Because of the many references to economics that have been made in these
Hearings on water development in Hawaii, I hope that as an Economist my comments
may be helpful to the Committee. I am one of the few professionally trained land
and water economists in the Territory with experience in water development both
in the Territory and on the Mainland. My remarks will be mainly confined to
development of water for irrigation purposes. Since these remarks and recom-
mandations are based at least partially on opinion, it should be stated here
that I appear as a professionally interested individual, not as an official
representative of the University of Hawaii or any other organization.

It is the objective of this statement to consider water development in the
Territory of Hawaii, particularly as related to the activities of the Federal
Government. Discussion will be carried out under the following topics:

1. The development of an over-all long range water policy for the Territory
2. The major types of investigation needed to form a program within a policy.
3. The administrative organization needed to carry out a program.
4. Areas within the program where the Federal Government could aid its
operation.

LONG RANGE WATER DEVELOPMENT PROGRAM

Hawaii has developed tremendous productivity in the past, yet a great
potential for future growth still remains. However, she is not so rich either
in the amount or the variety of her resources as to be able to afford major
errors in coordinating resource use if this potential is to be realized. Hawaii's major resources are her land, water, climate, location and a young, vigorous and capable population. Careful and continuous review of all of these resources is needed if full development is to occur. It is not implied that "planning" of resource use has not taken place in the past. This planning, however, has often been in terms of a single use, a single user, a single source, a single technique, or a single crop. As maximum use is approached, it is important that every effort be made to see that this is the best use both now and under future conditions.

Although individual projects may proceed without a basic policy determination, the chances that such a piece-meal growth will lead to optimum growth are remote. Although costs of development may be estimated unit by unit, returns or benefits cannot be so clearly separated, particularly in a relatively small, closely-knit economy such as exists in Hawaii.

The development of a water policy is primarily a local function, although the Federal Government will inevitably be involved as it is a major water user in the Territory and also as it is a major source of information and perhaps aid in water development. The nature of the policy decisions will be somewhat expanded in the following section as specific information that is needed is outlined.

MAJOR INVESTIGATIONS NEEDED FOR POLICY AND PROGRAM FORMATION

The experiences of the Committee during its visit to Hawaii should certainly substantiate the statement that in many factors the Islands are a land of extremes. In few areas of the United States would such a wide variety of circumstances occur within such a small area. Wide variations occur both between areas and over time in the amount and distribution of rainfall, in stream flow, in the nature and availability of ground water, in soils, in altitude, in production per acre, in acreage in crops, in the land ownership pattern, in the flow of goods
into and out of the area, in prices, and in many other factors. Under such conditions where concern is with extremes the use of averages of data may be entirely misleading. This has meant that greater effort and care and hence expense must go into the collection of basic data for even small projects than is often the case in other areas. Although a great deal of research has been done, many important gaps in knowledge still exist. To close these and to integrate existing studies, several major investigations are needed. Although several of these studies would appear so basic that the need is obvious, they have not been given sufficient emphasis in Hawaii. Since public irrigation development is new to Hawaii, the broad background of experience found in other areas does not always exist among either administrative, legislative or professional groups in the Islands.

1. Available Water Supply

Excellent work on rainfall, ground water, and surface water has been done in some parts of the Islands. These studies should be expanded so that similar data on the amount and characteristics of available water exists for all of the Islands. In addition, both existing and new data should be used so as to get as complete a picture as is possible of the interrelationship of the water and its availability during the various phases of the hydrological cycle. An essential first step is a complete coordinated study for all lands, public and private, so that the amount, nature, dependability and location of the total water supply island by island is known. Without this any consideration of alternative sources and alternative uses is incomplete.

2. Present Water Use and Ownership

As wider knowledge is gained of the potential water supply, the nature and amount of present uses should be more completely and regularly catalogued. Many cloudy titles due to incomplete knowledge of the ancient usages and to the limited legal experience with water, particularly
ground water, exist. These differences will seek solutions as the use and value of water increases. Neither legislative nor judicial law seem to conform to presently accepted theories of hydrological principles. An effort to clarify ownership patterns and problems may avoid costly and timely litigation in the future. With more information on uses and ownership available, a determination of any needs for and the nature of a water code could be more carefully made.

3. Land Capabilities Studies.

In order to put water to its best use, it should be applied to that land which shows the greatest response to its application. Again, excellent studies exist for some areas but with the limited amount of land and water available, it is essential that an over-all classification of the adaptability of Territorial soils to irrigation be carried out for both public and private lands. It would perhaps be more efficient to carry this out as part of expanding the total soil classification studies for the Islands.

4. Alternative Uses for Water

Physical experimentation to determine what crops will respond to irrigation under many conditions in the Islands has been neglected in the past. These studies will be needed for many crops and in many areas to supplement existing knowledge.

5. Engineering Studies

As data on available land and water resources becomes available, a start may be made upon the plans for getting the water where it is needed when it is needed. Estimates can also be started of the costs that will be incurred under alternative plans for using, moving, and storing water.

6. Economic Feasibility Studies

For an economist, the crucial step in this pattern is reached when
the data from various sources is brought together to determine if the projects will "pay for themselves." Although costs are comparatively easily estimated on the basis of current prices, benefits are more difficult to obtain. This is essentially an estimate of the present value of a flow of production in the future. First the future value of the various alternative products from the resource use must be obtained. Next the share of this value that is attributable to water is determined. The customary measures of both direct and indirect apply here. As is usual in most parts of the United States today, those areas where the direct benefits will pay the costs incurred are almost entirely developed. Public development particularly will depend to a high degree for its feasibility upon the more elusive indirect benefits.


The relatively limited market for many Island products means that a knowledge of the organization, efficiency, and extent of the market for any one product are probably more important to the success of water development than would similar studies be in the relatively more flexible Mainland markets. Generalized statements and figures on the Island market can well illustrate my earlier reference to the danger of using averages. As an example a statement was made earlier in the Hearings that "under 400 acres are needed to supply the Honolulu market with all the fresh produce that is now imported from the Mainland."

Since this number was arrived at by dividing the number of tons imported per year by the estimated yields of this crop under irrigation it makes no account of the potential market since it ignores such factors as the price at which these goods moved, the seasonality of their production and consumption, their quality in relation to local produce, the degree to which processed items were substituted for fresh, changing patterns of consumption, employment and population in the Islands and many other factors.
ADMINISTRATION OF A WATER DEVELOPMENT PROGRAM

Water development should primarily be the responsibility of the Territorial and local governments. When supply of water is being considered, each island separates itself into an independent unit. Many uses such as domestic water are local in character. Other alternative uses such as irrigation development and other problems such as some of the legal ones are wider in nature. For these the Territory appears to be the best level for operation.

The Hawaii Irrigation Authority Act with a few relatively minor exceptions provides an adequate framework for some phases of water development. Since the organization has been in operation for such a short time and since it has so far been largely concerned with projects, plans and studies which were carried out by other organizations and individuals it is too early to draw definitive conclusions on operations under the Act. It can be noted, however, that due to the concern with projects inherited from others, little in the way of an over-all policy for the Territory is yet visible from the activities of the organization.

RECOMMENDATIONS FOR FEDERAL GOVERNMENT ACTION

It is my belief that some Federal assistance would be helpful and within the policy framework of past aid to this and to other areas. Some of this aid would require Congressional action, but most of it could be done under existing organizations and statutes and would only require appropriations.

1. Direct Appropriations

Increased appropriations for the following agencies are needed to provide greater background information. In many cases these would be expected to be matched by Territorial funds to carry out the investigations.

U.S. Geological Survey--Surface Water Division; To enable existing data to be more completely analyzed and for the addition of selected new key stations.
U.S. Geological Survey—Ground Water Branch; Extension of excellent existing studies to additional critical areas, and a review of present studies in relation to present water needs and engineering techniques.

Weather Bureau; Expansion of both collection and analysis activities and of forecasting activities.

University of Hawaii—College of Agriculture; Many of the studies such as the soil survey, crop adaptability studies, and marketing studies could best be done through the University.

2. Loan Funds

The following types of loans are recommended:

a. To the Territory or directly to the Hawaii Irrigation Authority.

In order to not tie up the limited credit of the Territory with a single phase of development, availability of long-term non-interest bearing notes would be very helpful. Also by use of this type of credit, projects could be undertaken which are feasible under Bureau of Reclamation standards, but which are not possible under present payment systems for the shorter term, interest bearing notes that the Territory issues, since the direct payment that farmers could pay would be inadequate.

b. To the farmers.

Through farm credit, such as the Farm Credit Administration and the Farmers Home Administration so that farmers will have adequate capital to bring their farms up to designed capacity as rapidly as possible. This not only increases the income potential of the farmers but allows the entire project to operate at a fuller and more profitable level. As this Committee is well aware, the problems of limited available capital accumulated for farm operations have been one of the most important and often difficult ones that many
projects encounter. In addition, expanded funds for Water Facilities Loans through the Farmers Home Administration will help bring many small units into increased production.

With activities along these two general lines it is my belief that the Federal Government could be of the greatest help to water development in the Territory at the present time.
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"Statement to the House Interior and Insular Affairs Committee public hearings, Iolani Palace, Honolulu, Hawaii, December 14, 1954."
Mimeographed.

1. Water-supply - Hawaii.