II. ESTIMATES OF THE MAGNITUDE OF THE DAMAGE

The following pages present a preliminary evaluation of the damage caused by the floods. The results are based on information provided by the Nicaraguan authorities and estimates prepared by CEPAL after a reconnaissance of the flood area.

The provisional nature of the estimates is underlined, since the available information referred only to the most direct effects of the phenomenon. In many cases the assessments were based on the quantification of the number of units lost or damaged, to which the average replacement cost was applied. In others it was necessary to use improvised methodologies to quantify the losses, especially those caused by erosion or sediment on agricultural land.

An attempt has also been made to include an estimate of the income which will not now be received owing to stoppages or delay in the economic activity of some production and service sectors.

1. Effects on the population and living conditions

Although the meteorological phenomenon affected between 35% and 40% of the whole national territory, contrary to what usually happens in this type of disaster the number of victims was relatively small. The most recent calculation places the loss of human life at approximately 80 persons and those who have had to be lodged in temporary shelters at some 70 000.

The small number of deaths is explained -as stated elsewhere in this document- by the efficient and widespread popular organization existing in Nicaragua and by the decided action by the Sandinist Army. This largely facilitated the work of evacuation and temporary resettlement of the persons affected, reducing loss of life and to a certain degree alleviating the situation of the flood victims. Thanks to the work of cleaning and rehabilitation to a large extent undertaken by this organization, these persons will be able to return to their places of residence all the sooner, or install themselves in other places specially prepared for the purpose.

2. Damage in the social sectors

Although the damage to the social infrastructure was less than that suffered by the physical infrastructure and production apparatus, the efforts made over the past three years to improve living conditions were severely affected.

(a) Health

Before the floods, the National Reconstruction Government had embarked on an effective programme to improve the health of the population. Hospitals and other health centres damaged during the 1978-1979 conflict had been repaired and newly equipped, and preventive medical campaigns had been initiated the results of which were already

The meteorological phenomenon had three types of effects: destruction or damage in the public health infrastructure, destruction or loss of equipment and medical supplies, and the need to launch or reinforce some campaigns for the prevention of diseases.

Among the first type is the damage to the Chinandega hospital whose foundations were undermined by the flood, which will make it necessary permanently to remove a large part of its facilities, and the flooding and partial destruction of other smaller health centres. The second type includes damage to X-ray and

laboratory equipment, loss of medical supplies in store and the additional expenditure on medicines made necessary by the disaster. Finally, mention should be made of pools of water that still remain and may cause the spread of malaria, yellow fever, dengue and other diseases, so that intensive prevention campaigns should be initiated. It should be noted that owing to the relatively high levels of immunity attained thanks to the health campaigns undertaken before the floods, there have as yet been no outbreaks of those diseases. The crowded conditions of the flood victims and the damage sustained by the water supply services, however, make it imperative to initiate the above-mentioned preventive campaigns.

In view of the foregoing considerations and the need to provide services in the new settlements which will be referred to later in this document, new modular health centres and water supply and sanitary disposal systems will have to be established.

It is considered that the damage suffered by the health sector could be repaired with an investment of 12.5 million dollars. Of this sum, 6.5 million would be assigned to the reconstruction and repair of infrastructure (including the replacement of the Chinandega hospital); 3 million to the repair and replacement of the equipment and medical supplies, and, lastly, 5.5 million to the cost of the campaigns for the prevention of malaria, dengue and yellow fever (see table 1).

(b) Education

Priorities in the educational sector prior to the disaster were oriented towards the extension of school attendance at the primary and pre-school levels, the improvement of the teaching staff and popular education for adults as a follow-up to the national literacy campaign. For this purpose, a considerable investment had been made in the construction of physical plant, the purchase of teaching materials and equipment, and the establishment of a national system of Popular Education Collectives (CEP).

Although the material damage is not substantial -compared with other sectors- the educational system has been affected. Rural popular education centres, which represent over 80% of the national total, were located in improvised premises which were carried away by the floods, several normal schools were considerably damaged and the equipment of the only national centre for the production of teaching materials in the country was destroyed.

On the basis of information supplied by the Ministry of Education (MED), it is considered that the infrastructure, furniture and materials of some 60 educational establishments, apart from the CEP, were destroyed or damaged. A provisional estimate indicates that an investment of over 3 million dollars would be necessary to replace all this, and of this sum nearly 1 million would cover material and equipment from abroad (see table 2).

(c) Housing

The Ministry of Housing and Human Settlements had recently initiated a Progressive Urbanization Programme which consisted of the distribution of plots with the minimum infrastructure -including public sources of water, rain drainage and latrines- for settling families that were living in precarious places.

/Table 1

Table 1

NICARAGUA: DAMAGE IN THE HEALTH SECTOR

(Thousands of dollars)

Component	Replacement cost	Value of imported component
Total	15 000	9 850
Infrastructure	6 500	1 950
A hospital with 120 beds	2 500	750
Repairs to hospitals and other health centres	4 000	1 200
Damaged equipment and medical supplies	3 000	3 000
Prevention campaigns	5 500	4 900
To combat malaria	4 000	3 600
To combat dengue and yellow fever	1 500	1 300

Source: CEPAL estimates on the basis of data supplied by the Ministry of Health (MINSA) and the Panamerican Health Organization (PAHO/WHO).

/Table 2

Table 2

NICARAGUA: DAMAGE IN THE EDUCATIONAL SECTOR

(Thousands of dollars)

Department	Number of establishments affected	Replacement cost	Value of imported component
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 (Popular Education Centres)	...	145.5	

Source: CEPAL estimates on the basis of information supplied by the Ministry of Education.

/It was

It was precisely those precarious housing areas which were most affected by floods, since they are situated in low-lying regions adjacent to rain drainage systems on the borders of Lake Managua. A great many rural and urban dwellings located in areas which were flooded by the interior rivers of the country were also destroyed or damaged. Equally significant was the destruction of dwellings the whole length of the Corinto coast, due to the high tides which occurred there.

The number of dwellings which were completely destroyed is estimated at 6 400, and those partially destroyed at 4 700. The cost of their replacement, in suitable conditions and locations, is estimated at 20 million dollars. It is estimated that household equipment which is irretrievably lost could be replaced at the cost of 6 million dollars. In other words, the total damage in the housing sector would amount to 27 million dollars, and of that sum 3.5 million would be used for materials from abroad (see table 3).

The programme of the Ministry of Housing and Human Settlements for the provision of minimum housing for the population will have to be increased and considerably stepped up in order to cover, in the least possible time, the housing demand of some 12 000 families affected by the disaster.

3. Damage to infrastructure

The May 1982 floods mainly affected the infrastructure, causing substantial damage, as will be seen below, and heavy losses in terms of income.

(a) Road transport

As a result of the rivers overflowing their banks, 752 km of paved road, 1 000 km of secondary roads and 2 500 km of branch roads were damaged or destroyed; this represents 40% of the paved road network and 5% of the secondary and branch road system. In addition, seven main bridges were destroyed -including the Guasaule bridge linking Nicaragua with Honduras- and 18 more were affected when their heads broke or their structure was damaged.

The bridges were destroyed by the exceptionally high water levels which carried away the superstructure and/or undermined their bases. Many others were virtually clogged by the material carried and were converted into temporary dams which broke at the weakest points, thus accounting for the failure of the bridge heads. The sewers were insufficient to allow the passage of the flood waters and were broken or buried by the current as the rivers widened.

As a result of the foregoing events, added to the fact that many secondary and branch roads served as an outlet for the intensive rainfall, the waters inundated the paved and secondary roads, carrying away the surface paving and destroying extensive tracts of terraces.

The main damage in the road transport sector was along the Managua-León-Chinandega-Guasaule route and its branch roads, over which a high percentage of inter-Central American trade was carried, as well as Nicaragua's exports outside the Central American region. In spite of the recent urgent repair of some bridges and the construction of fords in several rivers, heavy traffic will have to take the alternative route along the Pan American Highway, with the consequent increase in costs owing to the longer and semi-mountainous run.

/Table 3

Table 3

NICARAGUA: DAMAGE IN THE HOUSING SECTOR

(Thousands of dollars)

Item	Number of units	Replacement cost	Value of imported component
Total value		26 660	3 500
Units destroyed a/	6 400	18 560	3 136
Units damaged	4 700	2 100	364
Household equipment	-	6 000	

Source: CEPAL estimates on the basis of data supplied by the Ministry of Housing and Human Settlements (MINVAH).

a/ Including the cost of reconditioning land for resettlement purposes.

The damage to the road system is calculated at 111 million dollars, to which must be added 6.6 million covering the cost of replacement of the bridges, and a probable loss in 1982-1983 of 1.8 million for increased transport costs on the alternative route.36/ It is estimated that of the above figure 48.5 million cover imported construction materials -asphalt, steel, etc.- and thermoelectric generation for the production of cement (see table 4).

The final reconstruction and repair of bridges and sewers will necessitate a revision of the hydraulic criteria used for its design, and the utilization now of more extensive hydrological and meteorological series which could raise the cost of construction of those structures.

(b) Rail transport

As in the case of road transport, the floods affected the main railway branch line linking Managua with the port of Corinto and serving as an alternative route for the transport of imports of goods and exports to countries outside Central America.

Eighteen kilometres of railway track and nine bridges were totally destroyed; this completely halted rail traffic to the west, which generated over 90% of the service's income. All that remained in operation was the Managua-Granada stretch which is mainly used for the transport of passengers.

Before the disaster, plans had already been made for the modernization of the system, the aim being to increase the gauge and renew the railway inventory. It is necessary now to determine whether it is best to adopt a new layout instead of repairing or modernizing the existing track, and to undertake a financial analysis to determine whether the rates should be modified or whether the Government will continue to subsidize this means of transport.

In the event that it was decided to reconstruct only what was lost, this would require an investment of 7.7 million dollars. Of this sum, 4 million would be assigned to the reconditioning of the track and 3.7 million to the reconstruction of bridges. Assuming that such repairs were to take 15 months, the railway would receive 1.7 million dollars less income over that period (see table 5).

(c) Ports and airports

The port of Corinto which is the main port terminal on the Pacific, suffered serious damage to its infrastructure as a result of the heavy rains and strong winds and simultaneously a relatively high tide. The wind and the waves destroyed the lighthouse and affected some piles of the wharf; they also seriously eroded the coast and damaged the breakwater protecting the port, which caused the destructio of a great many dwellings -as mentioned in the previous section- and constitutes a danger to the highway and railway-line running the length of the coast. The

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3/ The increase in transport costs affects not only Nicaragua's trade, a provisional estimate indicates that the rest of the Central American countries will have to pay an additional 1.4 million dollars under the head of transport over the next 18 months, as a result of the damage of Nicaragua's road system.

/Table 4

Table 4

NICARAGUA: DAMAGE TO ROAD TRANSPORT

(Thousands of dollars)

Component	Length affected (km)	Replacement cost	Value of imported component
Total		117 475	48 465
Roads		110 900	44 000
Paved	732	65 900	39 500
All-weather	1 000	25 000	2 500
Branch	2 500	20 000	2 000
Bridges		6 575	4 465
Causaule a/		1 125	900
Other bridges destroyed (6)		2 800	2 240
Bridges damaged (18)		2 650	1 325

Source: CEPAL estimates on the basis of information supplied by the Ministry of Construction and MIDINRA.

a/ Includes only 50% of the total replacement cost, which will be shared with Honduras.

/Table 5

Table 5

NICARAGUA: DAMAGE TO RAIL TRANSPORT

(Thousands of dollars)

Item	Replacement cost	Value of imported component	Loss of income a/
Total	7 668	4 547	1 730
Railway track (18 km)	3 960	1 580	-
Bridges of over 40 metres (4)	2 712	2 170	-
Shorter bridges (5)	996	797	-
Service	-	-	1 730

Source: CEPAL estimates on the basis of information supplied by the Ministry of Transport (MITRANS).

a/ Loss of income for a period of 15 months.

/flood also

flood also deposited a considerable volume of sediment in the recently dredged section of the port. It will be necessary, therefore, to reinforce and extend the coverage of the coastal defence works in order to prevent the sea from coming inland and ensure the safety of port operations -since a large proportion of extra-Central American trade enters and leaves the country through Corinto- and to carry out further dredging operations to enable vessels with a deeper draught to come alongside the wharf.

Furthermore, the currents seriously eroded about 25 air landing strips in the interior which were mainly used as a basis for operations involving the fumigation of crops, in particular cotton. Their reconditioning is also a matter of high priority with the aim of ensuring the activities designed to protect the crops against pests.

The replacement and repair of damage to port facilities, and the reconditioning and extension of coastal protection works would cost approximately 13 million dollars The reconditioning of landing strips would cost some 125 000 dollars. Thus the total cost of rehabilitation and replacement under this head would amount to nearly 13 million dollars, of which 5.7 million would cover imported materials. Moreover, since the facilities for shipping and unloading goods were affected only to a minimum extent, it is not expected that the port authority's income will be reduced.

(d) Urban infrastructure

The urban infrastructure of the flooded cities was severely damaged, in particular because 35 bridges and sewers were destroyed or undermined; structures for the control and lining of rain water gutters were eroded and destroyed, and over 30 km of paved streets, 56 km of cobbled streets and over 90 km of earth streets were damaged.

This damage will directly affect the cost of urban transport -both collective and individual- because of the wide detours which will have to be made in view of the damage to bridges and the increased maintenance costs for transport units.

The replacement or repair of the damage to urban infrastructure will cost approximately 16 million dollars. The bridges, sewers and gutters will require 8.7 million and the damage to roads 7.3 million. It is estimated that of the total cost mentioned, 10.4 million would cover imported materials and the thermoelectric generation for the production of cement (see table 6).

(e) Electric energy

In 1971 electric energy was supplied in equal proportions by hydroelectric sources and thermoelectric plants whose operation requires imported fuel. Before the floods, the Nicaraguan Energy Institute (INE) was making rapid progress towards bringing into operation the Momotombo geothermoelectric plant and to complete the interconnexion line with Costa Rica, which would make it possible to reduce the volume and cost of imports by replacing thermoelectric generation by the country's own geothermal energy and low-cost Costa Rican hydroelectric energy.

The floods left Nicaragua's generation capacity almost intact, save for minor damage to a hydroelectric plant caused by the fall of an access bridge. The damage to transmission lines was, however, considerable and affected important sections of 69, 138 and 230 kV on the León-Chinandega, León-Pavana and León-El Viejo lines. Approximately 100 km of the distribution networks of Managua, León, Chinandega, and other cities were damaged.

/Table 6

Table 6

NICARAGUA: DAMAGE TO URBAN INFRASTRUCTURE

(Thousands of dollars)

Item	Replacement cost	Value of imported component
Total	16 022	10 361
Streets	7 281	4 917
Asphalt (30 km)	5 272	4 745
Cobbled (56 km)	342	162
Earth (90 km)	1 436	-
Pavements	32	10
Bridges and water courses	8 741	5 444
Pedestrian bridges (1)	492	246
Vehicle bridges (22)	5 763	4 322
Sewers (17)	205	102
Ramps	447	224
Rain water gutters	1 835	550

Source: CEPAL estimates on the basis of information supplied by the Department of Municipal Affairs (SAMU) and the Managua Reconstruction Junta (JRM).

/In addition

In addition, two electricity projects under construction were also affected. In the case of the Momotombo geothermoelectric project, some damage was sustained by the access road and the canals protecting the plant and production wells, and valuable drilling equipment was flooded and will possibly have to be replaced. The access roads and excavations for the interconnexion line were also affected.

Owing to the fall of high-tension lines in the west, that region remained isolated from the national interconnected system, so that it was necessary to operate a steam plant in order to supply electricity to the area, with the consequent increase in costs and foreign exchange for its generation. Furthermore, the delay in the entry into operation of the Momotombo station and the interconnexion with Costa Rica will entail higher expenditure on thermoelectric generation both this year and the next.

The Nicaraguan Energy Institute estimates that the repair of infrastructure and replacement of the drilling equipment lost will be over 2 million dollars. Moreover, the indirect damage due to the drop in sales of electricity and the need to generate it in thermoelectric plants would amount to nearly 13 million dollars. In other words, the sector's total losses would amount to 15 million dollars, of which 3.8 million would represent expenditure in foreign exchange (see table 7).

(f) Aqueducts and sewers

The floods affected the water supply systems of approximately 40 towns and the sanitary sewerage of two of them. The drinking water service was interrupted in most of the communities and the installations in nearly all of them were repaired provisionally, but in mid-June there still remained several population centres without this service. The damage occurred mainly in the water catchment projects, in the lines for carrying it and the distribution system, in the pumping equipment and its electrical installations, and in the sanitary sewerage system.

Replacement of the works thus affected could cost slightly over half a million dollars; half of that figure represents imported equipment and materials. In spite of the small amount of damage incurred, the equipment and material and human resources required for its repair are not at present available, so that the services are expected to continue to be interrupted or functioning partially for at least six months. Accordingly, the loss of income of the Nicaraguan Aqueduct and Sewerage Institute is estimated at slightly over 4 million dollars, which substantially exceeds the material losses of the service (see table 8).

With the aim of preventing any possible epidemics owing to the lack of drinking water and the consumption of polluted water, it would be advisable immediately to divert the external loans for works in process to the rehabilitation and reconstruction of the damaged systems.

(g) Other sectors and services

In addition to the sectors already analysed, other activities were also affected although on a lesser scale: the country's cultural heritage, cargo and passenger terminals, goods warehouses, telecommunications and tourist facilities.

The damage in the cultural sector consisted of the undermining and inundation of several schools of art and popular cultural centres, and the historical patrimony. The cost of repair and rehabilitation of this item is estimated at 1.3 million dollars.

/Table 7

Table 7

NICARAGUA: DAMAGE AND LOSSES IN ELECTRIC ENERGY SERVICE

(Thousands of dollars)

Item	Losses in infrastructure	Production losses	Value of imported component
Total	2 113	12 850	3 785
Generation works	190	2 550 a/	2 686
Transmission lines	295	-	102
Distribution system	458	10 300 b/	272
Other items c/	1 170	-	725

Source: Nicaraguan Energy Institute (INE).

a/ In thermoelectric generation owing to the delay in completing projects for generation and interconnexion with Costa Rica.

b/ Loss of income due to a drop in expected demand.

c/ Including drilling and miscellaneous equipment.

/Table 8

Table 8

NICARAGUA: DAMAGE TO AQUEDUCT AND SEWERAGE SYSTEMS

(Thousands of dollars)

Item	Replacement cost	Value of imported component
Total	629	315
Water catchment works	51	5
Carrying and distribution networks	412	206
Pumping equipment and electrical installations	47	47
Sanitary sewerage systems	116	56
Other items	3	1

Source: CEPAL estimates on the basis of information supplied by the Nicaraguan Aqueduct and Sewerage Institute (INAA), the Department of Municipal Affairs and the Managua Reconstruction Board.

/Likewise, these

Likewise, there was damage by undermining, wetting and flooding of warehouses and cargo and passenger terminals in Managua and other towns in the interior, as well as damage to machinery and equipment for the handling of cargo. It is estimated that the repairs will amount to 475 000 dollars.

Telecommunications suffered damage to the physical lines, telephone exchanges and the telex system and some materials which were in the warehouses of TELCOR were lost. The systems were almost completely re-established with materials originally intended for other purposes; the cost of repair is estimated at nearly 150 000 dollars. Moreover, due to the interruption of the service, TELCOR received over 85 000 dollars less in income.

The tourist infrastructure also suffered damage in some popular complexes such as Xiloá. The cost of its rehabilitation is estimated at some 150 000 dollars.

Lastly, as a result of the rains, some public transport enterprises, received nearly 35 000 dollars less in terms of income.

In total, it is estimated that the cost of replacing material losses under these heads will amount to about 2 million dollars; imported equipment and materials will represent nearly 150 000 dollars. Finally, these activities will receive approximately 120 000 dollars less in terms of income (see table 16).

4. Agricultural sector

Since the end of the armed conflict, great efforts have been made in Nicaragua to restore the production capital of the agricultural sector, since before 1979 the machinery parks had been considerably reduced by the indiscriminate use of the equipment in activities other than agriculture. In addition, stock-breeding had experienced a drop of about 20% in the number of cattle as a result of slaughtering and excessive exports during the previous régime.

From 1979 onwards the agricultural sector was organized in a mixed ownership system in which the People's Ownership Area controls approximately 14% of the value of production, and the private sector the remaining 86%. Harvest trends since then made it possible slowly but surely to recover the volumes reached in 1978.

The 1982 agricultural programme envisaged an increase in the production of cotton -the main export crop- and of maize, one of the staple items of the Nicaraguans' diet which in the last few years had had to be supplemented by imports. The programmed increases for the year in general terms reflected the historical trend observed. Increases were also expected in other crops for domestic consumption except for sorghum in view of the surpluses obtained in 1981.

Because of the rains and floods the agricultural sector was seriously affected in terms of both its stock of capital and its production, inventories and infrastructure. The damage in this sector has been so great that it was only surpassed by the losses in the road infrastructure.

(a) Damage to soil and capital goods

Although the main damage under this head relates to soil swept away and/or eroded and the death of cattle, the production infrastructure was also severely affected.

Some 2 800 hectares of land used for intensive agriculture were virtually destroyed by the torrents when the river courses widened immeasurably or deposited upon them a considerable quantity of sediment, stones and trees; an additional 5 600 hectares of arable land were eroded by the water and lost a thickness c

/several centimetres

several centimetres od fertile soil, which will reduce its productivity. Another 77 000 hectares already prepared for sowing were also affected, and the terraces of some 24 500 hectares used for cotton-growing were partially or completely destroyed.

Furthermore, as a result of the floods, some 11 600 head of cattle -3 850 breeding cows, 7 000 calves and 2 300 steers- perished, thus reducing the stock of cattle which had barely started to recover after the damage suffered in the 1978-1979 conflict.

In addition, the waters inflicted serious damage on the equipment, installations and raw materials of a fertilizer mixing plant. Also destroyed by the waters were the fences of many farms, nurseries and other forest instalations, irrigation and fishing equipment, and some agricultural machinery and implements. Lastly, another loss was the plantation of bananas in some 1 200 hectares, which will have to be replaced this year and the next; similarly, it should be noted that about 1 500 hectares of coffee were destroyed.

Not less important was the destruction or serious deterioration of the access roads -as noted in the road transport sector- which are used for the transport of inputs and commodities and are indispensable for the sowing of crops, the season for which begins in mid-July and finishes at the end of August.

Total losses in land and capital goods in the sector, excluding access roads, amounted to over 68 million dollars. The most serious losses were in land (55 million) since where the soil was washed away there will be no production for an estimated period of 10 years, and eroded land will have lower yields. There was less damage to capital goods, i.e., 13 million dollars, of which a little over 4 million represent imported inputs and equipment (see table 9).

It should be stressed that the losses described above are a severe blow to Nicaragua, since, in addition to losing a considerable area of its best land, its productivity will diminish over a very wide area, the work of preparing the soil for the next harvest was lost, the stock of cattle was reduced and an input processing plant was affected.

(b) Agricultural production losses

The rains and floods caused losses both in exportable production and production for domestic consumption, the effects of the former will make themselves felt more intensely in 1983, while those of the latter will occur in the present calendar year.

(i) Export crops. Production of export crops suffered the most serious losses since the intensity of the disaster was greatest in the centre of the main cotton and banana growing area of the country, two commodities which generate a high percentage of foreign exchange.

In spite of the fact that cotton had not yet been sown at the time of the rains, the soil had already been prepared for the purpose; in fact, before the first rains of the season the terraces are prepared and the earth is broken up and ploughed; this work had already been done and was totally or partially lost. In view of the large number of terraces destroyed, it is difficult -if not impossible- to prepare once again all the land intended for sowing before the sowing period ends on 30 August. Besides the land which was completely carried away or covered with sediment, extensive tracts of the best cotton-growing land were eroded by the floods and by the lixiviation caused by the rains, which will adversely affect productivity.

/Table 9

Table 9

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

(Thousands of dollars)

Losses	Replacement cost	Value of imported component
Total	68 177	4 185
Land affected	54 882	1 085
Losses, 2 800 hectares a/	44 800	-
Eroded, 5 600 hectares b/	6 272	-
Lost terraces, 14 000 hectares	360	300
Damaged terraces, 10 500 hectares	150	125
Prepared land, 77 000 hectares	3 300	660
Capital goods	13 295	3 100
Lost cattle, 15 000 head c/	3 500	1 600
Damage to fertilizer mixing plant	1 608	1 000
Fences destroyed	420	270
Damage to nurseries and other forestry projects	297	-
Damage to fishing equipment	100	60
Damaged machinery and equipment	170	170
Loss of banana plantation (1 200 ha)	1 200	-
Loss of coffee plantation (1 500 ha)	6 000	-

Source: CEPAL estimates on the basis of information supplied 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 the harvests which cannot be produced in ten years time.

b/ Estimate based on the reduction in yields over five years (35 quintals of cotton at 1981 prices).

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

/Banana activi

Banana activities are located in what was no doubt the centre of the heaviest rainfall. Bananas are highly sensitive to excessive humidity, so that they were seriously affected; the plantation, whose extension is estimated at around 3 000 hectares, suffered not only from excess water, but it also remained exposed to fungus diseases, mainly Sigatoka. It is estimated that sowings were destroyed on about 1 200 hectares of land, in addition to which 1 million boxes already prepared and in warehouses could not be exported, although it is understood that these were covered by insurance. The infrastructure of the banana plantation -interior roads, wires for the transport of the fruit, packing plants, etc.- was also affected, but recovery under this head is not so important as that of the plantation. It is considered that this will take approximately one year, so that in 1982 and part of 1983 exports will diminish.

In the case of coffee, the damage was less serious since its characteristics and those of the production areas -mountain slopes- were less affected by the rains. It is estimated that some 1 500 hectares of coffee were damaged, so production will fall by only a small proportion.

The cultivation of sugar cane received the impact of the rains when fortunately the bulk of the harvest had already been completed. It is estimated that only 3 500 to 7 000 hectares remained uncut. This crop has a good capacity for recovery so cane-growing activities may be reinitiated as soon as the humidity of the land has been reduced. Before the disaster, some of Nicaragua's sugar plantations had planned to extend their production areas in the present agricultural year, so that the main effect of the disaster on this activity is confined to the destruction of about 80 000 quintals of refined sugar which were already in Corinto warehouses ready for export, as is noted later in this study.

Other crops -such as sesame and tobacco- suffered minimal damage since they had not yet been sown. In the case of sesame the only loss was 25 tons of seed which it was planned to use when initiating activities in 1982.

(ii) Commodities for domestic consumption. In view of the fact that there was a deficit in some grains at the beginning of the year, the Government promoted their cultivation during the low-water season, taking advantage of the irrigation infrastructure for the purpose; it was thus expected to produce enough to meet the current demand for maize and rice until the first crop was harvested, that is, approximately at the beginning of September. These crops were in the growing stage, part of them flowering and another part already in the ripening process. The rain affected maize more seriously since, unless the plant falls over, rice is not harmed by water. Although the maize harvests were not completely destroyed, it is estimated that 31 500 tons of this grain will have to be imported to satisfy demand until the new harvest.

The rest of the commodities for home consumption were undamaged as they had not yet been sown; even in the case of sorghum -which has come to replace maize in times of greatest demand- the 1981 harvest was excellent so that the reserves will suffice to meet demand in the main areas affected. For 1982 it is envisaged that the increase in production will not reach the figure planned.

Altogether agricultural production is expected to fall by about 35 million dollars, which means that the growth rate originally programmed for 1982 will be practically halved (see table 10).

/Table 10

Table 10

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

Crop	1981	1982		Difference (damage)
		As planned	After the floods	
	Millions of dollars at 1980 prices			
Total	524.5	606.8	570.7	34.9
For export	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	
For domestic consumption	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/
Light tobacco	4.0	4.8	4.7	0.1

Source: CEPAL estimates on the basis of data supplied by the Planning Ministry.
a/ The 1982 data relate to the calendar year, except in the case of cotton, sesame and bananas, where they refer to the agricultural year (season).
b/ For 1982, calculated on the basis of world prices in force in mid-June 1982.
c/ The decline in production is due to the fact that there were surpluses in 1981, not to flood damage.

/(c) Losses

(c) Losses in inputs

Before the floods Nicaragua already had the necessary inputs for the crops which were about to be sown. As a result of the rains an appreciable quantity of fertilizers was lost, as well as 9.5 tons of rice seed and as much again of cotton seed, and maize seed and other inputs. Their replacement cost is estimated at 1.7 million dollars (see table 11). Seemingly, only a minimum part of these commodities was covered by insurance policies.

(d) Losses in products ready for consumption

Owing to the flooding of warehouses in the packing plants or port terminals there was a substantial loss of agricultural commodities from the 1981/1982 harvest which were ready for consumption and export, mainly bananas -1.2 million boxes- and to a lesser extent, plantains, sugar, coffee and cotton. This loss is estimated at 4.2 million dollars, although most of it was ensured (see table 12).

(e) Effects on livestock production

The main damage in the livestock production sector was basically the death of about 11 600 head of cattle as mentioned above. This was due, in the first place, to lack of feed for several days -since the flood débris completely covered the pasture in some regions- and to tension in the animals produced by the flood which prevents them from moving and feeding properly and whose effects may last much longer than the rainy season.

Even though in terms of the stock of cattle the damage does not seem significant, it should be noted that it occurred at a time when stock-breeding was beginning to recover after having suffered the effects of the war, which meant a high slaughtering rate and the aforementioned reduction of about 20% in the stock of cattle which in 1978 amounted to 2.4 million head.

The effects of the rains were reflected in the main stock production indicators -for example, a larger number of abortions, a considerable drop in the production of milk, a fall in the calving indexes, etc.- hence the losses will probably turn out to be more serious than those indicated in table 13, and will affect productivity for the next three years.

Pig and poultry production were also affected by the disaster and will show a drop in the current year; however, since they are rapidly produced species the effect in the medium term could be easily overcome by a recovery programme.

Estimates of the loss in livestock production for 1982 in relation to the improvement envisaged before the disaster show a figure of 1 million dollars, which will represent a drop in the production index from 6.4 to 6% (see table 13).

(f) Effects on forestry

The damage to forest production was concentrated exclusively in the projects which are under the control of the Nicaraguan Natural Resources and Environment Institute (IRENA) and is mainly confined to losses of plants in nurseries which were ready for permanent transplanting, the loss of some machinery and implements and the cost of recovering some of these materials, and the time during which activities were at a standstill because of work difficulties. In all, the damage caused in the forestry sector amounts to about 300 000 dollars, a sum which is already included under the head of capital losses (see table 9).

/Table 11

Table 11

NICARAGUA: AGRICULTURAL SECTOR. LOSSES IN PRODUCTION INPUTS

Item	Estimated value (thousands of dollars)
Total	1 683
Fertilizers	1 240
Rice seed (9.5 tons)	10
Maize seed (30 000 hectares sown)	300
Cotton seed (9 tons)	9
Various inputs	124

Source: CEPAL estimates on the basis of information supplied by MIDINPA, the Planning Ministry, the International Reconstruction Fund and the Department of Information and State Operations.

/Table 12

Table 12

NICARAGUA: AGRICULTURAL SECTOR. LOSSES IN COMMODITIES READY FOR CONSUMPTION

Commodity	Estimated value (thousands of dollars)
Total	4 192
Cotton (1 000 quintals destroyed)	64
Cotton (4 000 quintals 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
Fishing	372
Milk (46 000 gallons)	74

Source: CEPAL estimates on the basis of information supplied by MIDINRA, the Planning Ministry, the International Reconstruction Fund and the Department of Information and State Operations.

/Table 13

Table 13

NICARAGUA: DAMAGE TO LIVESTOCK PRODUCTION

(Millions of dollars at 1982 prices)

Commodity	1980	1981	1982 a/	
			As planned	After the floods
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
Total livestock	279.2	252.9	269.1	268.2

Source: CEPAL estimates on the basis of figures supplied by the Planning Ministry.
a/ Estimates.

/(g) Effects

(g) Effects on fishing activities

The damage to fishing caused by the rains consisted of losses of equipment and machinery and a small reduction in the catch of crabs and lobsters, since the ships had to take shelter throughout the time the rains lasted. This damage was also included under the head of capital losses (see table 9).

(h) Medium-term effects

In the previous sections, losses in terms of land, capital goods and production as a direct and indirect result of the floods have been estimated. There is, however, some damage in the sector whose effects will make themselves felt even in the medium term. These relate mainly to productivity in cotton growing, since the land use for this commodity suffered the whole force of the elements. Part of it was carried out to sea; another part was covered with sediment, stones, tree trunks and sand, and yet another part was eroded by the excess rainfall and carried away. Despite the fact that the soil in this area is highly productive, its physical characteristics -very loose sand- makes it highly susceptible to erosion, by both wind and water, so that its productivity will fall in the next few years.

Even though the worst effects of the rains are already past, it is necessary to take action to restore the previously existing conditions -incorporation of humus- and to formulate programmes for the prevention of erosion by both wind -by means of windbreakers- and rain, by protecting the upper courses of streams and ravines which are badly damaged and totally unprotected. These activities should be carried out concurrently with the work of protecting the ravines in which there were considerable landfalls, and loss of soil will continue even in the normal rainy season.

The land covered by rocks, wood débris and sand will need to be cleared to make them suitable for cultivation, and this may take a relatively long time. The water courses which were blocked up and caused this damage should also be rehabilitated because there is still a possibility that new destructive floods may occur; it will undoubtedly be necessary to clear the river beds, expand them in some cases and protect their banks in others.

The medium-term situation for other crops is less gloomy, since with the exception of bananas -whose devastated land will begin to produce at the end of 1983- there could be a rapid recovery which will depend on the country's capacity to rehabilitate the land before the end of August which is the time limit for sowing.

5. Damage to industry and trade

(a) Manufacturing and mining sector

The manufacturing sector felt the impact of the floods in a climate of decidedly deteriorating climate which had been gathering way during the year in the face of the drastic reduction in the availability of foreign exchange for the purchase of inputs, which was much lower than that envisaged at the beginning of the year and compelled the Government to establish very strict priorities for its provision. This was one of the reasons why even before the natural phenomenon took place a drop of 2.2% was expected in the growth rate of 4.9% envisaged for 1982 in the Government plan. According to the estimates in this report, as a result of the floods that rate will necessarily fall even lower until it becomes a negative rate (-0.4%).

/At the

At the level of branches of industry, serious damage is noted in the production potential of the group of industries comprising food, beverages and tobacco, followed by the chemical industries.

According to the results of a survey of the industries affected (see table 14) and to provisional calculations it is estimated that the manufacturing sector suffered total damages amounting to about 19 million dollars, mainly in the way of losses of stocks of raw materials which were stored in enterprises and/or customs houses, and also in the form of damage to industrial plant. Only a minimum proportion of those goods was ensured. In most of the enterprises located in the disaster zone production activities came to a stop during the emergency period which caused production and sales to fall. The largest proportion of the damage was to enterprises in the private sector, except for a number of chemical and metal manufactures and machinery industries of the public ownership area which were seriously affected by the metereological phenomenon.

Although no very accurate information is available, the amount represented by the estimated figures seems to indicate that despite the efforts made it is not feasible that the sector will recover completely during the year, particularly owing to the limitations of foreign exchange for the purchase of the substantial imported component (machinery and raw materials). Approximate estimates show that the total loss in terms of production value represents not more than 2% of the 1981 level of gross industrial production (estimated at 7 700 million córdobas). Its repercussion on the sector's economy could, however, reduce the possibilities of achieving the growth targets of the current year.

Damage to the whole of the mining sector is estimated at about 500 000 dollars and comprises that affecting gold mining and the production of non-metallic minerals. The former showed production losses in three of the mines and the branch roads deteriorated in all of them; as regards the latter, producers of lime, gypsum and some quarries stopped their activities completely, although only on a temporary basis.

(b) Trade

According to very provisional estimates the damage to local trade amounted to 3.5 million dollars and was basically due to damage to stocks, buildings -including markets and slaughter-houses- and warehouses; the most serious losses appear to have been due to the reduction or stoppage of trade activities and damage to warehouses and inventories of ENABAS, which were partially insured (see table 15). In some cases the damage halted activities during the rainy period, as occurred in 21 municipal markets. The estimate includes losses in terms of income not earned by the trade activities affected for a period of approximately two weeks. It is believed, however, that the damage done to real estate may be fairly easily recovered, so that it will probably be repaired in the middle of 1982. The interruption of internal road traffic or its obstruction and higher cost, including that carried on in Central America itself, has reduced the flow of supplies so that the volume of this sector's sales has decreased even in establishments where no damage was inflicted. This situation will continue until the transport system is completely reconditioned.

Lastly, the 3% expansion expected in the Government plan for domestic trade and banks in 1982 can scarcely be attained, and even growth for the whole year will be zero in view of the above-mentioned damage.

/Table 14

Table 14

NICARAGUA: ESTIMATED DAMAGE IN MANUFACTURING AND MINING SECTORS
(Thousands of dollars)

Item	Value
Total	19 113
Manufacturing sector	18 613
Fixed assets	2 477
Buildings	84
Spare parts and machinery	216
Equipment and transport	260
Other installations	1 917
Stocks	2 299
Raw materials	1 788
Finished products	511
Fall in production and sales	13 837
Mining sector a/	500
Gold ore	250
Non-metallic minerals (lime, gypsum and others)	250

Source: CEPAL estimates on the basis of information supplied by the Department of Information and State Operations.
a/ Production losses.

/Table 15

Table 15

NICARAGUA: DAMAGE IN THE TRADE SECTOR

(Thousands of dollars)

Item	Replacement value
Total	3 482
Damage to warehouses and inventories (ENABAS)	1 180
Popular Trade Corporation	100
Municipal markets and slaughter-houses	462
Total estimate of losses to small-scale trade a/	500
Estimated losses due to the cessation or suppression of activities b/	1 240

Source: CEPAL estimates on the basis of information supplied by the Department of Information and State Operations.

a/ It is estimated that 1 000 establishments (10% of those existing in the country) suffered losses averaging 500 dollars each.

b/ Estimated on the assumption that 10% of the establishments received no income for two weeks, using for the purpose the value of the trade gross domestic product in 1981 (approximately 300 million dollars).

6. Recapitulation of the damage

An analysis of the damage clearly reveals that the sectors most seriously affected were transport, especially the road and railway systems; agriculture, which suffered substantial capital and production losses; and housing.

Manufacturing, and mining, electric energy and trade suffered less damage, which was concentrated in losses of stocks and of income from future sales. The urban infrastructure also sustained significant damage to a value similar to that of the three above-mentioned sectors. Lastly, the port protection works in Corinto were damaged.

The health and education sectors suffered relatively light damage; however, the losses were costly in qualitative terms because they seriously affected the efforts that were being made in such important social sectors.

In short, it may be said that the floods destroyed the transport structure which was the means of access to production areas for domestic and international trade, did even more damage to the key agricultural sector which generates foreign exchange and staple commodities, and caused the deterioration of the attention to the most primitive social needs. In view of the magnitude and type of damage suffered by these sectors, their recovery may only be achieved in the medium term. Other sectors maintained their production capacity virtually intact and only suffered losses in inventories or the temporary contraction of sales, so that they will be expected to recover shortly.

Table 16 presents an overall view of the damage caused by the floods, whose total cost is estimated at around 355 million dollars.4/ Of this sum, 55 million represent temporary or permanent damage to the land -one of the country's main resources- measured in terms of the updated value of the opportunity cost represented by doing without the crops that could have been harvested on that land; 82 million are indirect losses, either under the head of income which would not be received owing to the stoppage of normal activities or to the additional operating costs caused by the disaster; finally, about 220 million dollars represent losses in the country's capital stock which will have to be replaced. Moreover, about half of such replacement will require imports (see table 16). It is estimated that barely 10 million dollars' worth of losses will be recovered from reinsurance.

For a fuller understanding of the extent of the damage -direct and indirect- it should be noted that it represents, for example, almost one-fifth of the country's gross domestic product and around 40% of its exports in 1981. There can be no doubt, therefore, of the significant magnitude of the damage, whose impact on Nicaragua's economic development is analysed below.

4/ The same meteorological phenomenon also caused considerable damage in the neighbouring republics of Costa Rica and Honduras. Although the mission did not visit those countries, not having been requested to do so by the governments concerned, the United Nations Disaster Relief Office (UNDRO) has estimated that in Honduras there were at least 200 dead and that material losses amounted to 100 million dollars; of this amount, 60 million dollars' worth of losses affected the agricultural sector, 30 million, represent damage to highways and bridges, and the remaining amount represents damage to educational and health facilities and dwellings. It is also reported that the drinking water supply was affected, thus causing contamination.

/Table 16

Table 16

NICARAGUA: SUMMARY OF THE DAMAGE CAUSED BY THE FLOODS

(Millions of dollars)

Item	Total damage	Direct damage	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	9.9
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
Electric energy	15.0	2.1	12.9	3.8
Aqueducts and sewers	4.8	0.6	4.2	0.3
Other sectors and services	2.1	2.0	0.1	0.2
Agricultural sector	109.7	78.1	31.6	
Losses in land and capital goods	68.2	68.2	-	(4.2)
Losses in agricultural production	34.9	3.3	31.6	(33.0)
Losses in inputs	1.7	1.7	-	1.0
Losses in products ready for consumption	3.6	3.6	-	(3.0)
Losses in livestock production	0.9	0.9	-	(0.3)
Losses in fishery production	0.4	0.4	-	(0.4)
Manufacturing and mining sector	19.1	4.8	14.3	
Losses in industrial plant	2.5	2.5	-	1.0
Losses in stocks	2.3	2.3	-	(2.3)
Losses in manufacturing output	13.8	-	13.8	-
Losses in mining production	0.5	-	0.5	0.5
Trade sector	3.4	1.7	1.7	
Losses in fixed assets	0.5	0.5	-	0.1
Losses in inventories	1.2	1.2	-	1.0
Losses in sales	1.7	-	1.7	-

Source: CEPAL estimates on the basis of official figures.

a/ The figures in brackets indicate losses in exports; in total, 91 million represent imported materials and 36 reductions in exports.