



## 04. Agriculture Sector

### D. Irrigation Sub-sector

#### Organization Responsible

Level of Responsibility	Name of Ministry/Agency/Institution
<b>Ministry</b>	Ministry of Irrigation & Water Resource Management Ministry of Agriculture Ministry of Provincial Council and Local Government
<b>Department</b>	Department of Irrigation
<b>Province</b>	Provincial Irrigation Department
<b>District</b>	
<b>Irrigation Region</b>	
<b>Irrigation Division</b>	

## Concepts and Definitions

### Agriculture Sector

The agriculture sector is composed of the following sub-sectors:

- a. **Seasonal Crops** like rice, vegetables, root crops, etc.
- b. **Permanent Crops** like plantations of coffee, coconuts, fruit trees, etc.
- c. **Livestock and Poultry** like cattle, chicken, etc.
- d. **Fisheries** which may be open sea, river fishing or inland aquaculture
- e. **Forestry** which will include timber and other forest products
- f. **Other Primary Agricultural Products** like honey and unprocessed milk
- g. **Agriculture-related Assets** like irrigation, storage, agricultural inputs, etc.

This Guidance Notes will apply to the irrigation sub-sector in Sri Lanka.

### Damages

In agriculture, damages are cost of: a) repair of partially damaged assets and/or b) replacement of totally destroyed assets and infrastructure such as:

1. **Structures or buildings.** Agricultural buildings like storage, animal shelters, irrigation, research laboratories and other structures which function as part of the sector. They should be assessed in coordination with the local authorities.
2. **Equipment and other machinery/equipment.** There are various instruments used for agricultural purposes like tractors, mechanical harvesters, farm tools, etc. The types of equipment, machinery and other important assets should be considered.
3. **Agricultural products, inputs, materials and supplies.** Farmers normally have stocks such as harvested rice, corn etc., seed stocks, seedlings, fertilizers, pesticides, veterinary medicines, etc. Their value can be sufficiently high to warrant individual assessment.
4. **Plantation which were fully destroyed (uprooted).** The totally destroyed permanent crops plantations like oil palm, coconuts, coffee, tea, cacao, etc. are considered agricultural assets and are valued at their replacement costs (replanting and maintenance cost until again in full production). Their production is considered as a loss and accounted under this for all the years until the crops is again fully productive.

Damages in this sector will occur at the time of, or shortly after the disaster although some damages may become obvious only after a longer period. Damages

are measured in physical terms for which the monetary repair or replacement value is subsequently estimated.

### **Losses**

Losses are the values of foregone revenues or income due to the change in economic flows (income and expenditures) during the period of recovery and reconstruction following the disaster. They are the current value of goods and services that were not and/or will not be produced over a time span due to the disaster until full recovery is attained. Losses in the agriculture sector will include:

- 1. Loss or reduction in output (production) or income.** The reduction in income will occur when planted crops, livestock, fisheries, forestry, etc. are partially damaged by disasters. This can be estimated by considering the pre-disaster expected income less post-disaster expected income. Totally destroyed seasonal crops like rice, corn and vegetables which are ready to be harvested are valued at farm gate prices.
- 2. Reduction in future output or income.** Long-term income losses from harvests can be due to:
  - a.** The degradation of land by floods, landslides, prolonged droughts, etc. This will happen if agricultural lands are rendered less productive after a disaster which can extend years after a disaster. This can be estimated by considering the pre-disaster expected income less post-disaster expected income spread through the years until production levels normalize.
  - b.** The production from totally destroyed permanent crops and trees. This can be estimated by considering the pre-disaster expected income spread through the years until the permanent crops and trees are productive again to the same level.
- 3. Investment losses.** In agriculture, an important type of loss is the investment loss of farmers when the standing crops or livestock or fish stocks are totally destroyed by a disaster. If these happen and the farmers (or growers) are not able to replant (or replace the stocks) within the year, the value of investment put into the destroyed crops (or livestock or fish stock) will be considered as loss. Otherwise, losses are estimated as the value of the reduction of the expected production.
- 4. Higher or added production cost.** The added cost of production will occur if the farmers (livestock and fisheries growers) replant (or replace the stocks) in time to harvest within the year. This will mean that the farmers (or growers) will incur a higher production cost to produce the same volume of harvest within the year. The added cost of production will be the value of lost investment by the farmers (or growers).

**5. *Additional expenses*** to clean up the debris of destruction, retrieval of buried assets, etc.

Losses of the sector may stretch even beyond the year that the disaster occurred. It is expressed in monetary value at current prices.

In conducting a post-disaster damage and loss assessment in the agriculture sector, the following steps should be followed for every disaster-affected District.

## Steps in Undertaking Post-disaster Damage and Loss Assessment for the Irrigation Sub-sector

### ***Step 1. Collect and/or validate the baseline data for each of the disaster-affected District***

Baseline information must be compiled and validated at the national, provincial or district levels before the field assessment or, if possible, prior to the occurrence of disaster.

#### **Irrigation Assets**

Irrigation is one of the major components in agriculture. This is considered vital for the sector's performance and must be accounted before the occurrence of a disaster to facilitate a post-disaster assessment in the future. The following baseline information will provide the basis for the estimation of damages and losses. All irrigation systems are considered publicly owned.

**Table 1. Irrigation Facilities**

District						
Division						
Region						
Type Name and of Irrigation Facility	Capacity (Acre)	Irrigated Area (Acre)		Income per Year per Acre		Number of Beneficiary Farmer Families
		Paddy	OFC	Paddy	OFC	
<b>Major</b>						
Tank 1						
Tank 2						
Tank N						
<b>Medium</b>						
Tank 1						
Tank 2						
Tank N						
<b>Minor</b>						
Tank 1						
Tank 2						
Tank N						
<b>Anicuts</b>						
Anicut 1						
Anicut 2						
Anicut N						

The cost of repair or replacement of the irrigation assets are enumerated below.

**Table 2. Repair and replacement costs of irrigation assets**

District	
Division	

<b>Region</b>		
<b>Irrigation Assets</b>		
<b>Major Tanks</b>	<b>Average Repair Cost (LKR/m)</b>	<b>Average Replacement Cost (LKR/m)</b>
<i>Bund</i>		
<i>Riprap</i>		
<i>Spill</i>		
<i>Main Canals</i>		
<i>Distributor Canals</i>		
<i>Field Canals</i>		
<i>Others</i>		
<b>Medium Tanks</b>		
<i>Bund</i>		
<i>Riprap</i>		
<i>Spill</i>		
<i>Main Canals</i>		
<i>Distributor Canals</i>		
<i>Field Canals</i>		
<i>Others</i>		
<b>Minor Tanks</b>		
<i>Bund</i>		
<i>Riprap</i>		
<i>Spill</i>		
<i>Main Canals</i>		
<i>Distributor Canals</i>		
<i>Field Canals</i>		
<i>Others</i>		
<b>Anicuts</b>		
<i>Bund</i>		
<i>Riprap</i>		
<i>Spill</i>		
<i>Main Canals</i>		
<i>Distributor Canals</i>		
<i>Field Canals</i>		
<i>Others</i>		
<b>Other Structures</b>		
<i>Roads</i>		
<i>Bridges</i>		
<i>Culverts</i>		
<i>Causeways</i>		
<i>Retaining walls</i>		
<i>Interlock pavings</i>		
<i>Regulators</i>		
<i>Turnout</i>		
<i>Drops</i>		
<i>Retaining walls</i>		
<i>Canal linings</i>		
<i>Trough structures</i>		
<i>Canal spill</i>		
<i>Under Crossing</i>		
<i>Over crossing</i>		
<i>Others</i>		
<b>River Embankments</b>		

Buildings	Average Repair Cost (LKR/sqm)			Average Replacement Cost (LKR/sqm)
	Roof	Wall	Floor	
1 floor				
2-3 floors				
More than 3 floors				

## Step 2. Estimate damages and losses

With the baseline information, field assessment should be undertaken in the affected districts after a disaster. Direct interviews with officials involved in the construction and repair of facilities can also be conducted during the field visit in order to validate unit costs of repair and reconstruction.

### ✓ Step 2.1. Estimate the damages and losses

Based on the field visit, the table below will be filled out in the online system.

**Table 3. Damages and Losses**

<b>District</b>			
<b>Division</b>			
<b>Region</b>			
<b>Irrigation Assets</b>	<b>Partially Damaged (in Meters)</b>	<b>Totally Destroyed (in Meters)</b>	<b>Damages (LKR)</b>
<b>Major Tanks</b>			
Bund			
Riprap			
Spill			
Main Canals			
Distributor Canals			
Field Canals			
Others			
<b>Total</b>			
<b>Medium Tanks</b>			
Bund			
Riprap			
Spill			
Main Canals			
Distributor Canals			
Field Canals			
Others			
<b>Total</b>			
<b>Minor Tanks</b>			
Bund			
Riprap			
Spill			
Main Canals			

Distributor Canals							
Field Canals							
Others							
<b>Total</b>							
<b>Anicuts</b>							
Bund							
Riprap							
Spill							
Main Canals							
Distributor Canals							
Field Canals							
Others							
<b>Total</b>							
<b>Other Structures</b>							
Roads							
Bridges							
Culverts							
Causeways							
Retaining walls							
Interlock pavings							
Regulators							
Turnout							
Drops							
Retaining walls							
Canal linings							
Trough structures							
Canal spill							
Under Crossing							
Over crossing							
Others							
<b>Total</b>							
<b>River Embankments</b>							
Buildings	Partially Damaged				Totally Destroyed		Damages (LKR)
	Number	Roof (sq m)	Wall (sq m)	Floor (sq m)	Number	Total Square Meters	
1 floor							
2-3 floors							
More than 3 floors							
<b>Total</b>							
<b>TOTAL DAMAGES</b>							
<b>LOSSES</b>							



	Higher Operating Costs (LKR)	Other Unexpected Expenses (LKR)	Total Losses (LKR)
<b>Major Tanks</b>			
Tank 1			
Tank 2			
Tank N			
<b>Medium Tanks</b>			
Tank 1			
Tank 2			
Tank N			
<b>Minor Tanks</b>			
Tank 1			
Tank 2			
Tank N			
<b>Anicuts</b>			
Anicut 1			
Anicut 2			
Anicut N			
<b>Other Structures</b>			
<b>River Embankments</b>			
<b>Buildings</b>			
<b>TOTAL LOSSES</b>			

**Notes in filling out Tables 3.**

- The damages enumerated in the above table are the total of all the assets that were assessed.
- Only the length in meters for irrigation canals and the number of similar affected assets are required in the above table. The total damages will be automatically estimated by multiplying them to their corresponding baseline information.
- Other assets in each type of irrigation systems must be enumerated.

✓ Step 2.2. Summarize the Damages and Losses in the District

Based on the information gathered in the previous tables, the summary table below can show the magnitude and scope of damages and losses to the sector.

**Table 4. Summary of damages and losses to irrigation in the District**

Name of District			
Type of Irrigation Facility	Damages (LKR)	Losses (LKR)	Total (LKR)
Major Tanks			
Medium Tanks			
Minor Tanks			
Anicuts			
Other Structures			
River Embankments			
Buildings			
<b>TOTAL</b>			

✓ Step 2.3. Summarize the Estimated Damages and Losses in the Province

The total estimated effects of the disaster in the province can be summarized by combining the values of damages and losses in the Districts. The following table is used in the online system.

**Table 5. Summary of damages and losses in the irrigation sub-sector in the Province**

<b>Name of Province</b>			
<b>Type of Irrigation Facility</b>	<b>Damages (LKR)</b>	<b>Losses (LKR)</b>	<b>Total (LKR)</b>
<b>District 1</b>			
Major Tanks			
Medium Tanks			
Minor Tanks			
Anicuts			
Other Structures			
River Embankments			
Buildings			
<b>Total</b>			
<b>District N</b>			
Major Tanks			
Medium Tanks			
Minor Tanks			
Anicuts			
Other Structures			
River Embankments			
Buildings			
<b>Total</b>			
<b>GRAND TOTAL</b>			

✓ Step 2.4. Summarize damages and losses of the sector at the national level

A nationwide summary of the assessment will be created enumerating the damages and losses of the sector at each province. The data in the national summary should include all the information gathered by the various teams that assessed the different disaster-affected districts. The following table will be used for the national summary.

**Table 6. Summary of damages and losses in the irrigation sub-sector nationwide**

<b>Type of Irrigation Facility</b>	<b>Damages (LKR)</b>	<b>Losses (LKR)</b>	<b>Total (LKR)</b>
<b>Province 1</b>			
Major Tanks			

Medium Tanks			
Minor Tanks			
Anicuts			
Other Structures			
River Embankments			
Buildings			
<b>Total</b>			
<b>Province N</b>			
Major Tanks			
Medium Tanks			
Minor Tanks			
Anicuts			
Other Structures			
River Embankments			
Buildings			
<b>Total</b>			
<b>GRAND TOTAL</b>			

### ***Step 3. Analyze the impacts of the damages and losses to the economy and affected population***

The assessment team must be able to analyze potential impacts to the people and the economy, among others, if the sector is not restored immediately. The following are some of the issues that should be assessed, among others:

- ***The possible impacts on the welfare of the people.*** Income of farmers, their living conditions, food supply, housing, health, education, access to services and resources.
- ***Economic impacts.*** Business productivity (decline in output and income); reduction in employment; increase in prices; food supply; etc.
- ***Government services.*** Reduction in provision of services in education; health; security; administrative matters; etc.
- ***Added risks.*** The additional hazards and risks brought about by the disaster like the creation of new landslide-prone areas; epidemics; etc.
- ***Environment.*** The potential environmental risks like oil spills, destruction of watershed areas; etc.
- ***Gender and other cross-cutting issues and concerns.*** The potential impacts to vulnerable groups like women, children, elderly, indigenous peoples, etc.

### ***Step 4. Identify the recovery strategies and estimate the recovery and reconstruction needs***

The post-disaster needs must be based on a framework where policies and strategies are coherent and integrated. After analyzing the potential effects and

impacts if no assistance will be provided to the sector, the aggregate needs of the sector must be estimated.

✓ Step 4.1. Identify recovery and reconstruction strategies

After the consolidation of the field assessment, the assessment team must identify or recommend the policies and strategies for the recovery and reconstruction for the sector. The following strategies can be adopted for the post-disaster recovery and reconstruction activities:

- **Building Back Better (BBB).** Recovery activities based on BBB principles will promote longer-term disaster risk reduction and management. BBB principle should look at the how to make infrastructure and facilities safer from future disasters like stronger engineering design, the advantages of resettlement of facilities in disaster-safe areas instead of rebuilding in the same disaster-prone areas, etc.
- **Focus on the most vulnerable and socially disadvantaged groups such as children, women, and the disabled.** Recovery programming should give priority to those that will benefit the most vulnerable groups, including women, female-headed households, children, the poor, and take into account those with special needs.
- **Community Participation and Use of Local Knowledge and Skills.** The participation of the community in all process (identification, planning, design and implementation) of recovery activities will help ensure the acceptability of projects and optimize the use of local initiatives, resources and capacities.
- **Coordinated and coherent approaches to recovery.** The effective coordination among all involved agencies should be established based on uniformity of policies, flexibility in administrative procedures, etc. In some instances, a special new agency may be needed to oversee, coordinate and monitor complex disaster recovery programs.
- **Efficient use of financial resources.** Fund sources from the national budget and the international donor partners that are suited for the recovery activities should be identified. Assistance to the recovery of the private sector, if any, should be clearly outlined.
- **Transparency and accountability.** The overall plan and implementation of projects for recovery must be transparent, especially to those affected, through open and wide dissemination of information on all aspects of the recovery process. An effective monitoring system must be established.

✓ Step 4.2. Identify, estimate and prioritize recovery and reconstruction needs

Recovery needs are intended to bring back normalcy to all affected areas and sectors as soon as possible while reconstruction needs are generally long-term in nature (3 years or more) and are intended to 'build back better' from the ruins of a disaster. The sector assessment team must identify and prioritize their recovery and reconstruction projects based on their impact assessment.

✓ Step 4.3. Summarize the estimated needs and draft the implementation schedule

Based on the prioritized recovery and reconstruction needs, a summary should be created by the assessment team enumerating the post-disaster projects for the recovery and reconstruction with a rough general schedule of implementation outlining at the very least the activities, timing and budget required. The following table can be used.

**Table 7. Summary of needs**

Name of Project	Estimated Budgetary Requirement (LKR)			Total (LKR)
	Year 1	Year 2	Year N	

**Step 5. Draft the post-disaster damages, losses and needs (PDNA) report of the sector**

With all the information gathered using the previous steps, a report can be drafted by the assessment team which will be the inputs of the sector in the overall recovery and reconstruction plan. The draft sector report should be submitted to the DMC for consolidation.