

DOMINICAN REPUBLIC



The Water and Irrigation Sector

1. Agriculture and Socio – Economic Factors

1.1 Economy

The economy of Dominica is shifting from an agriculturally based one to a diversified one where services and tourism have a wide role. The contribution of agriculture to the gross domestic product (GDP) has been declining since 1962 when it represented 32% of our production, to only 12.66% in 1995. The total value of agriculture in 1997 was 12.36 %. Of this, 43.92 % was for livestock, fisheries and forestry, the remainder for crop production which, in 1997, was 6.93 % of the total GDP and had a monetary value of U.S. \$1,196x10⁹ at current prices. Other sectors are increasing their share in the GDP (commerce and tourism, 19.87 %; manufacturing, 17 %; services 20.13 %) reflecting a declining proportional contribution of farming to the economy. The decrease in agricultural production can be attributed to a relative increase of other sectors and the policies and incentives to motivate growth in those sectors.

The growth rate of production in agriculture (3.4 % in 1997) is not considered to be sufficient to cope with Dominica's population growth. Agriculture, however, maintains an important role in our exports and labor. Irrigated agriculture contributes to this with nearly half of the total production. There is a record increase of production on irrigated land, but it is related more to an expansion in area rather than to a marked rise in productivity.

1.2 Social aspects

The population of Dominica is approximately 8x10⁶ with a density varying from 21 people/km² in one of the most remote provinces to 1.4x10³ people/km² in the densely populated province (8.2x10³ people/km²

in the capital city). The average national population density is 165 people/km². The rural population has decreased to 40 % from the total. Poverty is reported as 52% of families and the literacy rate is reported to be 82.1 %.

1.3 Food Demand

Demand for calories and protein in our diet is valued as 2,323 cal/day. The total national requirement for food is 3.55x10⁶ tons/year. Actual production is only 1.82x10⁶ tons/year which represents 51.26 % of our present requirements. We are clearly unable to produce all we need to eat, thus we need to import food to satisfy an unmet demand. Projections for the year 2015 are that our food requirement will increase to 4.8x10⁶ tons/year.

2 Physical Factors

2.1 Soils and Vegetation

Of the total land area, 13 % of our soils have been classified as Class I to III (6.3042x10⁵ ha). To this can be added 7 % for marginal land where agriculture can be practiced with limitations. Thus the total land fit for cultivation is 6.48x10⁵ ha. The land area adapted for forests has been estimated as 52.7%. Land for the support of wild life is estimated at 2.5 % and fragile ecosystems occupy 0.50% of the total land area.

Regarding land use, the extent of our land covered by forests is 14%. Dry forest lands at 16.68 % of the land area is a good indication of the significant portion of our dry area. Pastures (grazing lands) have 28.44 % of the total, while agriculture occupies 26.7% (1.2883x10⁷ ha). Rainfed agriculture accounts for 80.28 % of this while irrigation is practised on 2.54x10⁶ ha (19.72 %). There are use conflicts and deforestation is estimated to be progressing at the rate of 4x10⁴ ha/year.

The rate of erosion is creating concern in the upper basins. Values as high as 507 tons/ha have been measured in some critical areas. Other problems encountered with soils are related to salinisation and waterlogging due to over irrigation. Degradation of agricultural land is growing at a rate of 300 ha/year.

3 Water Resources

Mean annual precipitation for the country is about 1.5x10² mm; with more arid zones receiving as little as 5x10² mm/year, and more humid areas an average of 2.5x10³ mm/year. Evapotranspiration is over 2x10³ mm/year. Total runoff has been estimated in the order of 2.1x10⁹ m³/year. Some areas are showing signs of a future water deficit and may shortly be under stress. Our largest basin has a catchment area of 6.8944x10³ km² (Yaque del Norte River) and we share a basin with Haiti (Artibonito) larger than 8x10³ km² with 2.3138x10³ km² on the Dominican side.

Ground water has a potential of 1.5x10⁹ m³/year, but less than a third of this is being extracted. Water for irrigation is supplied partly (13 %) by underground sources.

Water demand for irrigation is 7.34041x10⁹ m³/year which is 82 % of the total demand (8.89145x10⁹ m³/year). Water demand for municipalities is 9.1188x10⁸ m³/year (10.45 % of the total used). Reuse of water for agriculture is reported to be about 1.49x10⁸ m³/year.

Water supply systems serve 62 % of the population, while sewage systems cover only 30 % of our residents. Hydropower generation is about 16.7 % of the total annual energy generation in the country (1997).

3.1 Irrigation

A total area of 2.66427x10⁵ ha is served by our irrigation systems, almost completely by gravity for surface irrigation. This is about half the land adaptable for irrigation (5.5x10⁵ ha). The existing infrastructure is composed of 1.836x10³ km of main canals, 1.773x10³ km of secondary canals, 1.2x10³

km of drainage canals and 14 major dams (of more than $1 \times 10^6 \text{ m}^3$ storage capacity) for the regulation of river flows and with a domain over 55 % of the irrigated area. The total storage capacity is $1.5 \times 10^8 \text{ m}^3$. Actual delivery is approximately $4.6 \times 10^9 \text{ m}^3$. Presently there are 76,072 farmers using water.

The annual investment in the irrigation subsector is in the order of U.S. $\$1.9 \times 10^8$. As much as 80 % of the budget is spent on projects. Many are not really new infrastructures but the rebuilding of deteriorated systems. The Institute National de Recursos Hidraulicos (INDRHI) is the government agency responsible for the planning, design and operation of irrigation systems and the authority on water resources. It is the leading institution in the water sector and has the chair of the National Water Commission.

3.2 Retrospective Evaluation

The development of irrigation may be analyzed in three distinct stages. The first stage is the construction of irrigation schemes (canals). The Irrigation Service was established within the Ministry of Agriculture in 1932 and this was the starting date for this stage, although some canals existed before 1900.

The second stage is the era of dam construction. In the period 1970 to 2000, 18 dams have been built, one new dam will be commissioned soon (its irrigation area is $1.875 \times 10^4 \text{ ha}$) and further identified sites and studies will add about 20 more projects. Finding new suitable sites and financing new projects is becoming more difficult.

The third stage is organizing water users. This process started in 1986. To date, 10 main Irrigation Boards (IB), have been formed. They are composed of many water user associations (WUA), with a membership of about 3×10^4 users. INDRHI is releasing responsibility in the management, maintenance and operation of irrigation systems. A gradual decentralizing policy of government responsibilities is transferring authority to the IBs to collect fees and to operate and maintain the irrigation systems. Their development shows real signs of growth and impressive results in the quality of their organization and the services they offer to members. Among the many advantages and happy results of this process are: reduced conflicts between the authority and water users, better service, minimum flow gate delinquency; and a higher collection of fee (an increase from 20% of total charges, when managed by INDRHI, to almost 80 % on their own). They also have a better attitude to adjustments in the water tariff.

3.3 Present Needs and Problems

Needs in the irrigation subsector are related to improving efficiency, productivity and organizational aspects of irrigation systems. Solutions are sought in the use of better technology, efficient operation and adequate means of financial support. Poor maintenance of existing infrastructures and the irrational use of water are causes for the low (overall) irrigation efficiency (25 %). Specific areas of concern can be pinpointed as follows :

- a. Budgetary constrains : Annual fees for irrigation services are low (varies from U.S. $\$4.75/\text{ha}$ in some regions to U.S. $\$24/\text{ha}$ for farmers with less than 10 ha who are not cultivating rice). Water costs for a farmer only represent 0.21 to 0.58 % of total his production costs. Operation and Maintenance expenditure in INDRHI's Irrigation Districts for 1997 was U.S. $\$6.24 \times 10^6$ (average U.S. $\$35/\text{ha}$) while returns (income from water fees) was only 13.8 % of this vamount. Water fees are obviously too low to meet maintenance and operation requirements.
- b. Poor maintenance programs resulting from budgetary constraints and other organizational factors.
- c. Use of inadequate agricultural technology.
- d. Low efficiency at the farm level.
- e. Lack of water control and measuring structures in canals.
- f. Poor irrigation programming resulting in the waste of water: Supply of water is not based on actual crop needs and there is a permanent, total flow operation for main canals and laterals. Large volumes of water are lost to drains at night.
- g. Design and construction of incomplete systems, giving little attention to minor distribution and on-farm

development.

- h. Poorly developed agricultural plans and crop patterns which are not based on an analysis of crop demand and water availability or market opportunities.
- i. Insufficient drainage infrastructure. Only 9.6×10^4 ha, 36 % of the irrigated area, have an adequate drainage system.
- j. Lack of reliable data.
- k. Weak research and extension services
- l. Low cropping intensity and productivity.
- m. Reduced financial options for farmers: A state owned agricultural development bank (Banco Agricola) provides credit for farming, but is not performing well (low loan recovery). The private commercial banks have gained space in the financial market with a bit more than half the loans to the sector, but at higher interest rates. In 1998 Banco Agricola loaned U.S. $\$1.52 \times 10^8$ to 76,418 farmers working on 1.31×10^5 ha. "In spite of this, the total credit rendered to farming decreased from 12 % of the total loans from the financial system in 1990, to 8.4 % in 1996. This situation is not proportional to the contribution the sector makes to the GDP."ⁱ
- n. Land tenure: small scale farmers have great difficulty in proving clear legal title to their land. Occupancy without clear title is quite common. This is a limitation to the development of irrigation because farmers are not able to exercise all the rights over the land and are not take loans from banks. Small land holdings are another problem which restrict efficient and/or economic exploitation of land resources.
- o. Commercialization problems: Farmers a have limited ability and little knowledge of market mechanisms and price fluctuations to guarantee sales

3.4 Present Policy and programs

The government is reducing its presence and role as provider of services and consequently reducing its fiscal load to run the low return and non-profitable services. The energy sector has been recently opened to private capital and the same is expected to take place with other services (water supply) and "public" utilities. INDRHI is implementing and reducing its management functions in the water sector. State policy calls for transferring its responsibility and power to WUA. This will allow INDRHI to become more efficient in managing the systems at the basin level rather than handling small systems. The main aspects of this policy is being implemented by INDRHI and is oriented towards the following:

- a. Improve water resource management by the Irrigation Boards and the irrigation districts.
- b. Training field staff in the techniques of modern management and operation.
- c. Increase irrigation efficiency.
- d. Institutional analysis and revision of the legal framework in the irrigation sector.
- e. Disaster preparedness.
- f. Users participation.
- g. Community education campaigns on Water Conservation.

Some of the projects being executed are :

Project	Area (ha)	Beneficiaries	Activities	Financing
Moncion Dam	18,750	>4,500 farmers. 500,000 (energy)	Construction of a dam for irrigation and energy (140 G.w-hr.).	Go. D.R. (100%) U.S.\$150 million
PROMASIR (Transfer to users and	80,000	20,000	Rehabilitation of existing infrastructure, Transferring management of irrigation	I.D.B.(80%) Go. D.R.(20%)

ⁱ Project documents for the Small scale Farmers Support Project in the Southeast (Dominican Republic). International Fund for agricultural development (IFAD – FAO)/ 1997.

Management programme)			systems to users, loans to water users association, institutional support	U.S.\$53.5 million
PROMATREC (Irrigated land and watershed management programme)			Modernization of irrigation and drainage canal systems, Watershed management, Institutional capacity building, agricultural development (credit, transfer of technology), land tiling.	W.B.(64.8%) Go. D.R. (33.1%). Beneficiaries (2.08%) U.S.\$43.20 million
PRODAS (San Juan Province Development project)	123,600		Modernization of irrigation and drainage canal systems, research, extension services, development of existing organization (users and others), saline soils recovery, Community infrastructure, environmental protection.	I.D.B.(80%) I.F.A.D. (10%) Go. D.R. (10%) U.S.\$60 million
AGLIPO II (Aguacate, Limon, El Pozo project).	7,353	1,900 farmers	Construction of irrigation and drainage canals.	O.E.C.F. (75%) (Japan) Gov. D.R. (25%) U.S.\$90 million
Water Culture			Awareness campaign, Volunteers services for water quality monitoring in rivers.	
Hydrologic Disaster Prevention). (About to start)			Flood and Drought Studies, Flood control works, hydrometeorological and telecommunication equipment, National Alert system.	I.D.B. W.B. Go. D.R. U.S.\$24 million
Los Toros			Construction and equipment for a Small hydropower generation plant. 9.14 MW / Annual generation 57.27 G.w-hr.	E.D.F. (95.38%) Go. D.R. (4.62%) U.S.\$16.7 million

Go. D. R. = Government of the Dominican Republic.
I.F.A.D. = International Fund for Agricultural Development (U.N.)
W.B. = World Bank.
E.D.F. = European Development Fund (LOME IV agreement).
I.D.B. = International Development Bank
O.E.C.F. = Overseas Economic Cooperation Fund (Japan).

4. Future Perspectives

"Prospects of expanding cultivation by developing new lands are limited, but considerable opportunities exist for the intensification of irrigated agriculture and, in particular, for the better use of existing irrigation infrastructures."ⁱⁱ However, the challenge that lays ahead cannot be faced with the existing policies and institutional settings. Therefore, deep institutional reform and changes in policy are considered to be the most pressing need. The government is trying to reorient the role of the state and reduce its financial burden as much as it wishes to move out of its paternalistic role.

A Fourth stage of development is needed in irrigation and it will demand several answers. Urgent action is needed to satisfy the food demand, the low rate of agricultural growth, the low efficiency in the use of water, the low productivity even with irrigation and the possible critical water shortages for the future in some areas and, in fact, actual loss of water. The concrete problem to tackle is the poor management of existing resources reflected by the low overall efficiency of 25%. To close the gap in food production we need to recover systems presently out of service, achieve new irrigated land and increase productivity. Characteristics of this forth stage should be shaped with the following objectives :

- a. Demand that management increase its efficiency, and conserve water and other resources.
- b. Modernize the irrigation systems and move towards pressure systems.
- c. Design a proper credit system. Savings cooperatives and lending by NGOs is showing an acceptable rate of success. Loan recovery rates and resource allocation are both good. At present domestic lending institutions consider agricultural credit to be a high risk.
- d. Consolidate existing Irrigation Boards presently in operation, improve their management and achieve financial maturity. Continue with the transfer programmes creating more irrigation boards.
- e. Institutional reform in this sector thus improving the role and management of INDRHI and WUA.
- f. Improve basin planning and project formulation.

ⁱⁱ Irrigated Land and Watershed Management Project (Dominican Republic). World Bank – FAO / 1993.

- g. Increase farmer participation, both in decision making at all levels of projects and with their own share of funding to develop their farm lands. The right to manage and operate an irrigation system has to be accompanied by some involvement by the framers in the investment and cost of O & M activities. Sustainability and ownership issues need to be satisfactorily answered through real empowerment, personal investment and responsibility to maintain an efficient operation of their systems.
- h. Increased storage capacity. Dams have definitely played a great role and about $1 \times 10^9 \text{ m}^3$ of storage can be added to satisfy potential projects. The use of small reservoirs at the head of distribution systems is a complementary alternative.
- i. Create an effective training and extension services.