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65. THE ROLE OF BILATERAL AGENCIES IN WATER AND WATER POLICY IN WORLD FOOD SUPPLIES

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INTRODUCTION

Water resources have been a major factor in enhancing the economic and social development of the United States. Many of you may be keenly aware of the role water conservation and use have played in the western part of this country, not only in relation to agriculture, but to energy and domestic and industrial development. Water has played a different but equally significant role in the more heavily populated and industrialized eastern United States where environmental quality and health issues tend to dominate.

With our own development experiences in mind, it was only natural that from the inception of the Point Four program, in 1949, water considerations have been a major part of the bilateral aid program of this country. Irrigation projects, for example, have dominated our aid water efforts, but significant attention has also been given to power generation, flood control, and health and sanitation issues.

In the 1950s and 1960s, our technical cooperation program placed primary emphasis on the development of numerous irrigation projects. In cooperation with other donors we helped accelerate the worldwide increase in land under irrigation from 94 million ha in 1950 to about 261 million ha today. Most of this increase, of course, occurred in the developing countries.

Initially, most of our resources were used to finance capital construction. We helped design and build large dams and major distribution canals. The emphasis was on engineering, the aspect which we thought required priority consideration. We paid less attention to the institutional, management, and on-farm distribution aspects, perhaps assuming that the developing countries, utilizing their own cultural mechanisms, would take care of these other problems.

CONSTRAINED IMPACT OF SOME NEW SCHEMES

The irrigation schemes which we and other donors helped construct have had a remarkable and positive impact on food production and power generation in the developing countries, especially those in Asia. But in general they have been much less successful than was originally anticipated. Today, far less land than was planned is irrigated by new projects, and power production is likewise below design levels. I am sure you have devoted much time at this conference to ascertain why performance has been far below expectations. I will not attempt to enumerate all the factors which have influenced this performance but instead will identify a few major lessons AID feels have been learned over the past thirty-five years in water conservation and use. These lessons have helped determine the nature of the current programs which the U.S. Agency for International Development is supporting. They have called to our attention the fact that several criteria must be met if effective and sustained water conservation and utilization systems are to be developed. This is true whether we are discussing water for agriculture, health and sanitation, flood control, or power generation.

I would like to focus on three major lessons we have learned and show how our current programs are responding to these lessons.

THREE MAJOR LESSONS

Scope of Development

First is the recognition that the development of a water project involves far more than the construction of a dam and power plant and of major distribution canals. All aspects of water use must be considered, especially the management of the system and all its parts. This lesson has had a major impact on the nature of water projects we support. We now leave to the World Bank and other donors most of the responsibility for supporting major capital construction projects. We focus our efforts, through some 120 irrigation projects, on such activities as:

1. Improving the performance of *existing* systems rather than creating new ones.
2. Strengthening existing water-related *institutions* in host countries.
3. Initiating and supporting training courses to educate technicians on improved management techniques. Thus far, such courses have been held in India, Pakistan, Nepal, Sri Lanka, Bangladesh, Bolivia, and Peru.
4. Holding two senior officials workshops, one in Colorado and one in India. The decision makers must recognize the wisdom of a total systems management approach.
5. Holding eight *diagnostic workshops:* three in Sri Lanka, three in India, and one each in Nepal and Bangladesh.
6. Making seven *irrigation sector surveys,* in India, Nepal, Bangladesh, Thailand, Sri Lanka, Peru, and Haiti.
7. Making a major irrigation strategy review in India.
8. Developing handbooks and operational guides with primary emphasis on water management.
9. Provision of design assistance, especially on the modification of existing systems to provide more efficient on-farm delivery of the water. Much of the technical assistance for these activities is provided through our Water Manage-

ment Synthesis II project, which has a global mandate as well as a special focus on Asia. The project involves several U.S. universities and cooperators oversees and there is great demand for the services being offered. The project is now increasing its attention to African irrigation development problems.

Irrigation System Components Other than Water

The second lesson we have learned is that irrigation systems often do not meet expectations if they focus only on water and its conservation and utilization. From experience in Asian agriculture, for example, we have learned that much the success of new irrigation schemes has been due to the concomitant availability of high-yielding and pest-resistant varieties of wheat, rice, and maize along with the greatly expanded use of fertilizers and, in some cases, pesticides. Through our support for national agricultural research programs, international agricultural research centers, and U.S. universities we have helped develop these high-yielding technologies, which, in turn, have increased the effectiveness of the irrigation systems. We have also placed emphasis on the need for fertilizers to utilize more fully the yield potential of the new varieties. Without additional fertilizer inputs the miracle cereal seeds would have had little impact with or without irrigation. Likewise the seeds and fertilizer alone would have had only modest impact without irrigation water.

User Involvement

A third lesson suggests that water systems are most succesful if there is at least some involvement of the potential users of the system from the very beginning of project development. Likewise, the most successful systems involve these users and their institutions in basic decisions as to how the system is to be managed and financed. I am certain this point has received adequate attention at this meeting.

A number of AID projects focus on the involvement of users early in the process and more completely than in the past. We encourage greater farmer involvement by helping to establish and operate water users' organizations. We also help develop better communications between farmers and government officials. Specific farmer involvement activities include:

1. A joint workshop with FAO in 1984 on farmer participation in irrigation water management.
2. Assisting efforts to organize a water users' association in Sri Lanka.
3. Training Pakistani extension personnel to organize water users' associations.
4. Studies of macroeconomic public policies which influence a farmer's ability to profit from irrigation.

SPECIAL CONSTRAINTS IN AFRICA

Unfortunately, most of the conditions which have led to at least some degree of success in Asian water management projects are missing in much of Africa south of the Sahara. High-yielding food crop varieties adapted to African conditions are only now being developed. Fertilizer use is lower by far in Africa than in any other major food producing area. Human and institutional developing is generally not as well advanced as in Asia. Furthermore, Africa has a much lower overall water availability per hectare in Asia or Latin America.

As a consequence of these facts, irrigation projects in Africa generally have been only marginally successful at best. New irrigation schemes often supply water to only a fraction of the land area for which the project was designed. In many of these cases the actual costs per irrigated hectare are astronomical.

AID has recognized these conditions in Africa and is taking steps to help change them. While our direct involvement in major irrigation schemes is not too great, we are trying to help Africa develop other technology packages. For example, we provide about $100 million annually to support agricultural research efforts in Africa. Most of this support is made available to national research centers. Some, however, is provided through five International Agricultural Research Centers (IARCs) and several U.S. universities that are involved in collaborative research support programs (CRSPs) on major food crops and farm animals. While progress has been slow, significant results have been achieved. For example:

1. A new drought-tolerant hybrid sorghum has been developed and released.
2. New high-yielding maize hybrids are in wide use in Kenya and Zimbabwe.
3. New pest-resistant cassava and cowpea varieties have been released.
4. A new biological system has been developed to control the cassava mealy bug.
5. Potential vaccines for East Coast Fever of cattle and for pleuropneumonia in goats have been developed.

Much of the collaboration with national research centers is through research networks coordinated by IARCs or U.S. universities. We are working with other donors to expand these research networks.

If Africa's food production is to be increased significantly, fertilizer availability and use must grow markedly on that continent. Worldwide, increased crop production has been closely correlated with fertilizer use as well as with increases in irrigated land area. There is no reason to believe that this situation will not prevail in Africa. Consequently, steps must be taken to help the Africans provide sufficient fertilizer for food crops. The experiences of Asia and Latin America which clearly demonstrate the symbiotic effects of fertilizers and water must be heeded in Africa.

Another aspect of water management which must receive priority attention, particularly in Africa, is water management on unirrigated drylands where most of the crop production occurs. Innovative soils and crop management systems must be developed to capture rainwater and keep it in the soil to support crop growth. Farming systems research using so-called alley cropping is showing considerable potential. Leguminous trees and shrubs are grown in rows along with food crops. When properly fertilized with phosphorus, the trees and scrubs can enhance resistance to runoff and erosion while simultaneously, through fallen leaves and other residues, providing a mulch to reduce evaporation

losses from the soil surface. We are supporting research on alley cropping at two international agricultural research centers and at national centers in cooperation with a cropping systems research project involving a number of U.S. universities.

AID is also supporting a number of upland soil and water conservation projects. For example, we have helped initiate a dryland research network for cooperating countries in the Middle East. The goal is to help these countries increase the efficiency of water use through improved soil and crop management practices. In the semiarid tropics, we have partially supported the development of a simple land farming practice which helps capture precipitation on heavy clay soils. This practice has successfully doubled the number of crops which can be grown each year.

The agency is also supporting efforts to improve watershed management as a means of controlling soil erosion and enhancing water conservation. Included are extensive efforts to help reforest badly denuded areas, thereby reducing the silting of reservoirs and municipal supply systems.

HEALTH AND SANITATION

Even though I have concentrated my remarks on agriculture, it should be emphasized that some of the same principles we have discussed for irrigation projects also apply to health and sanitation projects. AID and other donors have provided hundreds of millions of dollars to help improve community water systems. As was the case with past efforts in agriculture, however, most of the attention has been given to the development and installation of pumps and associated equipment. All too little emphasis has been placed on other aspects of water utilization such as waste disposal and sanitation. As a consequence, most of these projects have not lived up to expectations. We are now trying to couple these capital inputs with concentrated educational programs to help the water users understand other aspects of sanitation which must be included in an overall health and sanitation program. I received a report only this week of a successful pilot project in Togo which has used this broader approach. Users are involved through the development of user institutions with some responsibility for the system's management.

CONCLUSION

I would like to close on a personal note.

Water resource considerations have always been an important part of my life. I was born in southern Colorado and spent my early years on an irrigated farm. My forefathers were among those who transformed desertlike western areas into productive agricultural land, and many of my family members still make their living on irrigated farms. Their experience proves that water deficiencies can be overcome.

As I broadened my knowledge of agriculture and extended it to international concerns, I noted that while the causes and effects of agricultural failure are usually similar, the real difference is often in how to solve the problem or get around the constraint.

This then is what AID and other bilateral donors often deal with—helping the developing countries find that correct solution. We are succeeding, and we are struggling for greater and faster success. Our vision is to help the people of the world to feed, clothe, and sustain themselves while, at the same time, cherishing and conserving our precious natural resources.

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