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TRIP REPORT

IRRIGATION IN THE DOMINICAN REPUBLIC

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These notes are based on field tours, literature review, and discussions while on TDY in the Dominican Republic during September 26 - October 7, 1977. Field trips were made to the irrigated areas of San Juan de la Maguana, Bani, Yaque del Norte, and Yuna-Cuma. Each trip involved traveling along canal and drainage systems from head works down through a considerable portion of the irrigated area and thus provided opportunity to see the irrigation systems in operation.

In each case, I was accompanied by staff from the local Instituto National de Recursos Hidraulicos (INDRHI) as follows:

San Juan - Tancredo Di Maggio, Agronomist - toured two systems of Rio Mijo and Rio San Juan.

Bani - Leonel Duarte - Engineer - toured Marcos Cabral system.

Yague del Norte - Vincente Gomez Nunez, Engineer and Angel Pichardo, Chief Operations Division INDRHI - toured Tavera system from Santiago to Valverde.

Yuna-Cuma - Sr. Mejia - toured Camu canal system.

Additional information was collected from various reports furnished by USAID and INDRHI and in discussion at INDRHI headquarters in Santo Domingo with Angel Pichardo; Franklin Roza, Agronomist; and Guaron de la Cruz Sanchez, Assistant Engineer.

I also visited the Centro de Desarrollo Agropecuardia (CENDA) in Santiago where Director Emilio Peralta explained their program.

Following are my impressions of present irrigation practices in the Dominican Republic. View them in the light of the above rather cursory examination, at one point in time, of some of the more important systems in the country. I apologize for errors of judgment or ommission.

General:

The quantity of annual precipitation in the Dominican Republic is such that irrigation could be considered supplementary rather than essential. Certainly rainfed agriculture is possible over almost all the country. There are a few small areas where annual rainfall is less than 600mm but in general most of the country receives more than 800mm annually. The distribution varies widely because of dominant air currents and terrain.

However, an important major crop is rice and for its production irrigation is necessary in some areas and beneficial in most others. In most areas rainfall is certainly not appropriately timed for optimum rice production. At least 90 percent of the land irrigated, under government constructed and managed systems is in rice production. Therefore, systems are designed and operated to meet the needs of rice.

Most canal systems are operated on the "run of the river." A few storage dams have been constructed and others are under construction, but storage for irrigation appears to be a rather recent development in the Dominican Republic.

The method of water application in rice is basin irrigation with water flowing from one diked area to the next in order to fill each basin. Most diked areas are hand constructed and individually they appear to be resonably well leveled. However, in order to obtain precision in each one,

very small paddies are resorted to even where topography appears to be even. Field ditches placed at various intervals (50 - 200 meters) are commonly used to distribute water from the individual turn out throughout the planted area. This does not imply that the fields are level between these field ditches. They are not. There may be as many as 30 diked areas between field ditches. Water proceeds through these areas by passing from dike to dike.

Other methods of water application were observed but the basin method is the only one used in rice and therefore is by any measure the most important method in the Dominican Republic. Furrow irrigation was observed on plantain and vegetables. A considerable amount of sprinkler irrigation was also seen on sugar cane, tobacco, and in one case sorgham. A drip irrigation experiment on plantain is in progress at CENDA in Santiago. Then, practically all methods of irrigation water application are in use in the Dominican Republic.

The canal system operational procedures do not appear to be based on demand requirements of the crop. Canals have undoubtedly been sized according to some rule such as one liter per second per hectare. However, in operation they appear to flow at a rate dependent only on the river flow and/or the condition of the canal. In general, however, canal maintenance looks extremely good especially on larger canals.

Water is controlled by gates at all headworks and at secondary and tertiary outlets. These gates are padlocked and there is an INDRHI employee whose job it is to divide the flow among the various laterals. Water is only measured in the primary canals and then it is not a matter of record keeping but is used as an operational tool when canals are flowing less

than full. There are no measuring devises at the farm level and apparently no government supervision over how the group of farmers on one turnout share their water.

Since rice is a crop which not only survives but thrives on inundation, it is difficult to reduce yield by using too much water. Therefore, any system providing an excess of water can be considered acceptable to individual users.

Observations:

The following are observations based on what I saw and from my experiences elsewhere. In general, they indicate problem areas where, I feel, improvements must be made if more effective use of irrigation water is to be realized.

a) Water application - As in most rice producing areas worldwide, there is little direct control over the amount of water applied. In fact, no one apparently knows how much is applied for in any given period of time. Certainly, it is highly variable among canal systems, among laterals on a specific canal, and among paddies within a given farm. Of course, some variation among areas is to be expected due to available river flow and due to precipitation differences. For example, the rice irrigation demand in the San Juan area during the rice season is less than one-half the requirement in Santiago during the same period, yet the annual rainfall is 1060mm. in San Juan and 910mm in Santiago. The irrigation demand is the amount of water needed by irrigation

to produce a crop. Total needs include rainfall plus irrigation demand. Therefore, in the San Juan area, only one-half as much water needs to be applied by irrigation as is applied in Santiago. My observation is that less is applied in San Juan; however, there is much over application in both places.

Surface topography is such that surface drainage is not a great problem other than loosing water through runoff and that is often reused. In the western area of Yague del Norte, however, high water tables have caused salinity problems. Several open drains have been constructed; however, they are non-functional because they carry excessive amounts of water. One drain was observed which was essentially full thus giving the appearance of a canal. The high flow rate is undoubtedly due to excessive surface runoff from the rice fields. It is highly unlikely that salinity problems can be solved without a great reduction or elimination of this surface runoff.

b) Land leveling - No evidence of machine land leveling was observed. This is in spite of the fact that tractors seem to be plentiful and are used quite extensively in some areas to plow rice land.

It will be impossible to become highly efficient in water use without getting more precision into the level of the fields. It is obvious that a great deal of labor is presently being used to construct the many and intricate diked areas within a given field. This certainly must cost something more than the mere loss of land and water.

Proper equipment is essential to level agricultural land. Bulldozers and road graders are not proper equipment. Soil scrapers and land planes are. The scraper is capable of cutting a thin layer of soil from one area and carrying it to another area where it is spread in a thin layer. The land plane, operating much the same as a carpenter's wood plane, evens out small undulations after scraping and is ordinarily used annually to re-level after plowing. These machines are probably not available in the Dominican Republic. However, they are used extensively in Western USA and small locally made ones have successfully been introduced in Turkey and Pakistan. Most machines in use in the USA are quite large requiring heavy prime movers but small ones are available for use with farm tractors as small as 35 hp.

c) Irrigation data - The scarcity of data regarding all aspects of irrigation is apparent. This is undoubtedly true because government financed irrigation systems are relatively new. However, It is difficult if not impossible to improve or even manage anything if one does not know how it is operating.

d) Research and extension - Very little research and extension has been done in irrigation water management. CENDA recognizes this and has initiated several significant programs. A one-week training course in irrigation practices is given to farmers at an especially designed and operated field station west of Santiago. This is a

cooperative effort among CENDA, INDRHI, and others. Other CENDA projects relating to irrigation are land leveling, methods of irrigation, and farmer organizations.

e) Groundwater - There is apparently little known regarding the extent of the groundwater resource in the Dominican Republic. Undoubtedly, there are large quantities available. Some pumping is now done for irrigation but its extent is very limited. A groundwater survey would be highly desirable because there are several advantages to its use for irrigation under various conditions. However, its extent and location should be known before large attempts at developing it are begun.

Improvement Programs:

It is obvious that irrigation water could be used more efficiently in the Dominican Republic, especially in rice production. With my very limited local knowledge, it is not obvious to me that a program of improvement should be undertaken.

Some at site increased production will result from better water management from less leaching and runoff of fertilizers, less land in dikes and better distribution of water. The economics of this increase would need to be carefully studied. However, if there is good use to which saved water can be put (irrigating additional land), there is sufficient incentive to launch a program for improved water management. Perhaps these factors are known. If they are not, a logical first step would be to judge if a water management program, which saved 30-50 percent of the water presently used, would be worthwhile for the Dominican Republic.

If a program is deemed desirable, the next stage should involve an evaluation of present practices. This identifies key problems and suggests solutions. A diagnostic approach to determine, by measurement, what is presently being done in water management and why it is being done is suggested because solutions and knowledge gaps become readily apparent once the system is thoroughly understood. Such analyses, of course, can only be done on samples of systems. It is important to use as the sample area at least an irrigation management unit which consists of the one to several farmers using water from a given gated outlet.

Technologies for improvement can be selected after physical and socio-economic data have been analyzed for a given area. These should be pilot tested over one or more selected areas to learn costs, benefits, farmer acceptance, extension and training requirements, and other factors related to implementation on a large scale. The program thus grows from one of learning the present state of the art to one of implementing technologies for improvement.

In all of the above it is essential that close cooperation be maintained among all concerned governmental agencies, farmer organizations, and individual farmers. In the final analysis, farmers and institutional agencies must make decisions before anything will change.

I believe that such a program could be highly successful in the Yague del Norte region. CENDA, INDRHI, et al, I am sure, could manage such a program and, with appropriate technical assistance, do a good job. I believe further that programs of better land leveling, improved ditch systems on and among farms, and more responsive canal delivery procedures would evolve as technologies worthy of test.