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RECHERCHE / RESULTS

IRRIGATION RESEARCH AND EXTENSION NEEDS IN DEVELOPING COUNTRIES

S.K. AGODZO, University of Science and Technology, Kumasi, Ghana

ABSTRACT: *This paper discusses irrigation research and extension needs in developing countries, emphasizing the fact that farmers and irrigation scheme managers must have access to reliable knowledge that will enable them to achieve outputs equal with the resources being used. Potential irrigation research areas are identified, problems hindering research discussed and finally emphasizing the need for effective extension services in irrigated areas. Considering the agriculture-based economies of many developing countries, the need for irrigation research and extension is an important fact which, if ignored, could have serious long-term consequences on such economies.*

1. INTRODUCTION: If irrigation were only water storage, lifting, conveyance and distribution, water supply companies should be the right organs to do the job and there would not be the need for other specialized agencies to do the job of irrigation. Like any other industrial use of water, irrigation does not actually start only at the farm or place of use. The fact that many irrigation development projects in the developing countries start with huge water supply systems, makes many people, including the politicians, place wrong emphasis on the water supply component of irrigation development, neglecting what happens to the water when it gets to the field. This belief makes it sometimes impossible for such projects to be managed because of rivalry among certain groups of professionals on such projects, usually leading to poor project performance.

The poor performance of these "beautiful" engineering rather than agronomic achievements have been the subject of concern and criticism in many circles and even though it is easy to point out certain problems, there are still a lot of things yet unknown. A number of reasons have already been advanced for the failure of these projects but the fact still remains that many of the problems are location specific. That is why irrigation research in the developing countries should be a subject of priority since many of these countries are still grossly underfed even under irrigated conditions.

It is essential that farmers and irrigation scheme managers have access to reliable knowledge that enables them to achieve outputs equal with or greater than the resources being used. Tested crop varieties, the potential for indigenous and purchased inputs, and crop husbandry practices suitable for irrigated conditions must be known (FAO, 1986). Agronomic research and other research activities can make a major contribution to each of these.

It will be in the best interest of the irrigator to build up his own combination of innovations as experience and economics dictate. On-farm research must therefore be able to deliver knowledge applicable to farmers' conditions, which are very different from those on research stations.

Also, it is not enough to just develop a new technology; how effectively this is communicated to the user is another question, hence the need for effective extension services in irrigated areas.

2. IRRIGATION RESEARCH: The first step towards research is to identify priority areas which need to be investigated and how this is achieved depends on the individual or group of people carrying out the research since different people could view the same problem differently.

Broadly speaking, the following areas of research in irrigation could be easily identified:

1.Socio-economic aspects of irrigation.

2.Agro-hydrology and irrigation water management.

3.Irrigation agronomy.

4.Education and training in irrigation.

5.Irrigation systems design.

2.1. **Socio-economic aspects of irrigation**: Irrigation is far more than an exercise in engineering and agriculture and it should be realized that when an irrigation project is newly introduced in a rural community, ancient values may be set aside and money consciousness appear where none existed before (Withers & Vipond, 1983). In this regard, it is important to fully understand what the objectives of the small farmer and the rural subsistence economy are all about and where there is need for social changes, how this should be done to achieve the best results. It is not uncommon to find irrigation projects appraised purely on an economic basis. (Agodzo, 1987) pointed out that even though this is important, it should be realized that such pertinent issues as land tenure, resettlement, disease and water management problems, should be looked at in the context of the overall irrigation development.

In the rural subsistence economy, suggested that agricultural activity is a way of life, dictated by or subject to the changes of nature. Unlike the huge commercial farming ventures which aim at profits, the objective of the subsistence farmer is to provide food security for his family. He is not under any real pressure to do this but he makes sure that he provides enough food to last the family until the next farming season. The farmer measures time by the activities that are governed by such natural changes. He has acquired enough skills to know how to minimise the risk of failure due to natural changes (Devred, 1981). The introduction of irrigation is to bring socio-economic progress and in the face of such well established practices, it is important to learn to strike a compromise between the objectives of the traditional and the "progressive" groups.

The task facing the researcher here will be the development of methodologies to achieve effective farmer participation in planning, development, construction and management of large and small schemes.

Since irrigation is basically a cooperative undertaking because it involves the sharing of a limited resource among numerous users, the researcher could look into how best the following roles could be performed by the farmer's groups to achieve better irrigation management:

1.Proper maintenance of canal systems.

2.Ensuring regular payment of irrigation service charges.

3.Preparation of water delivery schedules in consultation with the project officers.

4.Assisting in the detection of unauthorized irrigation.

Research into achieving effective cooperation between water users on irrigation projects will, therefore, be useful in achieving better irrigation management since it is rare to find a case where a single water user's interest does not impinge on that of a neighbour.

2.2 **Agro-hydrology and irrigation water management:** Agriculture is the largest consumer of water in the world and accounts for some 80% of global water consumption (Biswas, 1978). Whilst the emphasis is on irrigated agriculture, effectiveness and efficiency of water supply use is important in achieving best results. Most of the irrigated agriculture in the African region, for example, depends on surface water. However, surface water supplies vary tremendously in Africa with less available surface water per unit area and higher evaporation than most other regions of the world (Biswas, 1986). Groundwater accounts for some 20% of the total water resources of Africa but only about 10% of the land lies over high-yielding aquifers. The occurrence of groundwater is localized because of climatic and

geologic conditions. Fewer areas have extensive shallow groundwater which is comparatively more economic as well as quicker to develop.

The fact is that there is a lack of adequate and reliable hydrological data coupled with the general weakness of the statistical reporting systems in most developing countries. There is, therefore, the need for agro-hydrological research studies aimed at improving the water and other resource data base and this should include establishment of suitable methodologies for collecting and analysing data (Agodzo, 1987).

Improper irrigation may waste large quantities of water and leach out soil nutrients, and yield losses may occur if insufficient water is applied to crops. Water for irrigation and other uses will be limited, due to an increasing cost of irrigation projects and a limited supply of good quality water. Therefore, we must learn how to prevent waste of irrigation water to avoid land degradation and bring about its improvement for maximum production. Surface irrigation is still the most extensively used irrigation method in the developing world today with notoriously low irrigation efficiencies of about 40%. This means that field water losses are very high and thus provide a water management problem to be solved through conscientious research efforts.

2.3 **Irrigation agronomy:** As explained by Doneen and Westcot (1984), improving irrigation practices would be much easier if we could see below the soil surface and observe what is actually taking place: i.e., how rapidly the water moves downward and laterally and how far it penetrates the soil; what happens when it reaches a hard soil layer; how and where the water is stored; how it is removed from the soil by the plants; and the rate of removal and other underground conditions.

On the other hand there are such questions as: how rapidly does the plant transpire; what is the rate of evaporation from the soil surface; what is the influence of the weather on these processes; and should irrigation scheduling be achieved through soil, plant or weather monitoring or a combination of these factors ? In fact there is a lot to be learned about the soil-plant-atmosphere system. Further investigation into these aspects of irrigation will help in better irrigation management. The negative effects of land degradation due to over-irrigation and mis-application of chemicals are possible areas of investigation so as to avoid the risk of losing the productive potential of the land.

2.4. **Education and training in irrigation:** This aspect of irrigation research could be concerned with development of training methodologies for effective farmer and irrigation staff training programmes. This means that appropriate extension methodologies or rather effective communication techniques should be developed to facilitate transfer of research knowledge to the farmer. Also, monitoring and evaluation techniques could be developed as research tools to study the performance of irrigation systems so that management can take timely corrective measures based on data collected (Agodzo, 1987).

2.5 **Irrigation systems design:** Most of the existing irrigation systems, that is the "hardware" of irrigation, have been criticized for lack of flexibility in the operation of the systems. The arguments, usually, are that the irrigation system design should take into consideration the user of the system and that the level of sophistication of the system should depend on the ability of the farmer to use it.

Research here could be directed towards better systems design, with built-in flexibility and at reasonably low cost. Simplicity of these systems is important for easy operation by the farmer.

3. FUNDS FOR RESEARCH: Funds for research have always been a major problem in the developing countries and most people in research are under-utilised because of limitations on funds and equipment. It is estimated that whereas the North uses as much as 2.0-2.5% of their GNP on Science and Technology (including research and development), the South uses as little as 0.2%. Surprisingly, the corresponding figures for Defence, Education and

Health do not show the same order of magnitude difference. They are, 5.6% versus 5.6% for Defence; 5.2% versus 3.8% for Education and 4.8% versus 1.5% for Health for North and South respectively (Salam, 1987).

Running largely agriculture-based economies with little money input for research to support it will have a negative effect. This argument also holds true for irrigation research.

Irrigation project leaders must have the will to allocate substantial amounts of their project income to research in order to improve the performance of their schemes. Also, other national and international sources could be explored for funds but this means that good and convincing research proposals should be put forward in order to attract funding. Government sources for money are minimal, probably because of the under-estimation of the importance of research or that the money is just not there.

Researchers themselves must show some originality in their approach to solving problems. For example, certain simple research equipment and tools can be developed locally instead of totally relying on the importation of every single item from abroad before some work is initiated. Technology in the developed world is moving at such a rapid pace that is does not take long for a piece of equipment to become obsolete. In this case, it is easier to move forward when building on one's own technology than relying totally on imported technology. A piece of equipment must be imported only if it is too specialized and if the local capability to develop this equipment is not available. Even today in the more developed countries, governments are reorganizing every sector of their economies, including the research sector, in order to make them more resourceful and cost effective. This sets a good example for the developing countries.

4 IRRIGATION EXTENSION: Extension provides a two-way link between sources of knowledge, including research stations on the one hand and the farmer on the other. In most developing countries, extension leaves much to be desired. Its role is not understood, its importance is under-estimated and therefore it is under-funded (FAO, 1986). Irrigated areas are no exception; indeed irrigated areas may suffer, especially if extension is introduced at too late a stage in the project implementation sequence, which may be a good reason for early failure of the farmer and his subsequent frustration.

While the extension task is relatively straightforward in a well regulated mono-culture scheme, in most cases it will be much more complex than that encountered in rainfed farming (FAO, 1986). As the use of irrigation spreads, more extension workers will have to become familiar with the problems it poses for the irrigator and the opportunities it creates.

4.1. **Improving farmers' skills:** Farmers must understand the technology that is available to them. There is thus a strong case that can be made for farmers' training programmes which are linked to those innovations likely to be useful. However, there is no substitute for experience and the inventiveness that farmers show when faced with new challenges. Wherever possible, it is in the best interest of irrigation schemes that farmers' experience and skills be given the opportunity to expand.

This means that the extension worker must not only teach but learn to listen to what the farmer has to say.

5. RECOMMENDATION: Irrigation research and extension programmes initiated in many developing countries, have been fairly limited in scope, discontinuous and dispersed, according to FAO (1986).

It is important that technical, social, institutional and economic issues of irrigation research and extension be addressed by giving priority to the following:

1.Development of methodologies to achieve effective farmers' participation in planning, development, construction and management of both large- and small-scale schemes.

2.Initiation of research into ways to reduce cost and/or improve the benefits of irrigation schemes.

3.Research into impact of irrigation on environmental matters such as crop diseases, human health and farming systems.

In order to improve every aspect of the irrigation database for better management of irrigation schemes, there is the need for governments in the developing countries to formulate sound national irrigation policies towards increased research and extension.

6. CONCLUSION

It will be next to impossible to enumerate all the possible aspects of irrigation research and extension in this paper alone but the issues as presented here are intended to arouse interest in the subject for future action by those who share the concerns of the deteriorating food situation in constrast to the increasing populations in the developing countries.

The need for irrigation research and extension cannot be over-emphasized, considering the agriculture-based economies of many developing countries today. To ignore this important fact, will definitely have serious long-term consequences on such economies.

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LE PROGRAMME IRRIGATION DE L'INSTITUT D'ETUDES ET DE RECHERCHES AGRICOLES DU BURKINA FASO (INERA)

Youssouf DEMBELE

La recherche, en matière d'irrigation, à l'INERA, est rattachée au programme ESFIMA (Eau, Sol, Fertilisation, Machinisme Agricole). Avant la mise en place de ce programme, la recherche, dans ce domaine, se faisait au sein du CERCI (Centre d'expérimentations du riz et des cultures irriguées), une structure nationale, financée par la FAO, qui a commencé ses activités vers les années 1970.

Si les aspects agronomiques et variétaux, par exemple, comportaient un volet important, en revanche, l'irrigation était négligée. L'on apportait de l'eau, l'on récoltait, puis, à la fin, l'on disait : voilà, si on transpose les cultures pluviales en condition irriguée, voici les rendements qu'on obtient. C'est ainsi que cette lacune a été décelée, au début des années 1980. En 1982-83, la section irrigation a été créée au sein du CERCI. Avec la mise en place des programmes nationaux de recherches consécutive à la restructuration de l'INERA, et avec la fin du financement du CERCI par la FAO, l'irrigation a été intégrée au sein du programme ESFIMA. Compte tenu du fait que nous avons toujours travaillé avec le CERCI sur le riz l'essentiel des activités de ce Centre avaient trait au riz et aussi au blé, au maïs et au sorgho, mais le riz constituait 50 % de ces activités et bien que nous soyons ad-