Water Development and Utilization in Africa

Many of you are probably wondering how and why a U.S. Government Agency established to operate in the 17 Western States is involved in the water problems of Africa. A rather lengthy period of evolution has led to the Bureau of Reclamation's active participation in water resources development, not only in Africa but throughout the world.

During its infancy, starting in 1902, the Bureau of Reclamation was engaged primarily in development of single-purpose irrigation projects. It relied to a degree upon the experience of countries such as India and Egypt where irrigation had been practiced for many years as well as the experience of the early settlers of our own Midwest.

However, it soon became apparent that irrigation development in the Western United States presented new and unique problems. Departing from practices of India and Egypt, which depended mainly on direct diversions, the concept of large holdover reservoirs soon evolved - as did the multiple-purpose concept of river basin development. Thus began Reclamation's rise to world-wide leadership in water resource development.

By the early 1920's, the Bureau had gained prominence in the water field to the extent that its advice and counsel were sought, not only in this country, but also abroad. International exchange of technical information which had its beginning in this fashion continues today on a sizeable scale. Exchange of technical knowledge and information between the Bureau of Reclamation and foreign governments was carried on informally until the late 1940's. The number of foreign visitors and trainees coming to Bureau offices and projects also increased steadily.

Immediately after World War II, the Marshall Plan was implemented to reconstruct Western Europe. Also, during the post-World War II period, the Smith-Mundt law was enacted, followed by President Truman's Point IV program. That legislation and establishment of specialized United Nations agencies actually were the catalysts which began Reclamation's foreign activities program as it now exists. Among other provisions, the Smith-Mundt Act authorized interchange of persons, knowledge, and skills and the rendering of technical services.
The Act of Congress which implemented Point IV of President Truman's inaugural address of January 1949 empowered the Secretary of State to utilize the services of any other Federal agencies. The current Foreign Assistance Act - the legislation under which the Agency for International Development operates - also empowers the Secretary of State to utilize other Federal agencies. It is through these avenues that the Bureau of Reclamation is involved in the Foreign Aid Program. Our work is primarily in early investigations and reports to the governments involved while detailed planning and construction are accomplished by contract with private firms in most instances.

Although our principal areas of operation under the Foreign Activities program have been the Middle East during the 50's, and the Far East at present, we have worked in a number of African countries. From 1958 to 1964 we had a large team in Addis Ababa, Ethiopia making a reconnaissance study of the Blue Nile River Basin. At the present time, we have a 9-man team in Nigeria making a reconnaissance study of the land and water resources development potential of the northern region. In addition we have had people detailed for short periods to Ghana, Kenya, Liberia, Libya, Morocco, Rhodesia, Somalia, Sudan, Tanzania, and the United Arab Republic. These details have involved everything from review of a country's overall water development program to establishing an accounting procedure for controlling charges for water delivery.

In addition to the program of technical assistance to various African countries, we have also been involved in training technical personnel of these countries in our Engineering and Research Center in Denver, and in our various field project offices. This training program has seen people from 26 African countries spend anywhere from a few days to one year working with our regular domestic staff to become familiar with Bureau of Reclamation practices and procedures.

During this long and active involvement in water resources development around the world, the Bureau has assisted 108 countries by providing extended periods of training to over 1300 foreign nationals and consultation and observation visits for shorter periods by an additional 5,400 technical personnel from these countries. In addition, our own engineers have provided technical assistance on various projects in 37 countries.

With this brief resume of how we in Reclamation are involved in African water development programs, let us look at the principal subject of tonight's discussion - African Natural Resources - Water Problems.

Generally speaking, land and water resources have not been developed. Rivers flow unharnessed, undiverted, and largely unused. Farming methods are primitive, use of land is extensive, and conservation, at best, is in its infancy.

In the United States farming has become highly mechanized, and when soil and climate are suitable, land use is intensive. In certain foreign countries - Taiwan is a good example - even though methods remain nonmechanized and primitive, land use is very intense. In Taiwan, four crops are grown per year on the same
ground. A 15-month growing season is obtained from a 12-month year. This is accomplished by interplanting the second crop before the first one is harvested, and the fourth crop before the third is harvested.

Generally speaking, plowing in the developing nations is done by animal power - in Afghanistan it may be a camel and a donkey hitched to a primitive plow that is not far removed from the forked stick.

But in northern Nigeria, where our Bureau team is working, the ground surface is scratched by hand tools. The flat, dry land is dotted with numerous tribal family compounds, each containing 15 to 25 housing structures made of Nigerian type of cornstalk and built in a circular shape about 12 to 15 feet in diameter, with earth floors, and no modern conveniences. A single well serves the tribal family for washing, drinking, and cooking. I estimate that about 100 to 150 people occupy each of the average-sized compounds.

Our job in Nigeria is to inventory the water resource development poten­
tialities in the Kano River Basin; to identify specific potential water develop­ment projects that appear to offer the best opportunity for early development in light of existing patterns of population, access, cost, and benefits; and simultaneously to train Nigerian nationals in the technical skills required for their continuance of water resource development programs.

We find we must start from scratch. Fundamentally, basic land and water data are not available. Stream flow measurements must be instituted. Topography must be obtained. Lands must be classified. These types of basic data are prerequisites.

Considerable progress has been made by our team in its short two years in Nigeria, in spite of the general political unrest that has prevailed. The job that can be and needs to be done in Northern Nigeria is hardly even a scratch on the surface of total potentialities and needs.

Like Nigeria, the African continent in itself poses overwhelming challenges. It covers 11,500,000 square miles, almost four times the size of the continental United States. Even more than the North American continent, is an area of extreme variation in climate and rainfall. There is the large desert region of the Sahara in the north and smaller desert regions in Somolia on the eastern coast and in South West Africa on the western coast. Contrasted to these are the tropical jungles and rain forests of Central Africa. In addition there are large areas in South Central and Southern Africa that are similar to the grass­lands and prairies of the Central United States.

There are, however, certain problems related to the development of water resources that are continent-wide and deserve our main attention in this dis­cussion. Probably one of the greatest is the fact that practically every major river on the Continent is an international stream. The Nile Basin covers the United Arab Republic, Sudan, Ethiopia, Kenya, Uganda, and Tanzania. The Congo
involves the Democratic Republic of the Congo (Kinshasa), Congo - (Brazzarille) Angola, and to a limited extent Ruwanda and Burundi; the Niger - Nigeria, Niger, Dahomey, Cameroon and Chad; the Zambezi - Mozambique, Rhodesia, and Zambia.

Prior to 1952, most of the continent was controlled by four European countries - the United Kingdom, France, Belgium, and Portugal. The internationality of the continent's rivers did not then present so acute a problem. When you realize that there are now 42 independent countries plus seven other political subdivisions, overseas provinces of European countries or protectorates, you can understand why the international aspect of water utilization and control is of prime importance in Africa.

Through the good offices of the various UN agencies, the World Bank, and the several bilateral assistance programs such as the U. S. Agency for International Development the African countries have been made aware of this problem. Several international groups have been formed such as the Chad Basin Commission, and the Niger River Commission. Under the auspices of the Economic Commission for Africa and AID a group of 12 representatives from various African countries have recently completed a month's travel through the United States studying the requirements for cooperative efforts in water resources development. This included not only the cooperation among local, state, and Federal agencies but also joint efforts of the United States and Mexico on the Rio Grande, and the United States and Canada on the St. Lawrence and Columbia Rivers.

Although the emerging nations of Africa are becoming aware of the problem that confronts them, the true significance of the problem and the cooperative efforts required to settle it are not yet clearly understood. Some countries refuse to release hydrologic and other basic data to neighboring countries for fear that such data will be used against them in future negotiations.

This problem of international waters is not limited to the surface supplies such as rivers and lakes. Even the groundwater basins and aquifers upon which development in most of the arid areas of the north must depend are international in character.

Another problem area that is almost continent-wide is the lack of institutions and trained personnel. In establishing the organizational patterns for the governments of the new nations of Africa, little if any thought was given to such operational problems as water resources development. The responsibility and authority for such development, consequently, is frequently fragmented even more than in our own government.

In countries with an extremely limited pool of educated and trained technical people, such fragmentation has resulted in ineffective direction of development programs. In practically every instance, a part of the Bureau of Reclamation's program in the African countries where we have worked has been the establishment of suitable agencies to direct development planning or recommendation for improvements in the lines of authority and responsibility between existing agencies.
Another related factor that frequently enters the organizational picture is the desire to establish special authorities for river basins or regions. Although this may be an acceptable answer in some cases, most of these countries with their limited supply of competent personnel find that establishment of such groups spreads the available people too thin. We have encouraged the establishment of centralized organizations that can pool the human resources available or utilization of existing agencies with improved channels of communication and coordination.

The lack of personnel to which I have alluded varies considerably from country to country. Some nations have a fairly good cadre of well educated and competent people, while in others the number of technical people with the equivalent of a BS degree can be counted in the tens. Only in a very few of the older established countries, such as South Africa, is the supply of technically trained people sufficient to even approach the needs.

Those countries having a fair supply of technically educated people still have a problem. College graduates are in such demand that the competent man finds himself elevated to a position of responsibility within a very few years after graduation. Cabinet and subcabinet positions are frequently filled by men with almost no practical experience. The years of seasoning and on-the-job training common in this country are non-existent in the emerging countries of Africa.

It is with this in mind that we, in cooperation with AID, UN agencies, and various foundations, operate a program for training foreign nationals, as I have mentioned under this program, technically trained personnel are brought to this country for periods of on-the-job training in the Bureau of Reclamation offices. The period of training is usually one year. In some instances the high level personnel cannot be spared by their government for this long a time are provided special observation programs from a few weeks to three or four months. The group of African officials I mentioned previously who were here studying the cooperative efforts required in water resources development were a part of this program.

Under this program we have provided training to over 300 people from 26 different African countries. Many of these people have risen to positions of prominence in their governments after returning home. This program is a good start, but 300 people scattered throughout a continent the size of Africa is like one raindrop in the ocean.

There is one other problem I will mention briefly in passing, not because it is of extreme importance or because it is peculiar to Africa, but because of its interest and unusual character. It is a Moslem rather than an African problem and first came to our attention while we had people working in Libya, a Moslem country of North Africa.

The Koran teaches that water is a gift from Allah and must be made freely available to any human or animal that requires it. When some wells were driven and pumps installed to provide additional water in desert oases, any attempt
to regain development costs through sale of the water was opposed on the grounds that according to the Koran water could not be sold. A way around this problem was found by selling, not the water, but the service of making the water available. As a matter of fact, we follow the same philosophy in the United States. The Bureau of Reclamation has over 7,000 contracts with over 700 entities for water service.

Even though the annual payments due may be based on the quantity of water delivered, the payments are for water service, rather than for the purchase of water as a commodity. The revenues are applied to operation and maintenance of the contracted facilities and the repayment of the capital costs of construction. Technical problems, of course, do exist in African water development as elsewhere but in the main, they are no different than technical problems that may exist on projects here in California, or in New York, Europe, Asia or anywhere else in the world.

The technical development and know-how that have solved these problems here at home can solve similar problems in Africa as they are encountered. The overwhelming need at the moment is stability of government organizations, the development of in-house understanding and leadership in utilization of natural resources of which Africa has a plenitude, and also continuing understanding and assistance by the world community to help those emerging nations to help themselves.