficient water use is directly linked to better production and higher profits.

Main Elements of Irrigation Technology Transfer

The technology process proves a crucial element in each irrigation development program. No standard solution can be provided as each case proves to be specific to the typical institutional, technical and agro-ecological conditions of a given country. The development of appropriate procedures for technology transfer program adapted to the local conditions therefore forms an essential element in the success of any technical assistance program.

Process of Technology Transfer to the Farm

The staff and agencies involved in the introduction of improved water management are essential elements in the process of technology transfer. Technology transfer is an integral part of the development. Any development program should include as inherent part of its program a mechanism to test, adapt, demonstrate and introduce new techniques and methodologies in the farmers' fields.

The process of introduction of new technologies into the farmers' fields requires careful analysis and preparation of a detailed program to ensure a successful and sustainable transfer. The support services to be provided by which institutes and agencies are to be determined, while approach and methodologies for farmers' involvement need to be determined and may include mass communication, group activities and individual approach (5).

An individual approach seems most appropriate in developed countries while in developing countries a participatory group approach is preferable in view of the number of farmers and the social coherence of the group.

Appropriate and adequate government resources and policies should be available to ensure and sustain support services for the transfer programs.

Institutional Framework for Support Services

The agencies and institutes entrusted with the task of technology transfer have an important role in providing the appropriate support services to farmers.

Traditionally, the agricultural extension service has been a competent agency given the responsibility of technology transfer at the farm level. Its lack of specific technical knowledge in irrigation and water management has proved a major constraint in the introduction of irrigation technologies. The irrigation agencies on the other hand have little experience and interest in providing effective support to farmers.

Establishment of a separate irrigation extension agency may prove to be a great burden for an already overcharged public administration service. The role of semi-public and private organizations in providing paid or partly paid support services to farmers may provide an attractive alternative.

Each country will require its own solutions in finding optimal institutional framework for technology transfer in irrigation.

The training of staff involved in irrigation development and technology transfer will be in many ways the key to the introduction of new technologies in irrigation, especially in water management.

To be successful, a technology transfer program requires careful design and planning. Close monitoring and continuous evaluation of the transfer progress are required to indeed come to a successful strategy.

Appropriate and adequate government policies and strategies should be established to ensure the necessary resources and legislation to support the technology transfer programs. Whatever program is defined, its feasibility and sustainability will be determined by its cost effectiveness. Any public expenditure either for government staff providing support services or subsidies for improvement works should have relevance on the expected benefits. Any program should promote the principle of self reliance of farmers in operation and maintenance of irrigation facilities.

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