II. ASSESSMENT OF DAMAGES

A preliminary assessment of damages imposed by the floods is presented heretofore. It is based upon information provided by Nicaraguan authorities and estimates made by a CEPAL field mission which reconnoitred the affected area.

The preliminary quality of this assessment is to be stressed since information was available on direct effects only. In many cases, estimates were based upon the number of lost or damaged units, to which unit prices were assigned. In other cases, improvised methodologies had to be devised to estimate the losses, particularly those referring to land erosion and sedimentation.

An attempt has been made to quantify income which will not be earned due to the paralization or disruption of economic activities in some productive and service sectors.

1. Effects on the Population and its Living Conditions

Even though the meteorological phenomenon affected 35 to 45 per cent of the national territory, the number of casualties was indeed very limited. This is unusual for this type of disasters. An updated calculation indicates that a total of about 80 lives were lost and that nearly 70 000 refugees have been temporarily located in improvised shelter facilities.

The very limited number of casualties - as explained elsewhere in this report - can be described by the existence of an effective and extensive mass organization in Nicaragua, as well as by the expedient action of the Sandinista Army. They played a key role in the evacuation and temporary sheltering of the affected population, thus preventing a larger death toll and easening the situation of the affected population. Due to the cleansing and rehabilitation work undertaken by the mass organizations, many refugees will be able to return promptly to their place of origin or be relocated in other, specially-constructed dwellings.

/2. Damages

2. Damages in the Social Sectors

The actions undertaken during the past three years by the Government to improve living conditions of the population were adversely affected. It must be recognized, however, that damages to social infrastructure were of a lesser extent when compared to those suffered by physical infrastructure and the productive sectors.

a) Health

Before the floods, the National Reconstruction Government had initiated a special program aimed at the improvement of health conditions of the population. Hospital and other health centers damaged during the 1978-1979 war, had been restored and re-equipped. Preventive-medicine campaigns had been implemented and their results were already in evidence.

Three different types of effects were produced by the rains: damages or destruction of public health infrastructure; destruction or loss of medicines and equipment; and the need to initiate or reinforce some preventive campaigns.

The damages to the hospital at Chinandega - its footings were undermined, which will make it absolutely necessary to evacuate a large part of its facilities - and the flooding and partial destruction of other, smaller health centers can be included among the first type of effects. Damage to X-ray and laboratory equipment, the loss in medicine stocks and the additional requirements of medicines resulting from the disaster, belong to the second type. Finally, the pooling of water in low-relief areas - which stillexists- may induce the appearance and dissemination of malaria, yellow fever, dengue and other epidemics; preventive campaigns are to be initiated shortly in order to avert them. It should be pointed out, however, that due to the relatively-high immunization levels reached with the health campaigns undertaken before the disaster, no outbreaks of these epidemics have been detected. The crowding of refugees in provisional shelters and the damages to the water-supply and sewerage systems, however, do require the immediate implementation of said preventive campaigns.

/In view

In view of the above, and of the need to provide health care in the new human settlements centers which will be mentioned elsewhere in this report, it will become imperative to create new modular-type health centers and to build new water supply, sewerage and/or latrine systems for these centers.

It is estimated that total damages in the health sector could be repaired with a 15-million U.S. Dollar investment. Of this, 6.5 million dollars would be required for the reconstruction and repairs of the Chinandega Hospital; 3 million for the repair and reposition of equipment and medicines and, finally, 3.5 million more for the preventive campaigns against malaria, dengue and yellow fever. (See Table 1.)

b) Education

Before the disaster, the expansion of enrollment in pre-school and primary levels, the improvement of the educators' capacity and the massive education of adults - as a follow-up to the National Alphabetization Campaign - had first priority in this sector's agenda. Important investments had been made to expand physical infrastructure, to acquire educational materials and didactic equipment, and to the establishment of a national network of Mass Education Centers.

Although material damages in this sector are relatively minor when compared to losses in other sectors, the education program has received a severe blow, especially as refers to adults' education. Rural Mass Education Centers - which account for about 80 per cent of the total - were housed in temporary facilities which were washed away by the floods. Several teachers' schools were gravely damaged, and the first and only national center for production of didactic material was destroyed.

On the basis of information supplied by the Ministry of Education (MED), it is estimated that - besides the Mass Education Centers - about 60 school buildings were damaged or destroyed, including their material and equipment. A first estimate indicates that in order to replace and/or repair these facilities, equipment and material, a total of 3 million dollars would have to be invested. Of said amount, about 1 million refers to material and equipment to be imported from abroad. (See Table 2.)

/Table 1

Table 1

NICARAGUA: DAMAGES TO THE HEALTH SECTOR

(Thousands of US Dollars)

Item	Replacement Cost	Imported Component Cost
Total	15 000	9 850
Infrastructure	6 500	1 950
120-bed hospital	2 500	750
Repairs to other hospitals and health centers	4 000	1 200
Damaged equipment and medicines	3 000	3 000
Preventive campaigns	5 500	4 900
Malaria	4 000	3 600
Dengue and yellow fever	1 500	1 300

Source: Estimates made by CEPAL on the basis of information furnished by the Ministry of Health and the Pan-American Health Organization (PAHO/WHO).

/Table 2

Table 2

NICARAGUA: DAMAGES TO THE EDUCATION SECTOR

(Thousands of US Dollars)

Province	Number of Educational Centers Affected	Replacement Cost	Imported Component Cost
National Total	58	3 055.6	916.7
Managua	14	50.4	
Estelí	1	139.2	
Jinotega	1	37.2	
Carazo	5	315.3	
Masaya	3	10.6	
Chinandega	23	1 716.1	
León	1	270.0	
Boaco	2	11.0	
Chontales	1	320.0	
Granada	7	40.3	
Others (Mass Educational Centers)	...	145.5	

Source: Estimates made by CEPAL on the basis of information provided by the Ministry of Education (MED).

/c) Housing

c) Housing

The Ministry of Housing and Human Settlements (MINVAH) had recently initiated a Programme of Progressive Urbanization which involved assigning land lots with minimum infrastructure - including water supply, drainage and sanitary latrine facilities - to families located in slum areas.

The floods affected most precisely the inhabitants of slum areas, which are located in low-lying areas adjacent to city drainage canals and in the shores of Lake Managua. Many other urban and rural houses located in other areas of the country were also subjected to flooding. Due to the high tides near the Port of Corinto, many houses located in the seashore were washed away as well.

It is estimated that 6 400 houses were completely destroyed by the floods, and that 4 700 more were partially damaged. Their replacement cost, in adequate conditions and location, is estimated at 20 million U.S. Dollars. Unrecoverable household goods can be replaced with a 6 million Dollar additional investment. In other words, the total damage in this sector would require 27 million Dollars to be repaired; of said amount, 3.5 million refer to goods which must be acquired abroad. (See Table 3.)

MINVAH's envisaged plans to provide minimum housing facilities to the population of the lower strata will have to be notably strenghtened and accelerated, in order to furnish such facilities - as soon as possible - to the 12 000 families affected by the disaster.

3. Damages on Infrastructure

As will be described, the floods of May 1982 affected infrastructure inflicting heavy damages and causing high income losses.

a) Road Transport

Flood flows damaged or destroyed the asphalt layer of 732 kilometers of paved roads; 1 000 kilometers of secondary roads and 2 500 kilometers of production roads were also notably damaged. This represents about 40 per cent of the paved-road network and nearly 5 per cent of the

/Table 3

Table 3

NICARAGUA: DAMAGES TO THE HOUSING SECTOR

(Thousands of US Dollars)

Item	Number of Units	Replacement Cost	Import Component Cost
Total		26 660	3 500
Units destroyed[a/]	6 400	18 560	3 136
Units damaged	4 700	2 100	364
Household goods	-	6 000	-

Source: Estimated made by CEPAL on the basis of information provided by the Ministry of Housing and Human Settlements (MINVAH).

a/ Includes the cost of minimum services for the relocation of houses.

/secondary

secondary and production roads network. Seven main bridges - including the Guasaule bridge which connects Honduras and Nicaragua - and 18 secondary bridges were affected; their approaches were washed away and/or their structures were damaged.

Bridges were destroyed by abnormal floods which washed away their superstructure and/or undermined their footings. Other bridges were virtually "plugged" by the materials - trees, trunks, rocks, etc. - carried by the floods, thus becoming temporary dams, which fact explains the breaking of the weaker approaches. Culverts were insufficient to discharge flood waters, and were broken or totally submerged when river beds became enlarged.

Due to the above-described facts, and that some feeder and production roads acted as discharge canals for flood waters, the runoff reached paved and secondary roads washing away the asphalt surface of the first and earthfills of the latter.

The main damages to road transport occurred along the Managua-Leon-Chinandega-Guasaule route and some of its branches, through which most of the inter-Central American Trade and the Nicaraguan foreign trade circulated. In spite of the provisional repairs of some bridges and the construction of fords in some of the rivers where bridges had been destroyed entirely, most of the heavy traffic will have to be re-routed through the alternate Pan-American Highway. This will undoubtedly result in higher transport costs since this is a longer mountain road.

Damages to the road network are estimated at 111 million U.S. Dollars. To this figure, 6.6 million must be added for the replacement and/or repair of bridges, as well as a possible loss of 1.8 million in 1982-1983 due to the previously-mentioned increase in transport costs.[3/] It is estimated that of said figure, about 48.5 million Dollars refer to imported construction materials - asphalt, structural steel, etc. - and to thermal energy generation for cement manufacturing. (See Table 4.)

/Table 4

Table 4

NICARAGUA: DAMAGE TO ROAD TRANSPORT

(Thousands of US Dollars)

Item	Affected Stretch (km)	Replacement Cost	Imported Component Cost
Total		117 475	48 465
Highways and roads		110 900	44 000
Paved	732	65 900	39 500
All-Weather	1 000	25 000	2 500
Production	2 500	20 000	2 000
Bridges		6 575	4 465
Guasaule[a/]		1 125	900
Other bridges destroyed (6)		2 800	2 240
Bridges damaged (18)		2 650	1 325

Source: Estimates made by CEPAL on the basis of information provided by the Ministry of Construction and by MIDINRA.

a/ Since Honduras is expected to share equally in its reconstruction, only 50 per cent of the total bridge replacement cost is included.

/The reconstruction

The reconstruction and/or repair of bridges and culverts will require a thorough revision of the hydrologic criteria used for their original design. There are now available longer and more accurate hydrological and meteorological data series which can be used for that purpose. Higher reconstruction costs of said structures may then result.

b) Railway Transport

As in the case of road transport, the main railway line - which joined Managua and the Port of Corinto, and which provided an alternate route for incoming and outgoing Nicaraguan international trade - was affected.

Eighteen kilometers of railroad and 9 bridges were completely destroyed. The railway flow to the North-Western area of the country, which produced more than 90 per cent of the service's total income, was interrupted. Only the stretch between Managua and Granada is still operating; it is mainly used for passenger transport.

The upgrading and modernization of the railway was under consideration before the disaster. It was the intention of the authorities to widen the track and to renew the existing railroad units (cars and engines). After the disaster, a study must be undertaken to determine whether it would be more convenient to build a new route instead of improving the existing one. In addition, a financial analysis should be undertaken to determine whether existing tariffs should be modified or if Government subsidies are to be continued.

If the existing system is only to be repaired, a 7.7 million U.S. Dollar investment would be required. Of said amount, 4 million would be assigned for reconstruction of the railway and 3.7 million for reconstruction and repair of bridges. If such repairs and reconstruction were to require a period of 15 months, the railway company stands to lose 1.7 million U.S. Dollars. (See Table 5.)

/Table 5

Table 5

NICARAGUA: DAMAGE TO RAILROAD TRANSPORT

(Thousands of US Dollars)

Item	Replacement Cost	Imported Component Cost	Expected Loss of Income a/
Total	7 668	4 547	1 730
Railway (18 km)	3 960	1 580	-
Bridges (span larger than 40 m)	2 712	2 170	-
Bridges (short span)	996	797	-
Service	-	-	1 730

Source: Estimates made by CEPAL on the basis of information provided by the Ministry of Transport (MITRANS).

a/ Loss of income during a 15-month period.

/c) Ports

c) Ports and Airports

The infrastructure of the main port terminal on the Pacific seaboard - the Port of Corinto - was severely damaged due to the simultaneous presence of heavy rainfall, strong winds and high tides. Wind and tides destroyed the lighthouse and damaged some pier piles; they also severely eroded the seashore and damaged the breakwater which provides protection to the port. As stated in the previous chapter, many houses were destroyed and there exists a definite threat for the road and railway - which run along the coast - to be cut off by the sea. Rivers discharged large amounts of sediments in a recently dredged section of the port. It will be therefore necessary to reinforce and extend the breakwater in order to prevent further inland movement of the sea waters and to ensure safe port operations - since Corinto is the main port of exit and entrance of Nicaragua's exports and imports - and to re-dredge the port to enable the berthing of large-draft vessels.

In addition, about 25 airfields used for agricultural spraying purposes - especially of cotton - located inland throughout the affected area, were severely eroded by the floods. Their repair is also of prioritary importance in order to protect crops against desease.

An investment of 13 million U.S. Dollars would be required for the reconstruction and replacement of port facilities as well as for the extension of the breakwater. The rehabilitation of airfields would cost about 125 000 Dollars. Thus, the total cost of rehabilitation and replacement in this sector would amount to about 13 million Dollars, of which 5.7 million refer to imported materials. On the other hand, the income of the port authority is not expected to decrease since the loading and unloading facilities in the port were only slightly affected.

d) Urban Infrastructure

Infrastructure in flooded cities was badly affected; 35 bridges and culverts were destroyed or damaged; water control structures and drainage canal lining were eroded or destroyed; and more than 30 kilometers of paved roads, 56 kilometers of cement-block streets and 90 kilometers of compacted earth roads were affected.

/These damages

These damages will increase city - individual and massive - transport costs due both to the longer paths which will be necessary to travel in order to bypass destroyed and/or damaged bridges and the increased maintenance costs of transport units.

An estimated 16 million U.S. Dollars will be required for the replacement and/or repair of urban infrastructure. Of this figure, 8.7 million will be required for bridges, culverts and drainage channels, and 7.3 million, for road repairs. Imported materials and thermal electricity generation for cement manufacturing will cost 10.4 million. (See table 6.)

e) Electrical Services

During 1981 electricity was generated equally by hydropower stations and thermoelectric plants; the latter requires imported fuel for its operation. Before the floods occurred, the Nicaraguan Energy Institute (INE) was rapidly working towards the completion of the Momotombo geothermal unit and of the electrical interconnection line with Costa Rica; these works will allow the savings of foreign exchange by reducing fuel imports and by the acquisition of less-expensive, Costa Rican hydropower.

Except for the fall of an access bridge to a hydropower plant, the electricity generating capacity was not damaged by the floods. Damages to transmission lines, however, were considerable and affected long stretches of 69, 138 and 230 kilovolts lines between León-Chinandega, León-Pavana and León-El Viejo. Nearly 100 kilometers of electricity distribution networks in the cities of Managua, León, Chinandega and others were badly damaged.

Two projects under construction were damaged as well. Access roads and drainage protection canals for the production wells and the geothermal power plant at Momotombo were severely eroded, and an expensive drilling outfit was entirely flooded. Access roads and excavation works for the interconnection lines were similarly flooded.

In the Western area of the country, electricity conduction lines were broken, and the zone became isolated from the rest of the national grid. It then became necessary to start up a local vapor power plant in

/Table 6

Table 6

NICARAGUA: DAMAGE TO URBAN INFRASTRUCTURE

(Thousands of US Dollars)

Item	Replacement Cost	Imported Component Cost
Total	16 022	10 361
Streets	7 281	4 917
Paved (30 m)	5 272	4 745
Cement-Block (56 km)	342	162
Hardened Earth (90 km)	1 436	-
Sidewalks	32	10
Bridges and drainage channels	8 741	5 444
Footbridge (1)	492	246
Streetbridges (22)	5 763	4 322
Culverts (17)	205	102
Accommodation Ramps	447	224
Flood Channels	1 835	550

Source: Estimates made by CEPAL on the basis of information supplied by the Municipal Secretariat (SAMU) and the Managua Reconstruction Junta (JRM).

/order to

order to provide electricity in that area, which requires imported fuel for its operation. The delay in the completion of the Momotombo geothermal project and of the interconnection line to Costa Rica, will force Nicaragua to increase its oil imports in 1982 and part of 1983.

Estimates made by INE indicate that repairs of infrastructure and the replacement of the drilling equipment will require a 2 million U.S. Dollar investment. Indirect damages due to diminished electricity sales and to increased oil imports for thermal power generation, will amount to nearly 13 million. That is to say, total losses in this sector would amount to 15 million U.S. Dollars, and foreign exchange expenditures to 3.8 million. (See Table 7.)

f) Water Supply and Waste Disposal

Floods affected water-supply systems in approximately 40 cities; two waste-water disposal systems were damaged as well. Drinking water service was disrupted in nearly all of these communities, but provisional repairs were made at the earliest possible date; however, by mid-June, several towns were still without drinking water. Water catchment and diversion works, conduction lines, distribution networks, pumping equipment and their electrical facilities, and sanitary waste disposal works were affected.

Reconstruction and replacement of the damaged or destroyed works would cost over half a million U.S. Dollars; one half of said amount would be used to import equipment and materials. In spite of the relatively low value of the damages, Nicaragua does not presently have the necessary equipment, materials and human resources; it is therefore expected that these services will be - totally or partially - interrupted for at least six months. The National Institute for Water Supply and Waste Disposal (INAA) will lose an estimated income of just over 4 million Dollars, which by far exceeds the direct damages. (See Table 8.)

In order to avert the possible occurrence of epidemics due to the lack of drinking water and to the use of polluted water, it would be necessary to re-orientate at the earliest all existing foreign loans towards the rehabilitation and reconstruction of the affected systems.

/Table 7

Table 7

NICARAGUA: DAMAGES AND LOSSES IN THE ELECTRICAL SECTOR

(Thousand of US Dollars)

Item	Damages to Infrastructure	Losses in Production	Imported Component Cost
Total	2 113	12 850	3 785
Power plants	190	2 550[a/]	2 686
Transmission System	295	-	102
Distribution Network	458	10 300[b/]	272
Other Items[c/]	1 170	-	725

Source: Nicaraguan Energy Institute (INE).

a/ Thermo-electric power generation caused by the delay in the conclusion of Momotombo power plant and of interconnection line with Costa Rica.

b/ Decrease in sales due to reduction of envisaged demand.

c/ Includes drilling and miscellaneous equipment.

/Table 8

Table 8

NICARAGUA: DAMAGE TO WATER SUPPLY AND SEWERAGE SYSTEMS

(Thousands of US Dollars)

Item	Replacement Cost	Imported Component Cost
Total	629	315
Water Intake Works	51	5
Conduction and Distribution Networks	412	206
Pumping and Electrical Equipment	47	47
Sanitary Waste Disposal Systems	116	56
Miscellaneous	3	1

Source: Estimates made by CEPAL on the basis of information provided by the National Institute for Water Supply and Waste Disposal, the Secretariat of Municipal Affairs and the Managua Reconstruction Junta (JRN).

/g) Other

g) Other Sectors and Services

In addition to the above-described sectors, the following other activities were affected as well, although on a lesser magnitude: culture, cargo and passenger terminals, warehouses, telecommunications and tourist facilities.

Damages in the cultural sector refer to undermining and sedimentation of several art schools and popular cultural centers as well as the cultural heritage. Their repair and rehabilitation costs amount to 1.3 million U.S. Dollars.

Undermining, erosion and flooding damaged cargo and passenger terminals in Managua and other cities, as well as machinery and equipment for cargo handling. The amount of 475 000 Dollars is required to repair these damages.

The telecommunications network suffered damages in physical lines, telephone exchanges and telex systems; some stored materials were lost due to flooding of warehouses. By utilizing materials initially earmarked for other projects, it was possible to very rapidly repair all damages. The cost of these repairs is estimated at 150 000 Dollars. In addition to this direct loss, the telecommunications utility incurred in a sales reduction of 85 000 U.S. Dollars.

Flooding and erosion affected the infrastructure of some popular tourist resorts such as Xiloá. An estimated 150 000 U.S. Dollars are required for their rehabilitation.

In summary, it is estimated that a total of 2 million U.S. Dollars is required to repair material damages, of which 150 000 Dollars are to be spent abroad to import equipment and materials not available locally. In addition, these activities will incur in a loss of 120 000 Dollars during 1982 in non-received income. (See Table 16.)

4. Agriculture and Livestock Sector

Nicaragua, since the end of the 1978-1979 civil war, had made special efforts to rebuild the productive stock of the agricultural and livestock sector; before 1979, machinery stock had been considerably depleted due

/to its use

to its use for non-agricultural tasks. In addition, the breeding herd had been reduced by about 20 per cent due to excessive slaughtering and exports made by the previous regime.

Since mid-1979 this sector was organized in a mixed-property system. Now, the People's Ownership Area produces about 14 per cent of the total value, while private enterprise accounts for the remaining 86 per cent. Since then, agricultural production has slowly but steadily increased and reached the output level of 1978.

The agricultural plan for 1982 called for an increase in cotton - the main export crop - and corn production, one of the main staples in the Nicaraguan diet which, in previous years, had been complemented with exports. In broad terms, this plan called for output growths similar to the historical trends. All crops earmarked for internal consumption were required to grow in a similar fashion, except sorghum for which a surplus was produced in 1981.

Rain and runoff adversely affected the agricultural and livestock sector in its capital stock, inventories and infrastructure. Damages were of such magnitude that they were only surpassed by losses in physical infrastructure.

a) Damage to Soils and Capital Goods

While the main damage under this heading refers to eroded or washed away soils and to livestock death, production infrastructure was also severely affected.

Some 2 800 hectares of intensive-agriculture lands were practically destroyed by runoff when river courses were notably widened and/or when sediments, rocks and tree trunks were deposited on them; 5 600 hectares of additional arable lands were eroded, losing several centimeters of its uppermost layer, which will result in a reduction of productivity; 77 000 hectares of land already prepared for sowing were affected as well; soil terraces in 24 500 hectares of lands devoted to cotton growing were partially or totally destroyed.

/In addition,

In addition, the floods caused the drowning of 11 600 heads of cattle - 3 500 breeding cows, 5 400 calves and 2 300 steers - which caused a further reduction of the stock which was just beginning to recover after the 1978-1979 war.

Rains also damaged equipment, facilities and raw materials in a fertilizer mixing plant. Farm fences, nurseries and other forest facilities, irrigation and fishing equipment, and agricultural materials were destroyed as well. Finally, 1 200 hectares of banana and 1 500 hectares of coffee plantations were destroyed by the rain and floods; it will take this and the following year for their complete recovery.

The total or partial destruction of access or production roads - as noted previously - used for transport of inputs and commodities required for crop sowing during the comming season - which begins by mid-July and must be concluded at the end of August - was also of great significance.

Total losses in land and capital goods - excluding the damage to production roads - exceeded 68 million U.S. Dollars. The highest losses refer to eroded or sedimented land (55 million), since some of these soils cannot be sown for an estimated period of 10 years and/or will have much lower productivity. Damages to capital goods amounted to 13 million Dollars; about 4 million of which are required to import inputs and equipment. (See Table 9.)

The fact that the above-described losses represent a severe blow to Nicaraguan agriculture must be stressed. Besides losing a considerable extent of its best soils, productivity will be reduced in another extensive area, soil terraces for the next harvest will have to be rebuilt or repaired, cattle stock was reduced and an input-processing plant was damaged.

b) Losses in Agricultural Production

Rains and floods affected both export and internal-consumption crops. The effects of the first will be felt more intensely in the 1983 calendar year; those of the latter will occur during 1982.

/Table 9

Table 9

NICARAGUA: DAMAGE TO LAND AND CAPITAL GOODS IN THE AGRICULTURAL SECTOR

(Thousands of US Dollars)

Item	Replacement Cost	Value of the Imported Component
Total Losses	68 177	4 185
Land	54 882	1 085
Lost due to runoff[a/] (2 800 hectares)	44 800	-
Eroded (5 600 hectares)[b/]	6 272	-
Destroyed Terraces (14 000 hectares)	360	300
Damaged Terraces (10 500 hectares)	150	125
Land prepared for sowing (77 000 hectares)	3 300	660
Capital Goods	13 295	3 100
11 600 heads killed[c/]	3 500	1 600
Damage to fertilizer-mixing plant	1 608	1 000
Destroyed fences	420	270
Damage to nurseries and other forestry projects	297	-
Damage to fishing equipment	100	60
Damage to machinery and equipment	170	170
Banana plantation, destroyed (1 200 hectares)	1 200	-
Coffee plantation, destroyed (1 500 hectares)	6 000	-

Source: Estimates made by CEPAL on the basis of information provided by MIDINRA, the Ministry of Planning (MIPLAN), the International Reconstruction Fund (FIR) and the Department of Information and State Operations (DIGE).

a/ Estimate based on value of production during a ten-year period.

b/ Estimate based on the reduction in productivity over a five-year period (35 quintals of cotton at 1981 prices).

c/ Of these 3 850 are breeding cows, 5 400 calves and 2 300 steers.

i) Export crops. Losses in export commodities production were the largest since the disaster affected more intensely the heart of the main cotton and banana production areas, which products generate most of Nicaragua's foreign exchange.

Even though cotton had not been sown at the time the disaster struck, the land had already been prepared. To be sure, terraces are built and soils are broken and plowed just before the start of the rainy season; these tasks had already been completed and were partially or totally lost.

In view of the large number of terraces destroyed, it seems very difficult - if not outright impossible - to make all land preparations again before the end of the sowing period in late August. In addition to lands which were completely washed away or covered with sediment, extensive areas of Nicaragua's best soils devoted to cotton growing, were eroded by runoff and leaching, which fact will reduce their productivity.

Banana plantations are also located in the area where rainfall was heaviest. Bananas are highly sensitive to water excess, and they were severely damaged. The total land area of banana plantation, with an extension of about 3 000 hectares, remains vulnerable to fungus disease - mainly Sigatoka - as well. It is estimated that a total of 1 200 hectares of banana sowings were completely destroyed, and one million boxes of the product, which were ready for export and stored in warehouses, could not be shipped in time. Physical infrastructure - including access roads, fruit transport cables, packing facilities, etc. - was also affected, but its recovery is not as difficult as that of the plantation. It is estimated that total recovery will take approximately one year, so that exports in 1982 and 1983 will be reduced.

Damages to coffee plantations were less severe since they are more resistant to humidity and are located in the uplands where rainfall was less intense. Estimates indicate that only 1 500 hectares were affected - a small fraction of the total cultivated area - so that production will not decrease greatly.

The harvest of sugar cane had almost been completed at the time of the rains, so that only 3 500 to 7 000 hectares were not harvested. This crop has a good recovery capacity; it is expected that cane-growing

activities may be initiated as soon as soil humidity decreases. There were plans - before the disaster - to extend the area of sugar cane production in the present agricultural year. The main damage, therefore, refers only to the loss of about 80 000 quintals of refined sugar, which were stored at the Corinto warehouses ready for export.

Minimal damage was inflicted on other crops such as sesame and tobacco, since they had not as yet been sown. The only loss refers to 25 tons of sesame seed which was to be used for the 1982 crop.

ii) Losses in Domestic Consumption Crops. At the beginning of the year, the Government promoted the production of grains in irrigated areas, in order to alleviate a temporary shortage. Sufficient production was thus expected to meet the demand of corn and rice, until the summer harvest at the end of August. These crops were in their growing stage; some were flowering while others were in the process of ripening. Since rice is resistant to excess water, corn was the most affected of the two. Even though corn crops were not completely destroyed, it is estimated that 31 500 tons of this grain will have to be imported in order to meet the demand until the summer harvest is collected.

All other domestic consumption crops were not affected since they had not been sown as yet. In the case of sorghum - which has temporarily substituted corn in the people's daily diet - there was a surplus in 1981, which ought to suffice to meet the demand in the main affected areas. It is not believed feasible now to reach the production goals initially set for 1982.

It is estimated that, on the whole, agricultural production in 1982 will decrease by 35 million U.S. Dollars. This would mean that the growth rate envisaged for 1982 will be cut from 16 to 9 per cent.
(See Table 10.)

c) Losses of Inputs

The necessary inputs for sowing the different crops were already available before the floods. As a result, a large amount of fertilizers, 9.5 tons each of rice and cotton seeds, corn seeds and other inputs were

/Table 10

Table 10

NICARAGUA: AGRICULTURAL PRODUCTION VALUE AND DAMAGE CAUSED BY THE FLOODS a/

(Millions of US Dollars at 1982 prices)

Crop	1981	1982		Difference (Damage)
		As Planned	After the Floods	
Total	524.5	606.8	570.7	34.9
Export Crops	352.8	396.4	361.7	34.7
Ginned Cotton b/	106.8	126.4	96.4	30.0
Sesame	6.5	10.6	10.5	0.1
Bananas	9.7	10.0	6.9	3.1
Coffee b/	180.7	189.5	188.8	0.7
Sugar Cane	42.6	50.3	49.5	0.8
Havana Tobacco	6.5	9.6	9.6	-
Domestic Consumption Crops	171.7	210.4	209.0	0.2
Maize	55.8	72.8	72.8	-
Beans	41.1	45.2	45.1	0.1
Rice	53.7	67.7	67.7	-
Sorghum	17.1	19.9	18.7	c/
Virginia Tobacco	4.0	4.8	4.7	0.1

Source: Estimates made by CEPAL on the basis of data supplied by the Planning Ministry.

a/ The 1982 information refers to the calendar year, except in the case of cotton, sesame and bananas, where it refers to the agricultural year (season).

b/ For 1982, calculated on the basis of international prices for mid-June 1982.

c/ The decline in production is not due to flood damage but to the fact that there were surpluses in 1981.

/lost.

lost. Their replacement cost is estimated at 1.7 million U.S. Dollars. (See Table 11.) Apparently only a small fraction of such inputs was ensured.

d) Losses of Products ready for Consumption

Due to the flooding of packing enterprises and port warehouses, there was a large loss of agricultural products, ready for consumption and export. The losses refer to the 1981/1982 crop and were mainly banana - 1.2 million boxes - and, to a lesser extent, plantains, sugar, cotton and coffee. The loss is estimated at 4.2 million U.S. Dollars, although most of these products were insured. (See Table 12.)

e) Effects on Livestock

The main damages in the livestock sector refer to the loss of about 11 600 heads of cattle, as previously stated. This was due, on the one hand, to lack of food for several days since sediments were deposited on the grasslands of extensive areas; on the other, to the stress imposed on the animals by the floods, which prevents them from moving and eating properly, and which may last beyond the present rainy season.

Even though only a small fraction of the total cattle stock in the country was lost, it must be noted that the loss occurred precisely when this activity was beginning to recover from the effects of the war. In this respect, it should be remembered that the war involved the slaughtering of nearly 20 per cent of the stock of cattle which in 1978 had reached a peak of 2.4 million heads.

The effects of the rains can be noted through the main livestock indexes - a larger number of abortions, a decline in milk production, a further decrease in the calfing index, etc. - so that the losses will surely exceed those indicated in Table 13 since they will undoubtely affect productivity during the three following years.

Poultry and pork production was also affected, and will decrease during the present year. These species, however, have a high reproduction rate so that these adverse effects can be easily overcome by means of a special recovery program.

/Table 11

Table 11

NICARAGUA: LOSSES OF INPUTS FOR AGRICULTURAL PRODUCTION

Item	Estimated Value (Thousands of US Dollars)
Total	1 683
Fertilizers	1 240
Rice seed (9.5 tons)	10
Corn seed (30 000 hectares sown)	300
Cotton seed (9 tons)	9
Miscellaneous inputs	124

Source: Estimates made by CEPAL on the basis of information provided by the Agricultural Development Ministry (MIDINRA), the Planning Ministry (MIPLAN), the International Reconstruction Fund (FIR), and the General Directorate for State Information (DIGE).

/Table 12

Table 12

NICARAGUA: LOSSES OF AGRICULTURAL PRODUCTS READY FOR CONSUMPTION

Item	Estimated Value (Thousands of US Dollars)
Total	4 192
Cotton (1 000 quintales), destroyed	64
Cotton (4 000 quintales), damaged	128
Sesame seeds	14
Coffee (9 000 tons), damaged	180
Sugar (9 450 tons), damaged	175
Bananas (1.2 million boxes)	3 000
Plantains (17.5 million units)	175
Vegetables	10
Fish	372
Milk (46 000 gallons)	74

Source: Estimates made by CEPAL on the basis of information furnished by the Agricultural Development Ministry (MIDINRA), the Ministry of Planning (MIPLAN), the International Fund for Reconstruction (FIR) and the General Directorate for State Information (DIGE).

/Table 13

Table 13

NICARAGUA: LIVESTOCK PRODUCTION AND FORECASTS

(Millions of US Dollars at 1982 prices)

Produces	1980	1981	1982[a/]	
			As Planned	After the Floods
Total Livestock	279.2	252.9	269.1	268.2
Cattle	145.3	106.4	105.3	104.4
Pigs	20.4	24.3	23.0	23.0
Poultry	11.0	14.2	19.3	19.3
Milk	78.0	81.0	85.0	85.0
Eggs	24.5	27.0	36.5	36.5

Source: Estimates made by CEPAL on the basis of information provided by the Ministry of Planning.

a/ Estimates only.

/Estimated

Estimated losses in livestock production for 1982, determined by comparison to the expected increase before the disaster, reach a figure of one million U.S. Dollars, which is equivalent to a decrease of from 6.4 to 6.0 per cent in the production index. (See Table 13.)

f) Effects on Forestry

Damages to forestry occurred exclusively in several projects under implementation by the Natural Resources Institute (IRENA). They refer to losses of plants in nurseries - which were ready for permanent transplanting and of agricultural machinery and tools. In addition, expenses for repairs were incurred and there was unused labor during the time of the floods. In summary, these damages are estimated at 300 000 U.S. Dollars, amount already included in the losses of capital. (See Table 9.)

g) Effects on Fishery

Damage to fishery activities include losses in equipment and machinery, and a small reduction in the catch of shrimp and lobster since fishing boats could not operate under the storm. These damages were also included in the losses of capital. (See Table 9.)

h) Effects on the Medium Term

The direct and indirect losses of lands, capital goods and agricultural and livestock production, were estimated in previous sections. However, other damages are present whose results will only be felt in the medium term. These refer mainly to productivity of lands devoted to cotton growing, since they were greatly affected. Part of them was washed away and deposited in the sea; another part received a great load of sediment, sand, rocks and trees; and one more was badly eroded by excess rain and runoff. The soils in this area are highly productive but - since they are very loose sands - are very erosion-prone to wind and rainfall action. Their productivity will therefore be reduced in the coming years.

/Even though

Even though the worst effects of the rain and floods are already over, it is essential to undertake some programmes - such as the incorporation of humus - to restore the previously existing productivity, to prevent wind erosion of soils through windbreaking screens and to prevent soil erosion by runoff through the construction of conservation works in the uplands which are badly eroded and entirely unprotected. At the same time other protection works should be constructed in ravines which were subjected to erosion in their banks and which would otherwise continue to deteriorate during the normal rainy season.

Those lands which were covered with sediments, sand, rocks and wood debris must be cleared in order to rehabilitate them for production, an activity which may take a relatively long time period. The river courses which became silted must also be rehabilitated in order to avoid new flooding in the near future. There is no doubt that it will be necessary to excavate and widen river courses and to protect their banks.

The medium-term outlook for other crops seems less serious since - except in the case of banana which can only begin to produce again in 1983 - recovery can be very fast depending on the country's ability to rehabilitate the lands in time for sowing at the end of August.

5. Damages to Industry and Commerce

a) Industrial and Mining Sectors

Even before the disaster the industrial sector had been suffering from a progressive deterioration due to the scarcity of foreign exchange for the acquisition of imported inputs. The foreign exchange situation was so difficult that the Government had imposed a restrictive list of priority inputs which could be imported. The 1982 development plan which initially envisaged a 4.9 per cent animal growth for the sector, had already been adjusted before the floods in order to take into consideration the above-described situation; the growth of the industrial sector was then expected to be only 2.2 per cent. The negative effects of the May 1982 floods must be superimposed on that already ailing situation for the sector.

/After the

After the floods - and as will be seen later in this report - the growth rate for the industrial sector will now become negative (-0.4 per cent).

Serious damages were imposed on the subsector of food, drinks and tobacco, as well as on the chemical industry.

In accordance with the results of a special survey of affected industries (see Table 14) and with preliminary calculations, it is estimated that the industrial sector suffered damages of around 19 million U.S. Dollars; these refer especially to losses of raw material stocked in warehouses and customs, as well as to damage of industrial facilities. Only a small fraction of these items were insured. Most of the industrial plants located in the area affected by the floods stopped production during the emergency; production and sales decreased. The larger damage occurred in industries of the private sector, although some chemical and metal-mechanical industries belonging to the People's Ownership Area were highly affected by the floods.

Even though only preliminary information is available, the estimated losses are so great that, in spite of efforts undertaken, it will not be possible to achieve total recovery during this year; this is especially true due to the limitations in foreign exchange to acquire imported machinery and raw materials. Preliminary calculations indicate that the total loss of production about equals 2 per cent of gross industrial production in 1981 (estimated at 770 million U.S. Dollars). The effect of this loss, however, may prevent achieving the goals set by the Government.

Total damage in the mining sector is estimated at 500 000 U.S. Dollars,and refers to the gold and non-metallic mineral subsectors. Three gold mines decreased their production and some access roads were affected. Production of lime, gypsum and other products was temporarily halted.

b) Commerce

According to very preliminary estimates, damage to local commercial establishment amounted to 3.5 million U.S. Dollars; they refer mainly to damage in stock, infrastructure - including markets and slaughterhouses - and to ENABAS' warehouses and stock, which were only partially insured. (See Table 15.) In some cases, as for 25 city markets, all activities

/Table 14

Table 14

NICARAGUA: ESTIMATED DAMAGE TO INDUSTRIAL AND MINING SECTORS

(Thousands of US Dollars)

Item	Cost
Total	19 113
Industrial Sector	18 613
Fixed Assets	2 477
Buildings	84
Machinery and spare parts	216
Transport equipment	260
Other facilities	1 917
Stock	2 299
Raw materials	1 788
Finished goods	511
Decrease in production and sales	13 837
Mining Sector[a/]	500
Gold	250
Non-metallic minerals (lime, gypsum, etc.)	250

Source: Estimates made by CEPAL on the basis of information furnished by the General Directorate of State Information (DIGE).

a/ Production losses.

/Table 15

Table 15

NICARAGUA: DAMAGE TO COMMERCE

(Thousands of US Dollars)

Item	Replacement Cost
Total	3 482
Damage to warehouses and stock (ENABAS)	1 180
People's Commercial Enterprise	100
Municipal markets and slaughterhouses	462
Estimated small-commerce losses[a/]	500
Estimated losses due to paralization of activities[b/]	1 240

Source: Estimates made by CEPAL on the basis of information provided by the General Directorate of State Information (DIGE).

a/ It was estimated that 1 000 commercial outlets - 10 per cent of the country total - suffered an average loss of 500 Dollars.

b/ Assuming that 10 per cent of commercial establishments did not sell during two weeks, and utilizing the gross material product value of commerce during 1981 (approximately 300 million US Dollars).

/were halted

were halted during the rains. Estimates made include loss of sales by commercial establishments for a period of two weeks. Nevertheless it is estimated that damages imposed by the inmobilization of assets can be easily overcome, and that their repairs can be completed by mid-1982. The interruption or obstruction of internal road transport and its corresponding cost increase - as well as that to and from other Central American countries - has reduced the inflow of supplies, which fact has correspondingly reduced sales even in undamaged commercial establishments. This situation is expected to continue until road transport can be fully restored.

Finally, the 3 per cent growth foreseen by the Government for internal commerce and banking in 1982 will be impossible to achieve. It is estimated that growth for the year will be nil due to the above-described damages.

6. Summary of the Damage

The analysis of damages clearly shows that the most affected sectors are those of - road and railway - transport; agriculture, which lost both capital assets and production; and housing, especially for the lower income strata of the population.

The industrial and mining, electrical energy and commerce sectors suffered damages which mainly refer to loss of stocks and future sales. Urban infrastructure was significantly and equally affected. Finally, the breakwater works at Port Corinto were damaged as well.

Health and education facilities received relatively minor material damage. However, these losses were qualitatively very important because they severely affected the strong efforts to improve the living conditions of the population which the Government was undertaking.

In summary, it can be said that the floods disrupted transport infrastructure, which is essential for internal and foreign trade as well as for access to production areas; jolted the strategic agricultural sector which generates foreign exchange and produces basic staples for domestic consumption; and affected the basic services for the population.

/Due to the

Due to the type and magnitude of these damages, their recovery can only be completed in the medium term. The productive capacity of other sectors was virtually undamaged, although losses in stock and temporary sales reduction did affect them. These sectors, however, ought to have a speedy recovery.

Table 16 presents a global perspective of the damages imposed by the floods. The total estimated losses amount to some 355 million U.S. Dollars.[4/] Of this amount, 55 million refer to temporary or permanent losses of land - one of the main resources of the country - estimated through the present value of the opportunity cost of the crops that would have been produced in such lands. An additional 82 million represent indirect losses, either as income losses due to reduced economic activity or additional operation costs imposed by the floods. Finally, nearly 220 million Dollars worth of the country's capital stock will have to be replaced. About one half of said replacement will have to be imported (see Table 16). It is estimated that only about 10 million Dollars can be recovered through outside reinsurances.

In order to better understand the magnitude of the - direct and indirect - damages inflicted by the floods, it can be stated that they represent about 20 per cent of the country's gross national product and about 40 per cent of exports made in 1981. There can be no doubt, therefore, of the significant magnitude of the damages. Their effects on national economic development are analyzed in the following pages.

Table 16

NICARAGUA: SUMMARY OF FLOOD DAMAGE ESTIMATES

(Millions of US Dollars)

Item	Total Damages	Direct Damages	Indirect Effects	Import or Export Component a/
Total	356.5	274.7	81.8	
Social Sectors	44.8	39.3	5.5	
Health	15.0	9.5	5.5	0.9
Education	3.1	3.1	-	0.9
Housing	26.7	26.7	-	3.5
Infrastructure	179.5	150.8	28.7	
Road Transport	119.3	117.5	1.8	48.5
Railway Transport	9.4	7.7	1.7	4.5
Ports and Airports	12.9	4.9	8.0	5.7
Urban Infrastructure	16.0	16.0	-	10.4
Electricity	15.0	2.1	12.9	3.8
Water Supply and Waste Disposal	4.8	0.6	4.2	0.3
Other Services and Sectors	2.1	2.0	0.1	0.2
Agriculture and Livestock	109.7	78.1	31.6	
Land and Capital Goods Losses	68.2	68.2	-	(4.2)
Agricultural Production Losses	34.9	3.3	31.6	(33.0)
Agricultural Input Losses	1.7	1.7	-	1.0
Commodities Ready for Consumption Losses	3.6	3.6	-	(3.0)
Livestock Production Losses	0.9	0.9	-	(0.3)
Fishing Production Losses	0.4	0.4	-	(0.4)
Industrial and Mining Sectors	19.1	4.8	14.3	
Industrial Facility Losses	2.5	2.5	-	1.0
Stock Losses	2.3	2.3	-	(2.3)
Industrial Production Losses	13.8	-	13.8	-
Mining Production Losses	0.5	-	0.5	0.5
Commerce Sector	3.4	1.7	1.7	
Fixed Asset Losses	0.5	0.5	-	0.1
Stock Losses	1.2	1.2	-	1.0
Sales Losses	1.7	-	1.7	-

Source: Estimates made by CEPAL on the basis of official information.

a/ Figures in parenthesis indicate losses in exports. In summary, 91 million US Dollars refer to imported materials and 43 million to exports.