



REPUBLIC OF FIJI

# Post-Disaster Needs Assessment Guidelines

## Agriculture Sector



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## List of acronyms

<b>4RF</b>	Resilient Recovery, Rehabilitation, and Reconstruction Framework (Pakistan)
<b>BBB</b>	Build back better
<b>DaLA</b>	Damage and loss assessment
<b>DCU</b>	Disaster Coordinating Unit
<b>DRR</b>	Disaster risk reduction
<b>DSLO</b>	Disaster Service Liaison Officer
<b>ECLAC</b>	United Nations Economic Commission for Latin America and the Caribbean
<b>FAO</b>	Food and Agriculture Organization of the United Nations
<b>F\$</b>	Fijian dollar
<b>GDP</b>	Gross domestic product
<b>GPS</b>	Global Positioning System
<b>HRNA</b>	Human Recovery Needs Assessment
<b>IASC</b>	Inter-Agency Standing Committee
<b>M&amp;E</b>	Monitoring and evaluation
<b>MSMEs</b>	Mico-, small- and medium-sized enterprises
<b>NADMC</b>	National Agriculture Disaster Management Council
<b>NADMO</b>	National Agriculture Disaster Management Office
<b>NDC</b>	National Disaster Controller
<b>NDMC</b>	National Disaster Management Council
<b>NDMO</b>	National Disaster Management Office
<b>NDMP</b>	Fiji National Disaster Management Plan 1995
<b>NEOC</b>	National Emergency Operations Centre
<b>NGO</b>	Non-governmental organization
<b>PDNA</b>	Post-disaster needs assessment
<b>SOP</b>	Standard operating procedure
<b>SPO</b>	Strategic Planning Office
<b>UNDP</b>	United Nations Development Programme
<b>UNFPA</b>	United Nations Population Fund



1



# 1 Introduction

## 1.1 Background

The post-disaster setting is a complex and demanding environment, where the most urgent task is to promptly assess humanitarian needs and provide life-saving relief assistance to those affected. However, it further requires an assessment of the damage and loss caused by the disaster, and the development of a comprehensive recovery plan as the blueprint for implementing a sustainable development process in which risk reduction in the face of disasters is explicitly considered. To meet such challenges, a country affected by a disaster often requires the support of a wide range of national and international actors. In the past, this process was characterized by multiple parallel needs assessments and planning exercises conducted by respective individual groups, agencies and donors. Typically, such assessments varied in scope and rigour, and would be undertaken at different stages during the response and recovery phases (European Commission, United Nations Development Group and World Bank, 2013a). This led to the recognition of the need to develop a common platform of harmonized processes and methods in post-disaster assessments and recovery planning to assess, plan and mobilize support for the recovery of countries and populations affected by disasters.

Such a common platform of harmonized processes and methods is now based on the Post-Disaster Needs Assessment (PDNA) International Guidelines developed by the World Bank, the European Union, and the United Nations Development Group which includes the Food and Agriculture Organization of the United Nations (FAO), International Labour Organization, United Nations Development Programme (UNDP), United Nations Educational, Scientific and Cultural Organization, United Nations Environment Programme, UN-Habitat, UN Women, and World Health Organization). It presents a framework for partnership and coordinated actions in post-disaster assessment and recovery planning. The PDNA adopted at the international level draws from and incorporates various assessment and planning techniques, such as the damage, loss and needs developed by the United Nations Economic

Commission for Latin America and the Caribbean (UNECLAC) and applied by the World Bank, as the damage and loss assessment (DaLA) methodology, and the Human Recovery Needs Assessment, to provide step-by-step instructions on planning for and implementing a PDNA. The PDNA process is based on the national accounting framework of a country and is, therefore, developed on a sectoral basis with cross-cutting issues taken into consideration. The agriculture sector falls under the broad category of the productive sector, which also includes commerce, industry and tourism.

**This document presents the guidance note for undertaking a PDNA, analysing disaster effects and impact, identifying recovery needs, and developing a recovery strategy for Fiji's agriculture sector.**

It is being presented to strengthen the capacities for crisis assessment and recovery planning within the agriculture sector in the country. The *PDNA Guidelines for the Agriculture Sector of Fiji* (henceforth the agriculture sector PDNA guide) is aimed at assisting the country in general and the Ministries of Agriculture; Fisheries; Forestry; Lands and Mineral Resources; and Rural and Maritime Development and Disaster Management, in improving their abilities to prepare, assess, plan, implement and sustain crisis (disasters, conflicts and epidemics) recovery and peacebuilding activities. To this end, the agriculture sector PDNA guide adapted is expected to ensure the sustainability of the PDNA methodology as an approach and tool to formulate comprehensive recovery strategies. The agriculture sector PDNA guide, therefore, presents standardized forms, guidelines and tools for enhancing the processes related to assessing effects, conducting impact analyses, establishing recovery needs and developing recovery strategies.

The agriculture sector PDNA guide also presents in **Appendix 1** some key disaster terms that are to a large extent based on the disaster risk reduction (DRR) terminology adopted by the United Nations General Assembly in 2016.<sup>1</sup>

<sup>1</sup> For the complete list, please see <https://www.undrr.org/terminology>.

The agriculture sector PDNA guide is being presented against the background of the vulnerability of Fiji's agriculture sector to natural hazards, as identified below (United Nations Capital Development Fund, 2020).

- » Fiji is highly exposed to natural hazards, with cyclones and floods being annual events that damage property and cause long-term cumulative economic harm. Other natural hazards, including landslides, droughts, earthquakes, tsunamis and volcanoes, are present, but pose smaller threats. Climate change is expected to exacerbate weather-related hazards in the future.
- » Fiji's agriculture sector and fisheries industries, and micro-, small- and medium-sized enterprises (MSMEs), are particularly vulnerable to damage caused by natural hazards. These sectors are critical sources of livelihood for a large proportion of the population: 36 percent of all employment is in the agriculture sector (World Bank, n.d.), half of all rural households have some involvement in subsistence fishing (Fiji, 2016, p. 48), and 60 percent of employment across all sectors is in MSMEs (Paul, 2016, p. 22).
- » Damage to crops and fisheries can take many years to recover. For example, in the aftermath of Tropical Cyclone Winston, agricultural production in some areas was not expected to return to pre-cyclone levels for 5 to 10 years, and some fisheries could take 12 years to recover (Fiji, 2016, pp. 12, 50–51).
- » Many MSMEs, such as food processing, handicrafts, weaving, and tourism-related products, rely on agricultural production. Many are also home-based businesses that suffered when homes were damaged or destroyed (Fiji, 2016, pp. 60, 76, 102).
- » Natural hazards disproportionately affect people who are poor, workers in the informal economy, women, and young people. People who are poor tend to be more exposed to hazards than wealthier people, are more severely affected by hazards, and have fewer resources available to cope when disasters occur. Women and girls are disadvantaged and constrained economically, have less access to warning systems, more often have livelihoods that depend on natural

resources, and suffer increased incidences of gender-based violence during crises. Young people suffer long-term ill effects from disruption to education and employment caused by natural hazards, which can lead to long-term failure to develop human capital and to permanently reduced employment prospects and incomes.

As presented, the agriculture sector PDNA guide provides guidance to technicians in the identified ministries and the National Disaster Management Council (NDMC)/Office (NDMO) in the recovery assessment process, describing the steps to follow by each agriculture subsector in carrying out a comprehensive post-disaster analysis. It assumes that the agriculture sector comprises permanent crops, annual crops, livestock, fisheries and aquaculture, apiculture, and forestry. It incorporates auxiliary tables, which are the basis for the estimates in each phase of the methodology.

## 1.2 Purpose of the agriculture sector PDNA guide

The overarching purpose of the agriculture sector PDNA guide, adapted to Fiji's agriculture sector, is to provide improved support to the Ministries of Agriculture; Fisheries; Forestry; Lands and Mineral Resources; and Rural and Maritime Development and Disaster Management, and the NDMC/NDMO, in post-disaster recovery assessments and planning, through a more coordinated approach. The more immediate objective of the agriculture sector PDNA guide is to provide an agreed framework and predictable arrangements for effective and efficient coordinated support from national, regional and international organizations that are providing requested assistance for post-disaster recovery and reconstruction in the agriculture sector. In this way, the agriculture sector PDNA guide provides a practical, action-oriented and easy-to-use methodology and approach. These are expected to significantly benefit the disaster assessment process in the agriculture sector in that they:

- » Present common standards regarding quality, reliability and inclusiveness
- » Facilitate quick decision-making and action by stakeholders

- » Provide a predictable and coherent approach to assessment and planning
- » Contribute towards an objective and comprehensive estimate of recovery needs
- » Contribute towards an efficient professional response by national, regional and international communities
- » Contribute to a more cost-effective approach by working towards coordination and reducing overlaps in conducting assessments and developing recovery strategies
- » Improve the credibility of assessments and recovery strategies for the sector
- » Improve financing opportunities for recovery and reconstruction for the sector

### 1.3 Objectives of the agriculture sector PDNA guide

The overall objective of the agriculture sector PDNA guide is to support the Ministries of Agriculture; Fisheries; Forestry; Lands and Mineral Resources; and Rural and Maritime Development and Disaster Management, and the NDMC/NDMO, in the planning and implementation of the assessment of the full extent of a disaster's effects and impacts on the sector and, on the basis of these findings, to produce an actionable and sustainable recovery strategy for mobilizing financial and technical resources. More specifically, the agriculture sector PDNA guide establishes the following objectives:

- » Support sector-led assessments and initiate recovery planning processes through a coordinated inter-institutional platform by integrating the concerted efforts of relevant national, regional and international organizations
- » Identify and value economically, the effect of a disaster on:
  - Agricultural infrastructure and physical assets
  - Service delivery and access to goods and services across the agriculture sector, particularly the availability of basic services and the quality-of-service delivery

- Governance and social processes within the sector
- Underlying risks and vulnerabilities to reduce risk and build back better (BBB)
- » Assess the disaster's impact on the agriculture sector, including
  - The macroeconomic impact, particularly on agriculture sector gross domestic product (GDP), trade, revenue and expenditure, and food inflation
  - The human development impact on quality of life in the medium and long term
- » Assess the disaster's impact on the cross-cutting issues within the agriculture sector, including gender, governance, environment, DRR, employment, livelihoods and social protection
- » Identify all recovery and reconstruction needs
- » Develop the recovery strategy outlining priority needs, recovery interventions, expected outputs, and the cost of recovery and reconstruction, which would form the basis for a comprehensive recovery framework
- » Provide the basis for mobilizing resources for recovery and reconstruction through local, national and international sources

To achieve these objectives, the agriculture sector PDNA guide provides the following:

- » A framework for the conduct of the agriculture sector assessment
- » Guidelines for calculating damage and loss
- » Tools to support the technical officers in conducting the assessment
- » Homogeneous criteria for the economic evaluation of all subsectors
- » An action plan to strengthen the technical capacity of local actors

- » Guidelines to facilitate the integration of the agriculture sector assessment with other sectors, including the development of comprehensive sectoral and national recovery needs and strategies

## 1.4 Audience

The agriculture sector PDNA guide for the agriculture sector is intended primarily to assist technical officers from the NDMC/NDMO, the National Agriculture Sector Disaster Management Office (NADMO), and participants from the private sector, civil society and humanitarian organizations in the planning and implementation of the agriculture sector PDNA. The agriculture sector PDNA guide is also useful for managers from government agencies and line ministries who are responsible for steering and coordinating the PDNA processes at the national and sectoral levels, as well as local leaders, volunteers, officials and advisors at the national and international levels involved in emergency and recovery management.

## 1.5 Framework for the conduct of the agriculture sector assessment

In implementing the agriculture sector PDNA guide, it is necessary to establish a frame of reference for the conduct of the necessary assessments and development of the recovery strategy. This is important, as the recovery strategy to be formulated should follow the results-based model to include priority needs, the short-, medium- and long-term interventions required, expected outputs, recovery cost, and intended outcomes.

**Such a recovery strategy should, therefore, be aligned with the national and agriculture sector policies and strategic plans, and the related strategic objectives thereof.**

In this context, past, current and future national and agriculture sector policy frameworks should be reviewed, including specific/concrete advances, challenges and innovations made. The lessons learned from the development of the needs assessments and recovery plans for the 13 disasters that have impacted Fiji since 2016, with approximate damage of US\$3.13 billion and 79 lives lost, including

Category 5-strength Tropical Cyclone Winston, are also relevant. These should be considered in relation to the national objectives of the agriculture sector established in the sectoral plans and related policy documents, as well as international references such as the Sustainable Development Goals.

The frame of reference should take on board the following five important policy frameworks and documents, including:

- » Fiji (2023). *Report on Baselineing the Mainstreaming of Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA) Measures in the Agriculture Sector of Fiji*. Suva. UNDP audit, August 2023.
- » Fiji (2023). *Report on the Mapping of Adequacy of Fiji's Agriculture Sector Database System for the PDNA Methodology*. Suva. UNDP audit, August 2023.
- » Fiji, Ministry of Agriculture (2020). *Fiji 2020 Agriculture Sector Policy Agenda*. Suva.
- » Fiji, Ministry of Economy (2017). *5-Year & 20-Year National Development Plan: Transforming Fiji*. Suva.
- » Initiative for Climate Action (2019). *Agriculture Policy Assessment for Fiji: Livestock & Rice Cultivation*. Copenhagen: United Nations Office for Project Services.

Fiji, Ministry of Economy (2017) comprises two important mutually exclusive and reinforcing pillars, designated as:

- » Inclusive socio-economic development
- » Transformational strategic thrusts

The issues of food and nutrition security, as well as the need to protect the natural environment, are addressed under the first pillar.

The goal of the agriculture sector policy agenda is to contribute to the national goal as envisioned in the Government's *Roadmap for Democracy and Sustainable Socio-Economic Development* (Fiji, Ministry of National Planning, 2009). This national goal for the agriculture sector in Fiji is to build sustainable



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community. This national agriculture sector development goal alludes to rural and urban communities because it is the Government's primary responsibility to ensure food security, in conjunction with the primary economic development goal of increasing income and employment opportunities in rural communities.

The baselining of the level of mainstreaming of DRR and climate change adaptation measures in the agriculture sector of Fiji, and the mapping of adequacy of Fiji's agriculture sector database system for the PDNA methodology, have provided critical information on areas of deficiencies in both areas that should be given special attention in the development of recovery strategies.<sup>2</sup>

### Consideration of the key partnerships established before and after a crisis is vital.

For example, it is essential to consider the sectoral approach, the role of civil society, humanitarian actors, professional associations in Fiji's agriculture sector and other associations, and the participation of the agriculture and food security and livelihoods cluster, the health and nutrition cluster, and others who work directly in the post-disaster recovery process.

## 1.6 Limitations of the agriculture sector PDNA guide

The agriculture sector PDNA guide is not intended to replace the more elaborate assessment methodologies developed and used by United Nations agencies, the European Union and the World Bank. In fact, it recognizes that a more in-depth assessment and planning, beyond the scope of an agriculture sector PDNA, may be required for agencies, donors and international finance institutions to develop their individual recovery strategies and programmes, particularly those specific to the agriculture sector.

Furthermore, the agriculture sector PDNA guide is not intended to be comprehensive and all-encompassing, nor is it a prescriptive document. Rather, it provides an overarching approach and orientation towards assessment and initiating the recovery planning process in the agriculture sector, which is of use to a wide audience.

<sup>2</sup> Accompanying documents to the agriculture sector PDNA guide.

2



## 2 Post-disaster needs assessments and the institutional arrangements

### 2.1 Overview of the PDNA process

The PDNA is an approach for analysing disaster effects and impact for the purpose of identifying recovery needs and strategy, defined from a human, sociocultural, economic and environmental perspective. It is an approach shared by the World Bank, the European Union and the United Nations system and agencies.

**It is an integrated process that incorporates a collection of analytical methods, tools and techniques developed for post-disaster assessments and recovery planning.**

The process ensures sector-to-sector comparability and homogeneity in the definition of its basic concepts of damage, loss and post-disaster reconstruction and recovery needs. It serves as a common platform for analysis and action, with common elements that weave sector methodologies into one approach, thereby providing a comprehensive picture of post-disaster conditions and the distinct needs and priorities of different sectors, social groups and subgroups.

In a PDNA process for the agriculture sector, the following subsectors are evaluated:

- » Crop production (including annual and perennial crops)
- » Livestock/livestock activities
- » Fisheries and aquaculture
- » Apiculture
- » Forestry (exploited plantation trees)

The remainder of this chapter provides a guide to the agriculture sector standard operating procedure (SOP), and its insertion into the national SOP, including detailed arrangements for emergency or disaster

management and coordination with regard to the sector.

### 2.2 SOP for the agriculture sector PDNA

#### 2.2.1 Objective of the SOP

The agriculture sector SOP for the conduct of a PDNA is grounded in Fiji's Natural Disaster Management Act of 15 June 1998, and the Fiji National Disaster Management Plan (NDMP) prepared by the NDMO in 1995, in close consultation with the NDMC, other government agencies, and the National Emergency Operations Centre (NEOC). The SOP provides a guide for management and personnel in the Ministries of Agriculture, Fisheries and Forestry of the operational methodology to be employed for a response to the impact (impending or actual) of natural hazards in Fiji. Specifically, the SOP:

- » Sets out the detailed arrangement and coordination for disaster management and climate change adaptation at the national, islands, islets and atoll levels
- » Provides a guide for the Ministry of Agriculture as the operation methodology to be better prepared and able to respond to the impact of both natural and human-caused or induced hazards in Fiji
- » Provides specific processes required for the Ministry of Agriculture to carry out correct and timely interventions before, during and after disaster events
- » Ensures that the Ministry of Agriculture has an effective mechanism in place to ensure safer and more resilient rural agriculture communities, able to increase their ability to prevent disasters and crises, as well as to anticipate, absorb, accommodate, and quickly recover and adapt from them in a timely, efficient and sustainable



manner. This includes protecting, restoring and improving food and agricultural systems under the threats that impact agriculture, food and nutrition security, and food safety

- » Provides guidelines on the operational linkages between the Ministry of Agriculture and the Ministry of the Environment/NDMO for various hazards in Fiji
- » Highlights the use of disaster assessment tools, including the PDNA standardized methodology, using the DaLA tool for the valuation of disaster damage and loss (Fiji, Ministry of Agriculture, 2015)

In order to achieve the above objectives, the Government has established a national system for disaster management, to ensure effective and efficient coordination of all activities in the event of a disaster.

### 2.2.2 Fiji's national system for disaster management

Fiji has adopted the global humanitarian cluster coordination system for disaster risk management, in which there are groups of organizations working in the main sectors of humanitarian action (Fiji, 2014). **The disaster management cluster approach** operates at two levels. At the global level, the aim is to strengthen system-wide preparedness and technical capacity to respond to humanitarian emergencies by designating global cluster leads and ensuring predictable leadership and accountability in all the main sectors or areas of activity.

At country level, it aims to strengthen partnerships, and the predictability and accountability of international humanitarian action, by improving prioritization and clearly defining the roles and responsibilities of humanitarian organizations. The national cluster system:

- » Provides a clear point of contact and is accountable for adequate and appropriate action
- » Creates partnerships between international humanitarian actors, national and local authorities, and civil society

- » Ensures access to support from the global system, with respect to issues related to terms of reference and robust SOPs
- » Establishes a close relationship with the global cluster system to exploit potential access to assistance for partnering, training and related funding

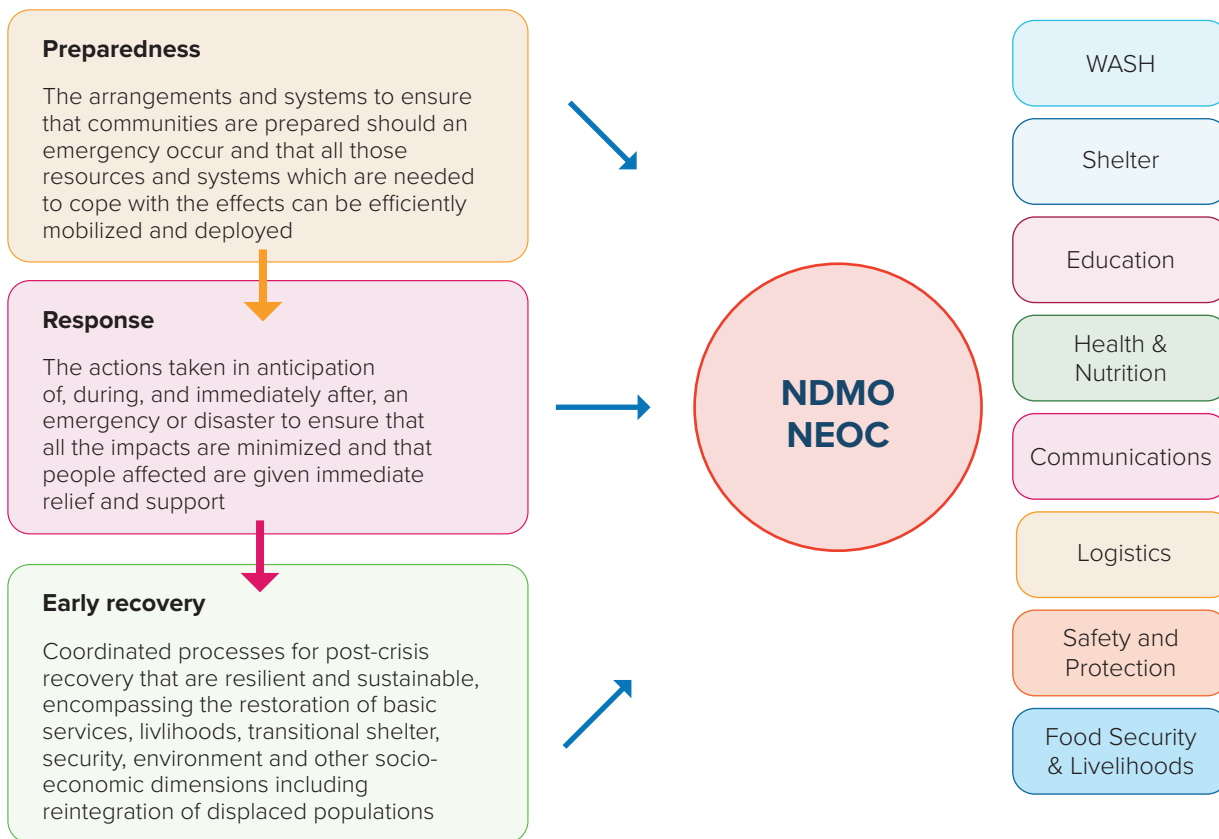
**Figure 2.1** presents the Fiji disaster management cluster system, in which the following eight clusters are identified for disaster management:

- » Education
- » Food Security and Livelihoods
- » Health and Nutrition
- » Logistics
- » Public Works and Utilities
- » Safety and Protection
- » Shelter
- » Water, Sanitation and Hygiene (WASH)

The core of Fiji's disaster management cluster system is to provide all the disaster risk management services required to ensure that the work of each cluster is appropriately facilitated, coordinated and supported. The roles of the core are characterized as coordinating, planning and funding.

The Ministry of Environment and Waterways is identified as the lead institution for the PDNA process in Fiji, with the NDMO having operational responsibilities. Under Fiji's 1998 Natural Disaster Management Act, the NDMO is responsible for day-to-day operations during any disaster response. However, the Strategic Planning Office (SPO) will have full authority for the implementation of the PDNA at the national level once triggered, and will work closely with the National Disaster Controller (NDC) from the NDMO. In effect the NDC is the link between the Ministry of the Environment/NDMO and the SPO. The National Disaster Coordinator (NATDISCORDO) is the Director of the NDMO and is responsible for coordinating all its functions and advising the NDC on all matters relating to disaster risk management.

Figure 2.1: Fiji disaster management cluster roles



Source: Fiji (2014).

The food security and livelihoods cluster is key for disaster risk management in Fiji’s agriculture sector. The Ministry of Agriculture is the government lead agency responsible for this cluster. Its goal is to plan and implement proportionate, appropriate and timely food security responses in humanitarian crisis situations. More specifically, it helps ensure that food assistance and agriculture-based programmes are linked as part of a coordinated response. It also integrates food aid, agricultural issues and other livelihood interventions.

The food security and livelihoods cluster comprises the following institutions:

- » Ministry of Agriculture as the government lead agency
- » Ministry of Fisheries
- » Ministry of Forests
- » Ministry of Health
- » Ministry of Provincial Development – Divisional Office
- » NDMO
- » Adventist Development and Relief Agency Fiji
- » Agricultural Marketing Authority
- » Australian Agency for International Development
- » Commercial statutory authorities (Fiji Sugar Corporation, Rewa Rice and Fiji Meat Industry Board)
- » FAO
- » Fiji Crop and Livestock Council
- » International Fund for Agriculture Development

- » National Food and Nutrition Centre
- » Nature's Way
- » New Zealand Aid Programme
- » South Pacific Commission
- » Twain Technical Mission
- » UNDP

**A disaster can impose severe strains and tensions on an organization that is not structured or prepared to absorb such a shock.**

To mitigate this, clear lines of authority and responsibility need to be established. The Ministry of Agriculture organizational structure for national disaster/emergency operations, including linkage with the NDMO and NEOC structure of the country, is shown in **Figure 2.2**. The figure shows a very high level of symmetry between the national organizational structure and that of the national agency responsible for the PDNA and the Ministry of Agriculture. It also shows the flow of information within the Ministry of Agriculture and between the Ministry and the other agencies at various levels.

As indicated earlier, the NDMO as the focal agency for disaster management, under the ministry responsible for disaster management – i.e. the Ministry of Rural and Maritime Development and Disaster Management in Fiji – executes the PDNA, in collaboration with the European Union, World Bank and United Nations agencies, or a combination of these development partners. NADMO is the focal point of the Ministry of Agriculture, with responsibility for the execution of the agriculture sector PDNA. At the divisional and district levels, the Divisional Commissioner and District Officers coordinate emergency/disaster operations on the ground in the respective geographic areas.

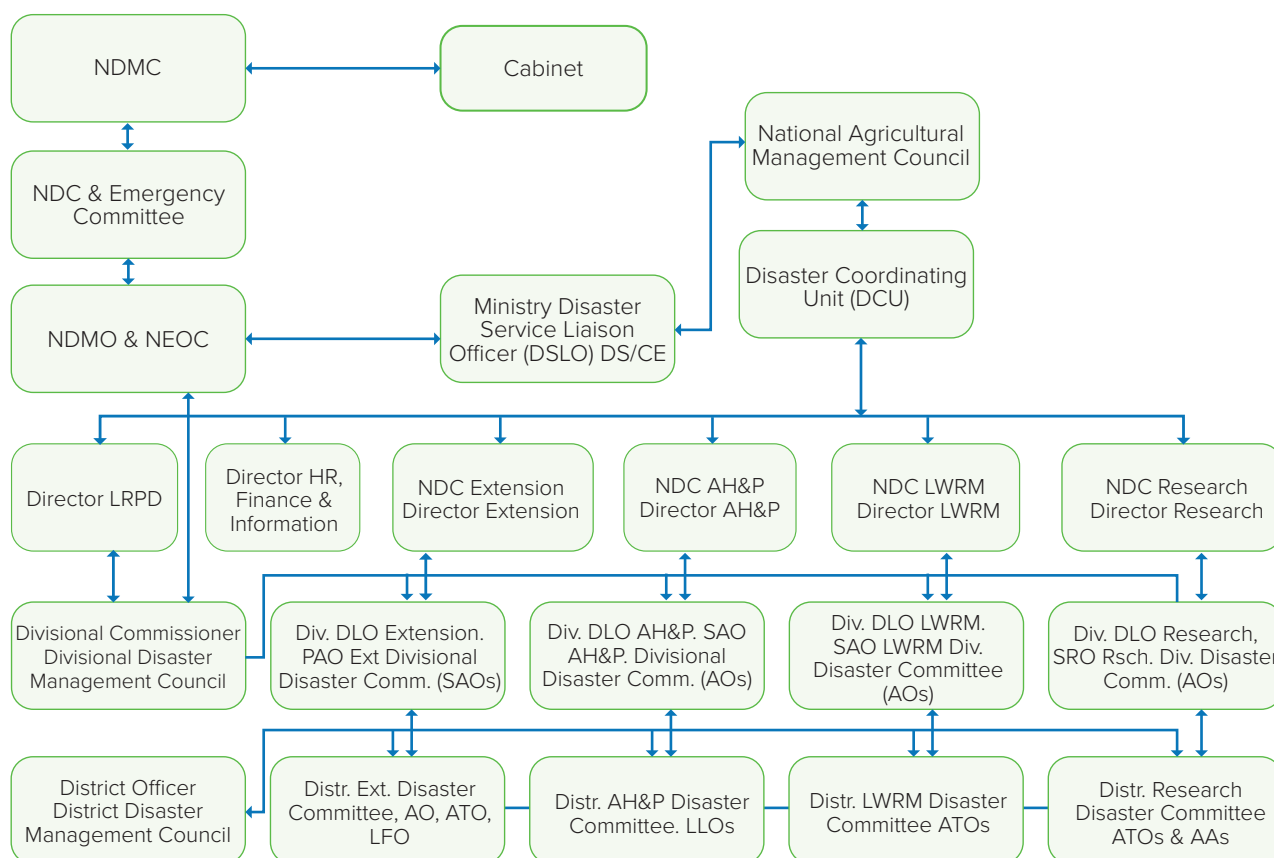
In the preparation for the PDNA, the NDMO provides a brief situation report, which presents preliminary information on the general impact of the disaster on the affected area, and the affected sectors and areas, especially those most severely affected. The NDMO proposes the national agriculture sector PDNA team and sector focal points. The size, composition and management structure of a PDNA team would depend on the type and size of the event. The composition of a PDNA team also depends on the sectors to be assessed.

The NDMO defines the national scope of the PDNA. Based on the brief situation analyses, it will recommend:

- » The sectors to be included in the assessment
- » The geographic areas to be assessed (provinces, districts or communes)
- » The timing for initiating and completing the PDNA. The timing of the PDNA requires careful consideration; its duration varies depending on the scale and magnitude of the disaster, and other factors. Timely delivery of the assessment should be a guiding principle in the conduct of the PDNA
- » Management structure for PDNA. It is desirable to keep the PDNA team size and management structure as lean as possible. In large disasters, however, when national capacities have been affected severely, a full PDNA team may be needed. Multiple experts would be needed to assume charge of various elements of the PDNA
- » Organizational arrangements for the PDNA. Preparations should be taken as soon as possible, particularly in terms of human resources, logistics, information management, the budget and training for the PDNA team

NADMO works with the NDMO and the SPO in defining the scope of the agriculture sector PDNA.

Figure 2.2: Ministry of Agriculture organizational structure for national disaster/emergency operations, and linkage with NDMO and NEOC structure



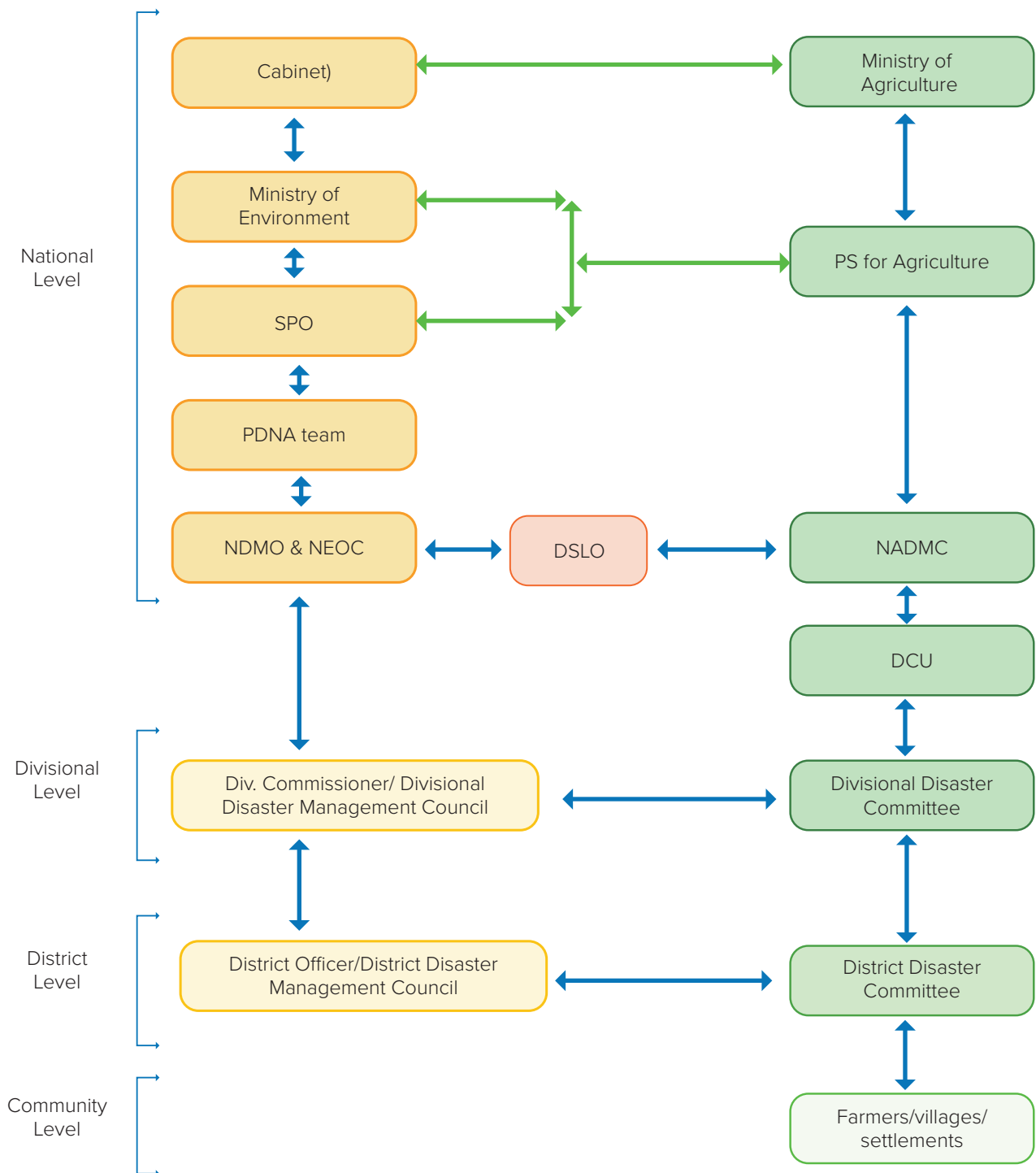
Source: Fiji, Ministry of Agriculture (2015).

**Key acronyms for Figure 2.2:**

- AA** – Assistant Accounts Officer
- AH&P** – Animal Health and Production
- AO** – Agricultural Officer
- ATO** – Agricultural Technical Officer
- DS/CE** – Chief Economist
- DSLO** – District Service Liaison Officer
- HR** – Human Resources
- LFO** – Locality Field Officer
- LLO** – Local Livestock Officer
- LRPD** – Land Resource Planning and Development
- LWRM** – Land and Water Resource Management
- PAO** – Principal Agricultural Officer
- SAO** – Senior Agricultural Officer

Effective decision-making is supported by efficient information flow and sound record-keeping. **Figure 2.3** shows the information flow between the Ministry of Agriculture disaster operations and the National disaster/emergency operation centres at the national, divisional, district and community levels.

Figure 2.3: Natural disaster response/emergency and recovery information flow



Source: Fiji, Ministry of Agriculture (2015); UNDP PDNA Expert and Data-Collection Facilitator for the consultancy

### 2.2.3 Responsibilities for the execution of the agriculture sector PDNA

The Ministry of Agriculture, through the National Agriculture Disaster Management Council (NADMC) and its Disaster Coordinating Unit (DCU) under NADMO, has responsibility for the execution of the agriculture PDNA. This process is ably supported by the myriad of national and international collaborators identified and listed under the food security and livelihoods cluster above.

Other collaborators should include, but not be limited to:

- » Representatives of the private sector and associations of producers in the agriculture sector, as well as agroprocessors, marketing companies and suppliers of inputs for the sector
- » Service providers to the agricultural, livestock, forestry, fishing and aquaculture sectors, academic and research institutions, corporations and financial institutions, including microcredit lenders, and insurance agencies active in the agriculture sector
- » Civil society organizations/non-governmental organizations (NGOs), representatives of producers, women, young people, etc.
- » Representatives of the affected population, including men, women, boys and girls
- » Representatives of affected ethnic groups and communities

### 2.2.4 Members of the agriculture sector PDNA team

Ideally, the agriculture sector PDNA team should be multidisciplinary. The inclusion of local expertise within the agriculture sector PDNA team, especially those with local knowledge and/or previous experience of a disaster in the country or region, or sector, will certainly add value to greatly facilitate the process.

All members of an agriculture sector PDNA team must have a basic knowledge of the PDNA process and stages. They should also understand their

responsibilities and roles during the pre-and post-disaster phases of data- and information-collection from the population and key sources in or from the affected areas. This is carried out by the personnel responsible for collecting baseline and post-disaster information, and who will also be responsible for DaLA, identifying recovery needs, and developing the recovery plan. All PDNA team members should be trained in the thematic areas related to data collection, DaLA, identification of recovery needs, and development of the recovery plan.

To conduct the assessment in the agriculture sector, the PDNA team should work closely with the PDNA senior management and coordination groups, including the NDMO under the Ministry of Rural and Maritime Development and Disaster Management, the United Nations, European Union and World Bank (European Commission, United Nations Development Group and World Bank, 2013a).

The agriculture sector PDNA team is made up of specialists from each of the five subsectors (crops, livestock, fisheries, apiculture and forestry) that contribute to the PDNA evaluation. As mentioned earlier, the composition of the agriculture sector PDNA team must be multidisciplinary in scope, and balanced by gender, with requisite competence in the following areas:

- » Agricultural economics
- » Agriculture statistics
- » Agronomy (all types of crops)
- » Civil engineering (irrigation, drainage, etc.) and agricultural infrastructure
- » Fisheries and aquaculture
- » Food technology
- » Forestry
- » Livestock (animal health and production)
- » Mechanized agriculture and agricultural equipment

### 2.2.5 Responsibilities for data collection, collation, analysis and reporting

All members of the agriculture sector PDNA team who themselves come from the agriculture sector should have a basic understanding of the PDNA process, including its stages, as well as a good understanding of their responsibilities and roles during pre- and post-disaster data collection in affected areas. These are the personnel responsible for:

- » The collection of baseline and post-disaster information
- » DaLA
- » The identification of recovery needs, estimation of recovery cost and development of the recovery strategy

The data-collection process should be based mainly, although not exclusively, on the information collected by the technical officers from the different departments of the Ministry of Agriculture (qualified informants with a pre-established list) and the NDMO, as well as secondary information obtained by other actors in the sector. The post-disaster information collected in the field, its management and analysis will be compiled by NADMO through the statistics division of the Ministry of Agriculture. This information is important for DaLA, the identification of needs, the estimation of recovery cost and the development of the recovery strategy.



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The agriculture sector PDNA team is required to collect and analyse quantitative data to assess the extent of damage to subsectors. The team also collects data on the demographic, social and economic characteristics of the country in general and the agriculture sector in particular, the geographic areas affected, and data specific to each subsector. Interviews with key stakeholders through field visits to affected areas are crucial for a first-hand vision of the effects and impact of the disaster.

Several data-collection methods are used to assess the impact of disasters. In general, methods for information collection may include one of or a combination the following:

- » Focus group discussions
- » Interviews with livelihood groups
- » Interviews with key informants
- » Household visits and interviews
- » Observations in the field
- » Household surveys
- » Maps and satellite imagery

The agriculture sector PDNA team should consolidate, process and analyse the data collected to determine the effects of the event by subsector. Once the damage and loss are compiled, it is important to identify the sector recovery needs and priorities, and synthesize them into the agriculture sector report. However, it is also important that the team cross-checks findings across other sectors. This multisector analytical approach helps to achieve a common understanding of disaster damage, loss and impacts; identify common priorities across sectors, geographic areas, vulnerable groups and cross-cutting issues; and establish a common basis for recovery programming.

All agriculture sector PDNA reports and information from community, district and divisional levels should go through the agriculture sector hierarchy and be copied to the District Disaster Management Council's District Officer and the Divisional Disaster Management Council's Divisional Commissioner. Information that is specifically requested by the Divisional Commissioner and District Officer should be adhered to, and a copy of correspondence should go through the agriculture sector hierarchy for reference and necessary advice and follow-up if needed.

Agriculture damage and loss reports to the NEOC and NDMO should come from the Disaster Coordinating Unit (DCU) through NADMC/NADMO. Agriculture damage and loss reports should go through District Disaster Committee, Divisional Disaster Committee and DCU, and copy to the District Officer and Divisional Commissioner.

### 2.2.6 Training of PDNA actors

Once coordination and all sector teams are established, a general training/orientation workshop on the PDNA methodology and approach should be provided to all members of the different actors from the agriculture sector at the beginning of the assessment process. This is to build the capacities of the members of the team on the PDNA methodology, and to ensure their effective and efficient contribution to the evaluation of the agriculture sector. The PDNA training module should be consistent across the different sectors to ensure a common understanding of the terms of reference, the information sought through survey instruments, and their individual and collective responsibilities.

Additionally, during or throughout the PDNA process, some additional specific sessions should be given to staff members of the agriculture sector to provide them with specific knowledge related to the sector, and develop the skills of PDNA team members through a learning-by-doing approach. The sessions should focus on the methodological approach established for the agriculture sector and key elements of this agriculture sector PDNA guide (European Commission, United Nations Development Group and World Bank, 2013b).

### 2.2.7 Provision and availability of facilities and equipment

The Ministry of Agriculture, as the lead institution for the agriculture sector PDNA team, must provide the members of the team with the necessary facilities (workplace, meeting rooms and equipment) to facilitate the process. In fact, the provision of facilities and other facilitation processes should be done in

coordination with the logistics team of the national/general structure of the PDNA, especially regarding field visits, making financial and human resources available for the survey work, etc. Most importantly, the Ministry of Agriculture and NADMO make all the required and validated information available to the members of the agriculture sector PDNA team (context, baseline and effects of the event). In case of being unable to implement the PDNA process in person (for example, due to a pandemic), remote and digital means of communication available to all actors would be used.



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## 2.3 Main steps in the PDNA process

The main steps in the PDNA process are the same as those described by European Commission, United Nations Development Group and World Bank (2013a), and are briefly as follows:

- » **Analysis of the context and baseline:** This describes the characteristics of the agriculture sector through the available baseline information to compare the pre-and post-disaster situations, provide quantitative and qualitative data to assess the effects of the disaster, and provide a solid basis for estimating the impact of the disaster on the agriculture sector.
- » **Evaluate the effects of the disaster:** Quantify in monetary values the effects of the disaster in the agriculture sector in (i) damage to infrastructure and physical assets, (ii) interruption of production and access to goods and services, (iii) interruption of social and governmental processes (governance), and (iv) increased risks and vulnerabilities in the agriculture sector.
- » **Evaluate the impacts of the disaster:** Analyse the possible impacts of the disaster in the agriculture

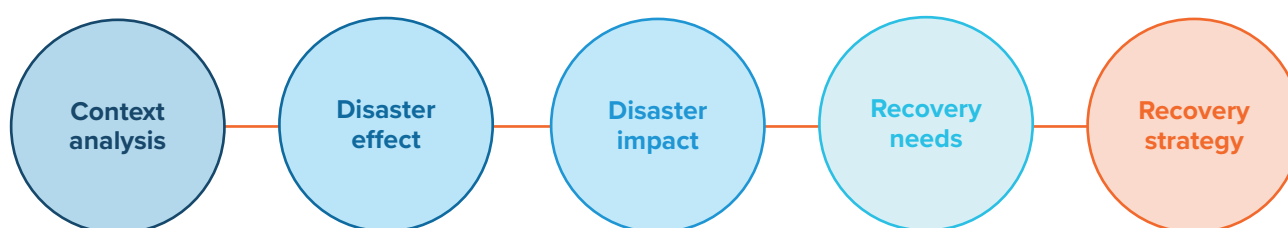
sector, and its impact at the national level, on economic indicators (macro- and microlevel) such as GDP and the balance of payments, and social indicators (human impact) such as employment, food security and poverty.

- » **Define the needs and develop a recovery strategy:** Immediate interventions to reduce the risks faced by the affected population; make quantitative estimates of the cost of rehabilitating or replacing the infrastructures and assets totally or partially destroyed; apply recovery activities in the four dimensions of the agriculture sector; and identify what is necessary to recover better – BBB – rebuild better, more resiliently and sustainably (Hallegatte, Rentschler and Walsh, 2018). What is the basis for developing the recovery strategy to respond to the needs of the affected population of the agriculture sector?

Figure 2.4 presents the main steps in the PDNA process described above under five pathways:

- » Context analysis
- » Disaster effect
- » Disaster impact
- » Recovery needs
- » Recovery strategy

Figure 2.4: Five steps in the PDNA process



Source: Adapted from European Commission, United Nations Development Group and World Bank (2013b).

The proceeding chapters will present the step-by-step approach to the PDNA methodology.

3



## STEP 1

### 3 Develop the pre-disaster context

#### 3.1 Requisite context information

The PDNA process involves the comparison of the pre-and post-disaster conditions, and consequently, the evaluation of the effects and impact of the disaster on the agriculture sector.

**In order to measure the full extent of these effects and impact, it will be necessary to identify the affected geographic area and understand its main demographic, socio-economic, geographic, ethnic and cultural characteristics prior to the disaster.**

The PDNA process is heavily data-driven, and so the availability of and access to reliable data is critical to the process. A generic process for the management of data in the PDNA process involves the following:

- » Identify sources of information (primary and secondary)
- » Identify the pre-disaster baseline data required and its location for the agriculture sector
- » Where possible, make use of geographic information systems (GIS)
- » Collect and verify all post-disaster data sets received
- » Undertake surveys to collect information where no information has been collected
- » Establish an audit trail for data received
- » Work to overcome data challenges through training, orientation, transparency and goodwill
- » Avoid survey fatigue

Due to time constraints, the PDNA process uses all available information from secondary sources, with primary data, samples and averages almost always used.

A thorough review of existing secondary data, with different government institutions, academia, research, the private sector, producer associations, chambers of commerce, exporters, development institutions and other local actors (NGOs, civil organizations, professionals, etc.) should be conducted. What is important is that all sources of information be referenced, with priority given to information from government sources.

As indicated earlier, primary data collection should focus on the use of participatory tools such as semi-structured interviews, focus group discussions, household economics and livelihood surveys and analyses, and direct observation. These data-collection approaches should be conducted from a gender lens. The data-collection process should target interviews to key informants, affected populations, relevant government officials, staff of key national and international agencies, and local and international NGOs operating in the country.

Pre-disaster baseline information includes national, socio-economic, demographic and geographical data relevant to the affected areas in general and the agriculture sector in particular. It should include development indicators such as literacy rates, malnutrition and food insecurity, poverty levels, access to potable water and sanitation facilities, education facilities and school enrolment, and the incidence of communicable diseases. Where possible, all relevant data should be disaggregated by sex, age, ethnic and cultural/religious characteristics, to ensure the identification of specific vulnerabilities and opportunities that the associated special groups may

encounter, which may require differentiated actions in the post-disaster era.

Baseline data are critical to determining the overall impact of the disaster within and across all subsectors, including its impact on human development. Baseline data also contributes to the vulnerability analysis and towards an understanding of the underlying causes of the disaster. That in turn contributes to planning effective and resilient recovery strategies and plans. The agriculture sector PDNA team should, therefore, gather data on pre-disaster baseline conditions pertinent to the sector and its subsectors (European Commission, United Nations Development Group and World Bank, 2013a).

In those situations where the baseline data cannot be obtained from agricultural census, agriculture sector surveys or sector-disaggregated reports, it may be necessary to estimate the baseline data based on discussion with key informants. It could also be feasible to arrive at the baseline data based on visual observations of unaffected areas and their comparison with the affected areas, provided there are geo-referenced data corresponding to the images. In certain situations, where satellite imagery of pre-disaster situations is available, these images could be interpreted to develop sector-wise baseline data (European Commission, United Nations Development Group and World Bank, 2013a).

Generally, the information collected includes the following:

- » Pre-disaster demographic, socio-economic, geographic, ethnic and cultural information
- » Pre-disaster data for each subsector
- » Nature and extent of pre-disaster hazards, vulnerabilities and risks
- » National and regional (or local) development plans, socio-economic goals and poverty reduction strategies

The agriculture sector PDNA team should, therefore, gather data on pre-disaster baseline conditions, as the information base to be used to formulate the general context of the agriculture sector. This information base

should include the description of:

- » The affected geographic area and its demographic, socio-economic, ethnic and cultural characteristics
- » Characteristics of the resources and socio-economic groups of the affected agricultural zones and their relationships
- » The main physical and livelihood assets of agricultural/livestock or fishing/aquaculture operations (self-sufficiency, small- and medium-sized operators, or large commercial companies).
- » Institutions and organizations dedicated to the management of public and private resources
- » Information on risks and vulnerability of the socio-economic groups of the affected agricultural areas
- » The macro- and microeconomic indicators at the national, agriculture sector and subsector, and district levels.
- » The human development situation

## 3.2 Pre-disaster agriculture sector baseline information

### 3.2.1 Overview

Baseline information should preferably be compiled prior to the occurrence of a disaster. When a PDNA is being conducted, the baseline data should be validated, as it provides the basis for the estimation of damage and loss for each of the disaster-affected areas and subsectors. This data can be collected and compiled by the various government agricultural divisions or departments at the extension districts and/or regional administration office levels, with the coordination of the statistics division of the Ministry of Agriculture. The necessary inputs from the offices of the agricultural agencies and partners are required. **Tables A3.1 to A3.6 of Appendix 2** can be used as the framework for the baseline information on the agriculture sector. Details on the baseline data required for each subsector is presented below.

### 3.2.2 Crops

- » Cultivated land area (ha) disaggregated by each annual and perennial crop, and fodder grown in the country
- » Average yield (kg/ha) of each crop during a regular season
- » Crop seasonality (crop calendar)
- » Type and quantity of inputs (feed, seeds, grains, fertilizers, pesticides, veterinary supplies, agricultural inputs and others) and unit sale prices (wholesale and retail)
- » Types and numbers and types of agricultural assets owned by farmers, e.g. tractors, threshers, ploughs, spray pumps, combine harvesters, seed processing plants, dryers
- » Area of agricultural land under irrigation compared to area of rain-fed agricultural land
- » Number, type and capacity of agricultural infrastructure, e.g. silos or storage infrastructures, irrigation facilities (including irrigated area, monthly fee for water use, public or private ownership, and number of beneficiaries), rural roads, and government buildings/offices
- » Price of agricultural machinery (e.g. tractors, mechanical hoes, ploughs) and inputs (e.g. fertilizers, seeds, fuel, chemicals), possibly at retail and wholesale
- » Cost of agricultural land per irrigated and non-irrigated hectare
- » Market prices (farm gate, wholesale and retail) for all agricultural products produced for consumption, processing or export
- » Unit cost of transportation (per tonne of farm produce) from the farm to the wholesaler
- » Unit cost of processing (e.g. threshing, drying, milling, storage, packing) per tonne of harvest for each crop during a regular season
- » Number of farmers (self-employed) and workers (salaried seasonal work, including landless

workers) engaged in agricultural production (disaggregated by gender)

- » Services, facilities and distribution channels related to logistics and the value chain:
  - Input suppliers (seeds, fertilizers, pesticides)
  - Equipment rental
  - Access to credit, savings plans and insurance
  - Transportation facilities
  - Input distribution centres
  - Processing plants, and cold storage facilities for perishable products such as fruits and vegetables, livestock, and fish products (e.g. refrigerated trucks, warehouses, cold rooms)

### 3.2.3 Livestock

- » Types and number of animals (e.g. cattle, sheep, poultry, goats, sheep and beehives) disaggregated by production purpose or use, e.g. reproductive, fattening, milk production or mixed production
- » Total and individual quantity of animal products and by-products produced by each category of livestock, e.g. milk, eggs, meat, honey
- » Price of animal products (e.g. milk, eggs, meat, honey) at the farm gate, wholesale and retail markets
- » Seasonality/production cycles (e.g. milk, eggs, wool, meat)
- » Grassland area (ha)
- » Quantity of inputs (e.g. fodder, water, veterinary supplies) and unit sale prices (wholesale and retail)
- » Unit prices of feed, medicines and vaccines (wholesale and retail)
- » Price of live and dress weight of animals for each category of livestock

- » Type and number of livestock facilities/ infrastructures (e.g. feed, fertilizer and chemical stores, veterinary services)
- » Type and number of houses/sheds/enclosures for animals
- » Number of farmers and workers operating/ employed in the subsector (salaried workers, seasonal workers, self-employed), if possible with a gender lens
- » Type of services, facilities and distribution channels related to logistics and the livestock value chain:
  - Veterinary and animal health facilities and services (equipment, human resources, information systems, disease alert systems, distribution system for medicines and vaccines), slaughter centres
  - Transportation services
  - Extension services
  - Livestock marketers
  - Access to credit, savings plans and insurance
  - Local livestock markets and related facilities
  - Livestock marketing fairs
- » Type and number of registered fishponds or farms
- » Seasonality of marine fish/aquaculture production
- » Type and quantities of inputs for fishing and aquaculture (feed, fuel, medicines, vaccines), unit sales prices (wholesale and retail) and types
- » Price of fish of each species sold F\$/kg (per farm, collector, processor and retailer), including the price of fingerlings and fish embryos
- » Type and number of workers employed in the fisheries subsector (salaried, seasonal and self-employed), by occupation (producers, traders, transporters, fishmongers and others), and disaggregated by size of business (small-scale and commercial fishing, including aquaculture production) and gender
- » Type of facilities, services and distribution channels related to logistics and the fishing industry value chain (handling, conservation, transport, packaging and processing):
  - Service providers (e.g. boat builders, engine repair, gear manufacturing)
  - Auxiliary suppliers (e.g. ice, firewood, salt, fingerlings, medicines, vaccines)
  - Information systems
  - Access to water
  - Fish breeding farms
  - Vessels (including pre-cooling systems)
  - Transportation (including refrigerated trucks)
  - Warehouses, storage facilities (including cold storage) and distribution centres
  - Processing plants (of dried fish, frozen, other)
  - Specific local and national markets for fishery/ aquaculture products

### 3.2.4 Fisheries and aquaculture

- » Complete list of the number and type of fishing assets (e.g. vessels, gear, motors, floats, traps, cages)
- » Price list of gear and other fishing and aquaculture assets and equipment (e.g. boats, motors, nets, traps, cages, boats, insulating boxes, buoys, beacons)
- » Average fish catch (per day or per year), or average production disaggregated by fish types
- » Type and number of registered fish hatches

### 3.2.5 Forestry

- » Land area covered with natural or planted forest (ha)
- » Land area covered by planted mangroves (ha)
- » Type, quantity and quality of forest products produced (e.g. wood, agroforests, and other non-wood forest products)
- » Unit price of seedlings by type of tree
- » Production seasonality of forest products
- » Number of workers engaged in the forest industry (salaried workers, seasonal workers, self-employed), disaggregated by gender
- » Prices of forest products
- » Facilities, services and distribution channels related to logistics and the forestry industry value chain
  - Processing plants (sawmills, lumber mills, pulp mills)
  - Conveyors
  - Dealers
  - Warehouses and distribution centres
  - Local, national and international markets

### 3.2.6 Apiculture

- » Number of beekeepers engaged in the industry by geographic location and gender
- » Number of beehives and geographic locations
- » Density of apiaries and colonies
- » Ownership of apiaries by gender
- » Production of various economic products, including yields/colony
- » Cost of production, including those related to the various economic products

- » Prices of products
- » Beekeeping equipment:
  - Bee smokers to quell the bees
  - Veil to protect the face
  - Gloves for novices or persons sensitive to stings
  - Blunt steel blade (hive tool) for separating the frames and other hive parts for examination
  - Uncapping knife for opening the cells of honey
  - Extractor for centrifuging the honey from the cells
- » Local and international markets for products
- » Facilities, services and distribution channels related to logistics and the value chain:
  - Processing and packaging
  - Warehouses and distribution centres
  - Extension services support
  - Local and international market support

## 3.3 Information sources

Presented below are some important sources of information that could provide critical support to the PDNA for the agriculture sector in Fiji.

- » FAO and Fiji, Ministry of Agriculture (2020). *Fiji Agricultural Census 2020. Volume 1: General Table & Descriptive Analysis Report*. Suva.
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- » Fiji, Ministry of Economy (2017). *5-Year & 20-Year National Development Plan: Transforming Fiji*. Suva.
- » Annual reports of activities of the agricultural, livestock, fishing, apiculture and forestry subsectors.
- » Most recent risk and vulnerability assessments.
- » National, territorial, departmental, sectoral and subsectoral development plans (crops, livestock, fisheries, apiculture and forestry).
- » Reports from banks, financial institutions and insurance companies on the agriculture sector and related subsectors.
- » Surveys of living conditions or other studies of rural communities.
- » Asian Development Bank (n.d.). Poverty data: Fiji. Available at <https://www.abd.org/countries/fiji/poverty>. Accessed on 5 October 2023.
- » Drazba, Marina C., Yan-Richards, and Wilkinson, Suzanne (2018). Landslide hazards in Fiji, managing the risk and not the disaster, a literature review. *Procedia Engineering*, vol. 212.
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  - <http://firms.fao.org/firms/data-coverage/en>
  - <http://www.fao.org/corp/statistics/en/>
  - <https://www.fao.org/countryprofiles/index/en/?iso3=FJI>
  - <https://www.fao.org/faostat/en/#data>
  - <https://www.fao.org/fishery/en/fishstat>
  - <https://www.fao.org/qIEWS/en/>
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- » International Household Survey Network. Surveys on Fiji. Available at <https://datacatalog.ihnsn.org/>
- » United Nations Department of Economic and Social Affairs. Statistics on Fiji. Available at <https://unstats.org/unsd/publications/pocketbook/files/world-stats-pocketbook-2023.pdf>.
- » United Nations Children’s Fund (n.d.). Country profiles: Fiji. Available at <https://data.unicef.org/country/fiji/>. Accessed on 5 October 2023.
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4



## 4 Assessment of the total effects of the disaster on the agriculture sector

### 4.1 Overview of the assessment

The chapter provides guidance on defining, describing and estimating a disaster's effects on the agriculture sector. The assessment of a disaster's effects on the sector should include:

- » A general description of the disaster event, its geographical scope, population affected, and the evolution and distinct consequences of the disaster on the agriculture sector.
- » Damage and destruction of infrastructure and physical assets.
- » Loss, including changes in economic flows arising from the disaster, linked to (i) disruption of service delivery and production of and access to goods, (ii) disruption of governance and decision-making processes, and (iii) emerging risks and vulnerabilities. The latter may include information on emergency responses taken to address the risks.

These effects can be expressed in both quantitative and qualitative terms, and must be presented according to Fiji's geographical divisions as presented in censuses,<sup>3</sup> and by other key characteristics such as age, gender and productive sector (private and public sectors) where relevant. The effects should also address cross-cutting issues including gender, governance, environment, DRR, employment, livelihoods and social protection, either across the description of the effects or in a separate paragraph.

**The aim of the assessment is to ensure that necessary measures are taken to restore service delivery and people's access to basic goods and services.**

The needs identified consist of the additional cost incurred by disaster-affected populations to access services. Care must be taken to avoid duplicating the additional cost to service providers; this may already have been included, especially in cases where special measures must be put in place to ensure equal access for all.

With the baseline information in hand, the agriculture sector PDNA team should undertake field visits after a disaster to validate the estimates of the damage and loss suffered by the various subsectors. Both public and private damage and loss should be assessed.

### 4.2 Post-disaster status of the agriculture sector

The description of general post-disaster conditions in the agriculture sector, including the overall post-disaster scenario and distinct consequences of the disaster on the agricultural sector, should be considered as important to the PDNA report. Some of the post-disaster issues that could be included in the agriculture sector PDNA report are:

- » Geographic areas affected in the sector, including geographic variations (e.g. urban, semi-urban or rural)
- » Population affected, number and percentage (e.g. farmers, fishers, beekeepers, pastoralists, forest-dependent populations) disaggregated to the extent possible by gender, age and marginalized groups
- » Migration and internal displacement of fishers, farmers, pastoralists, etc. (United Nations Office for the Coordination of Humanitarian Affairs, 2015)

<sup>3</sup> Fiji is administratively divided into four divisions, which are further subdivided into 14 provinces and one self-governing dependency. The four divisions are Central Division, Eastern Division, Northern Division and Western Division. In alphabetical order, the provinces are Ba, Bua, Cakaudrove, Kadavu, Lau, Lomaiviti, Macuata, Nadroga and Navosa, Naitasiri, Namosi, Ra, Rewa, Serua and Tailevu. The self-governing dependency is Rotuma. The provinces are further divided into 17 districts and five subdistricts.

- » Seasonal considerations (e.g. timing/duration of planting, harvest, rainy season). See **Table A4** of **Appendix 3** for the calendar of selected crops in Fiji
- » Population groups most affected or most vulnerable (e.g. smallholder farmers, wage workers, self-employed, female-headed households)
- » Overall level of food insecurity (food availability, household income and food access, nutritional status and safety of food, and food stability), number of food-insecure households and as a percentage of the total population, malnutrition rates
- » How the disaster is expected to affect livelihoods and food security
- » Post-disaster energy access and availability of sources of fuel

### 4.3 Understanding damage to the agriculture sector

The assessment of disaster effects is comprised of the economic valuation of damage and loss, which is described as the total disaster effects. This can be illustrated by the estimated value of disaster effects arising from Tropical Cyclone Winston in Fiji in 2016 of 1.99 billion Fijian dollars (F\$) (US\$0.9 billion), including F\$1.29 billion (US\$0.6 billion) in damage (i.e. destroyed physical assets) and F\$0.71 billion (US\$0.3 billion) in losses<sup>4</sup> (Table 4.1). On Saturday 20 February 2016, Tropical Cyclone Winston, an extremely destructive Category 5 cyclone, struck Fiji. Tropical Cyclone Winston was the first Category 5 cyclone to directly impact Fiji and the most intense cyclone on record to affect the country, according to the Fiji Meteorological Service.

Table 4.1: Summary of damage and loss from Tropical Cyclone Winston by sector

Sectors	Disaster effects (F\$ million)			Share of disaster effects (%)	
	Damage	Loss	Total	Public	Private
Productive sectors	241.8	594.5	836.3	12	88
• Agriculture	81.3	460.7	542.0	7	93
• Commerce and manufacturing	72.9	69.9	142.8	49	51
• Tourism	76.1	43.9	120.0	0	100
• Mining	11.5	20.0	31.5	0	100
Social sectors	827.9	40.0	867.9	12	88
• Education	69.2	7.4	76.6	100	0
• Health	7.7	6.2	13.9	100	0
• Housing	751.0	26.4	777.4	2	08

4 These figures exclude the environment sector, as environmental assets and flows of environmental services are not included in the national accounts.

Sectors	Disaster effects (F\$ million)			Share of disaster effects (%)	
	Damage	Loss	Total	Public	Private
Infrastructure sectors	208.2	40.4	248.6	84	16
• Transport	127.1	2.4	129.5	98	2
• Water and sanitation	16.9	7.9	24.8	100	0
• Electricity	33.0	8.1	41.1	100	0
• Communications	31.2	22.0	53.2	30	70
Cross-cutting issues	239.6	660.1	899.7	4	96
• Environment	232.5	629.8	862.3	0	100
• Culture and heritage	5.1	0.8	5.9	23	77
• Disaster risk management	2.0	29.5	31.5	100	0
Total (excluding the environment)	1,285.0	705.2	1,990.2	78	22
Grand total	1,517.5	1,335.0	2,852.5	84	16

Source: Fiji (2016).

Damage is the effects of the disaster on agriculture sector-related infrastructure and assets. The assessment quantifies affected assets as either partially damaged or totally destroyed. Damage is valued as the cost of replacement or repair of destroyed or damaged structures or equipment at pre-disaster prices, while agricultural products are valued at pre-disaster farm gate prices.

Physical assets refer to productive livelihood assets, and include the basic infrastructure and producer goods needed to support agriculture sector-based livelihoods, such as equipment, inputs and tools used

for the production of crop, livestock, fisheries, honey and forest products. These assets enhance people's capabilities to live and make a living.

Infrastructure and assets can be privately owned by households (such as tools, livestock and farm infrastructure), or they may be public assets used by households (such as farm roads and irrigation and drainage systems). **Table 4.2** lists some of the infrastructure and physical assets to be considered in the damage assessment for each of the agriculture subsectors.

Table 4.2: Categories of agricultural infrastructure and assets that are quantified as partially damaged or totally destroyed

Crops	Livestock	Fisheries and aquaculture	Exploited trees and forestry	Apiculture
<ul style="list-style-type: none"> <li>• Agricultural land (e.g. soil erosion, sedimentation, salinization)</li> <li>• Stored agricultural inputs</li> <li>• Farm buildings, sheds, storage facilities, seed laboratories</li> <li>• Farm equipment and machinery</li> <li>• Equipment/materials for seed processing, home-based food processing and preservation</li> <li>• Irrigation systems and infrastructure</li> <li>• Irrigation equipment (e.g. engines, electric motors, pumps)</li> <li>• Drainage systems, equipment and infrastructure</li> <li>• Internal farm roads</li> <li>• Perennial trees (e.g. plantations)</li> <li>• Research, training and extension centres</li> </ul>	<ul style="list-style-type: none"> <li>• Animal deaths or disappearance</li> <li>• Animals are slaughtered because of endangerment as a direct result of the disaster, and therefore do not reach the market. Note: The by-products of the slaughtered animals (e.g. dairy, eggs, meat) are part of the production process and should be considered a loss</li> <li>• Pasturelands</li> <li>• Livestock sheds</li> <li>• Storage buildings</li> <li>• Stored feed and fodder</li> <li>• Livestock equipment and machinery</li> </ul>	<ul style="list-style-type: none"> <li>• Fisheries enforcement and monitoring, control and surveillance (vessels, build-ings)</li> <li>• Fishing vessels and engines (marine and inland)</li> <li>• Fishing gear (marine and inland)</li> <li>• Aquaculture production (ponds, cages, tanks, farm buildings)</li> <li>• Aquaculture hatcheries and nursery units</li> <li>• Aquaculture inputs (fish larvae, lime, fish feed)</li> <li>• Post-harvest assets (ice plants, freezers, storage buildings)</li> <li>• Major fisheries infrastructure (ports, landing facilities, harbours, markets)</li> <li>• Fuel supply</li> <li>• Boat construction and re-pair facilities (may be accounted for by the industry or services sectors)</li> </ul>	<ul style="list-style-type: none"> <li>• Standing timber</li> <li>• Firebreaks and watch towers</li> <li>• Access roads</li> <li>• Forestry equipment and machinery</li> <li>• Fire management equipment</li> </ul>	<ul style="list-style-type: none"> <li>• Bee houses</li> <li>• Beehives</li> <li>• Bee colonies</li> <li>• Bee equipment and machinery</li> <li>• Bee storage house</li> <li>• Stored bee inputs and outputs</li> </ul>

Source: European Commission, United Nations Development Group and World Bank (2013b); consultant research.

Note: The above list of typical assets that could be totally or partially destroyed is indicative, not exhaustive.

Animal products, such as milk, eggs and meat, are part of the production process and must be considered as a loss. In the agricultural evaluation, only exploited forests that are planted, and the corresponding wood produced, are considered. The environment sector assesses natural or unexploited forests.

To avoid double counting, it is important to check the country-specific system of national accounts and be aware of which items may be accounted for and assessed by other sectors or productive subsectors (e.g. industry, services and infrastructure), rather than the agriculture sector.

The guidelines that should be employed in the assessment of the disaster effects on the agriculture sector are presented in the next two chapters as follows:

- » *Chapter 5/step 2: Estimate the economic value of damage within the agriculture sector*
  
- » *Chapter 6/step 3: Estimate the economic value of damage within the agriculture sector*

# 5



## STEP 2

### 5 Estimate the economic value of damage within the agriculture sector

There are several substeps involved in the estimation of damage to the agriculture sector in the aftermath of a disaster. These are presented below.

#### 5.1 Step 2.1: Calculating crop damage

##### Damage information no. D1: Damage to perennial/permanent crops

In the assessment of the economic value of the damage to perennial and plantation crops, only the total destruction of these crops is taken into consideration. The value is calculated from the cost of replanting and caring for the trees (including seedlings, labour and inputs) until these trees become productive again. Table 5.1 can be utilized to calculate the damage to perennial/permanent crops.

Table 5.1: Damage to perennial/permanent crops

Permanent crops	Size of affected areas (ha)	Number of totally destroyed trees	Average replacement cost (F\$)	Total value of damage (F\$)
	A	B	C	D
Permanent/tree crops				
• Avocado				
• Banana				
• Breadfruit				
• Citrus				
• Cocoa				
• Coconut				
• Coffee				
• Drumstick				



• Duruka				
• Kura				
• Mango				
• Mint				
• Passion fruit				
• Papaya				
• Pineapple				
• Plantain				
• Soursop				
• Sugar cane				
• Other				
2. Pastures				
3. Other				
Total				

Source: European Commission, United Nations Development Group and World Bank (2013b); consultant research.

#### Notes for completing Table 5.1:

- » The “total value of damage” (column D) is the “number of trees” (column B) multiplied by the “average replacement cost” (column C).  $\text{Column D} = \text{column B} \times \text{column C}$ .
- » The average replacement cost will be the amount required to replant and care for each of the totally destroyed or uprooted permanent crops and trees due to the disaster, until they become productive again.
- » The number of trees can also be estimated by the average number of trees per hectare.
- » Damage to natural forest trees is estimated under the environment sector.

## 5.2 Step 2.2: Calculating livestock damage

### Damage information no. D2: Damage to livestock, poultry and apiculture

In the livestock sector, only the value of the animals that have died directly or indirectly as a result of the disaster, during or shortly after, are considered as damage. The damage to livestock, poultry and apiculture can be estimated using **Table 5.2**.

Table 5.2: Damage to livestock, poultry and apiculture

Livestock and others	Number of dead animals	Average replacement cost (F\$)	Total value of damage (F\$)
	A	B	C
1. Cattle			
• Beef			
• Dairy			
2. Poultry			
• Broilers			
• Layers			
• Ducks			
3. Sheep			
4. Goats			
5. Pigs			
6. Rabbits			
7. Other animals			
8. Apiculture/bees			
Total			

Source: European Commission, United Nations Development Group and World Bank (2013b); consultant research.

#### Notes for completing Table 5.2:

The value of damages will be the number of animals multiplied by the average replacement cost at current prices. In formula, column C = (column A × column B).

## 5.3 Step 2.3: Calculating damage to fisheries and aquaculture

### Damage information no. D3: Damage to fisheries and aquaculture

In fisheries and aquaculture, only the value of the fish killed by the disaster is calculated as damage. The damage to fisheries and aquaculture can be estimated using Table 5.3.

Table 5.3: Damage to fisheries and aquaculture

Fisheries and aquaculture	Number of dead fish	Average replacement cost (F\$)/kg fish	Total value of damage (F\$)
	A	B	C
1. Marine fish			
• Marine			
• Prawns			
2. Inland fisheries			
• Eels			
• Mussels			
• Pearl oysters			
• Prawns/shrimps			
• Tilapia			
• Other			
Total			

Source: European Commission, United Nations Development Group and World Bank (2013b); consultant research.

#### Notes for completing Table 5.3:

The value of damage will be the number of fish loss multiplied by the average replacement cost at current prices. In formula, column C = (column A × column B).

## 5.4 Step 2.4: Calculating damage to forestry

### Damage information no. D4: Damage to forests

In the forestry subsector, only the totally destroyed trees planted by humans are considered as damage. The value is calculated from the cost of replanting and caring for the trees (including seedlings, labour, and inputs) until they are ready to be harvested/exploited. The damage to forests can be estimated using **Table 5.4**.

Table 5.4: Damage to forests

Forestry	Area totally destroyed (ha)	Replacement cost for area totally destroyed (F\$/ha)	Total value of damage (F\$)
	A	B	C
Forestry			
Standing timber trees			
• Pine			
• Mahogany			
• Other			
• Natural forest trees			
• Forest access roads			
• Other			
Total			

Source: European Commission, United Nations Development Group and World Bank (2013b); consultant research.

#### Notes for completing Table 5.4:

- » The value of damage will be the planted hectareage totally destroyed multiplied by the average replacement cost at current prices for the planted hectareage totally destroyed.
- » The number of trees can also be estimated by the average number of trees per hectare.
- » Damage to natural forest trees is estimated under the environment sector.
- » In formula, column C = (column A × column B).

## 5.5 Step 2.5: Calculating damage to infrastructure and physical assets

The monetary value of damage to infrastructure and physical assets is calculated as the quantity of totally destroyed assets multiplied by their average cost of replacement plus the quantity of partially damaged assets multiplied by their average cost of repair.

Damage is quantified in four levels:

- » Slight (up to 15 percent, without structural damage)
- » Moderate (up to 30 percent, with slight repairable light structural damage)
- » Severe (up to 80 percent, with structural damage needing reinforcement or total reconstruction)
- » Destroyed/collapsed (damage of more than 80 percent, needing reconstruction of the infrastructure)

These factors are taken into consideration in the repair cost calculations, except for severely damaged or collapsed infrastructure or assets, since they are considered totally destroyed and total reconstruction is required.

### 5.5.1 Step 2.5.1: Assets and infrastructure for crop production

#### Damage information no. D5: Crop-related assets infrastructure, equipment, and stored inputs and outputs

The damage to the assets, infrastructure, equipment and outputs and inputs related to crop production can be estimated using **Table 5.5**.

Table 5.5: Damage to crop-related assets, infrastructure, equipment and stored inputs for crop production

Assets	Number totally destroyed	Average replacement cost (F\$)	Number partially damaged	Average repair/rehabilitation cost (F\$)	Total value of damage (F\$)
	A	B	C	D	E
Physical assets					
• Agricultural land					
• Storage buildings					
• Other					
Equipment and machinery					
• Tractor					
• Hand tractor					

Assets	Number totally destroyed	Average replacement cost (F\$)	Number partially damaged	Average repair/rehabilitation cost (F\$)	Total value of damage (F\$)
	A	B	C	D	E
• Ploughs					
• Pulverizer					
• Weeder					
• Shovel					
• Forks					
• Hoes					
• Fertilizer spreader					
• Thresher					
• Other					
<b>Stored crop outputs</b>					
• Rice					
• Maize					
• Banana					
• Plantain					
• Root crops					
• Fruits and vegetables					
• Pulses					
• Other crops					
<b>Stored crop inputs</b>					
• Seeds					

Assets	Number totally destroyed	Average replacement cost (F\$)	Number partially damaged	Average repair/rehabilitation cost (F\$)	Total value of damage (F\$)
	A	B	C	D	E
• Fertilizer					
• Pesticides					
• Herbicides					
• Other					
Other					
Total					

Source: European Commission, United Nations Development Group and World Bank (2013b); consultant research.

#### Notes for completing Table 5.5:

- » Column A is for the number or quantity of totally destroyed assets.
- » Column B refers to the estimated average cost of replacement of each of the totally destroyed assets.
- » Column C is for the number or quantity of partially damaged assets.
- » Column D refers to the estimated average repair cost of each partially damaged asset.
- » The total value of damage in column E will be the quantity of totally destroyed assets multiplied by their average cost of replacement plus the quantity of partially damaged assets multiplied by their average cost of repair.
- » In formula, column E = (column A × column B) + (column C × column D).
- » The table can be expanded if there are other important assets that were damaged, as may be determined by the agriculture sector PDNA team.
- » The above concept will be applied to the following tables.

**5.5.2 Step 2.5.2: Assets and infrastructure for livestock production**

**Damage information no. D6: Livestock- and apiculture-related assets and infrastructure, equipment, and stored outputs and inputs**

The damage to the assets, infrastructure, equipment, and outputs and inputs related to livestock production can be estimated using **Table 5.6**.

Table 5.6: Damage to agricultural assets, infrastructure, equipment, and stored inputs for livestock production

Assets	Number totally destroyed	Average replacement cost (F\$)	Number partially damaged	Average repair/rehabilitation cost (F\$)	Total value of damage (F\$)
	A	B	C	D	E
<b>Physical assets</b>					
• Pastureland					
• Feed silos					
• Cattle houses					
• Pig pens					
• Sheep houses					
• Goat houses					
• Poultry houses					
• Rabbit pens					
• Beehives					
• Bee frames and foundations					
• Fencing					
• Other					
<b>Equipment and machinery</b>					
• Tractor					
• Hand tractor					
• Ploughs					
• Rotavators					



Assets	Number totally destroyed	Average replacement cost (F\$)	Number partially damaged	Average repair/rehabilitation cost (F\$)	Total value of damage (F\$)
	A	B	C	D	E
• Cultivators					
• Feed grinding machines and feed mixers					
• Threshers					
• Forage harvesters					
• Forage choppers					
• Rakes					
• Balers					
• Trailer/truck/wagon					
• Water tanks and waters					
• Feeders					
• Shears					
• Poultry-keeping machinery					
• Hand tools					
• Livestock handling equipment					
• Identification supplies					
• Bee smoker					
• Bee feeder					
• Honey extractor					
• Honey jugs					

Assets	Number totally destroyed	Average replacement cost (F\$)	Number partially damaged	Average repair/rehabilitation cost (F\$)	Total value of damage (F\$)
	A	B	C	D	E
• Other					
<b>Other equipment for:</b>					
• Milk processing					
• Meat processing					
• Broiler processing					
• Egg processing					
• Food processing					
• Honey processing					
• Poultry hatcheries					
• Other					
<b>Stock and raw materials</b>					
• Feeds					
• Feed ingredients					
• Seeds/planting materials					
• Fertilizer					
• Pesticides					
• Herbicides					
• Veterinary supplies					
• Other					
<b>Other</b>					
<b>Total</b>					

Source: European Commission, United Nations Development Group and World Bank (2013b); consultant research.

**Notes for completing Table 5.6:**

- » Column A is for the number or quantity of totally destroyed assets.
- » Column B refers to the estimated average cost of replacement of each of the totally destroyed assets.
- » Column C is for the number or quantity of partially damaged assets.
- » Column D refers to the estimated average cost of repair of each of the partially damaged assets.
- » The total value of damage in column E will be the quantity of totally destroyed assets multiplied by their average cost of replacement plus the quantity of partially damaged assets multiplied by their average cost of repair.
- » In formula, column E = (column A × column B) + (column C × column D).
- » The table can be expanded if there are other important assets that were damaged, as may be determined by the agriculture sector PDNA team.

### 5.5.3 Step 2.5.3: Assets and infrastructure for fisheries and aquaculture production

#### Damage information No. D7: Agricultural assets and infrastructure, equipment, and stored outputs and inputs for fisheries and aquaculture harvesting/production

The damage to the assets, infrastructure, equipment and outputs and inputs related to fisheries and aquaculture production can be estimated using **Table 5.7**.

Table 5.7: Damage to agricultural assets, infrastructure and equipment for fishing and aquaculture production

Assets	Number totally destroyed	Average replacement cost (F\$)	Number partially damaged	Average repair/rehabilitation cost (F\$)	Total value of damage (F\$)
	A	B	C	D	E
<b>Physical assets</b>					
• Fish hatcheries					
• Fishponds					
• Docking facilities					
• Fish processing facilities					
• Boats					
• Other					
<b>Equipment and machinery</b>					
• Engines					
• Nets					
• Traps and cages					
• Gears					
• Ponds					
• Other					
<b>Stored fish production inputs</b>					
<b>Stored fish products</b>					
<b>Total</b>					

Source: European Commission, United Nations Development Group and World Bank (2013b); consultant research.

**Notes for completing Table 5.7:**

- » Column A is for the number or quantity of totally destroyed assets.
- » Column B refers to the estimated average cost of replacement of each of the totally destroyed assets.
- » Column C is for the number or quantity of partially damaged assets.
- » Column D refers to the estimated average repair cost of each partially damaged asset.
- » The total value of damage in column E will be the quantity of totally destroyed assets multiplied by their average cost of replacement plus the quantity of partially damaged assets multiplied by their average cost of repair.
- » In formula, Column E = (Column A × Column B) + (Column C × Column D).
- » The table can be expanded if there are other important assets that were damaged, as may be determined by the agriculture sector PDNA team.

### 5.5.4 Step 2.5.4: Assets and infrastructure for the forestry industry

#### Damage information no. D8: Agricultural assets, infrastructure and equipment for forestry harvesting/production

The damage to the assets, infrastructure, equipment, and outputs and inputs related to the forestry industry can be estimated using **Table 5.8**.

Table 5.8: Damage to agricultural assets, infrastructure and equipment for the forestry subsector

Assets	Number totally destroyed	Average replacement cost (F\$)	Number partially damaged	Average repair/rehabilitation cost (F\$)	Total value of damage (F\$)
	A	B	C	D	E
<b>Physical assets</b>					
• Houses for foresters					
• Sawmill plant					
• Forest roads					
• Other					
<b>Equipment and machinery</b>					
• Delimbers					
• Feller bunches					
• Stump grinders					
• Mulchers					
• Yarders					
• Forwarders					
• Log loaders					
• Harvesters					
• Diameter tape					
• Increment borer					

Assets	Number totally destroyed	Average replacement cost (F\$)	Number partially damaged	Average repair/rehabilitation cost (F\$)	Total value of damage (F\$)
	A	B	C	D	E
• Laser rangefinder/hypsometer					
• Clinometer app					
• GPS device					
• Other equipment					
<b>Total</b>					

Source: European Commission, United Nations Development Group and World Bank (2013b); consultant research.

#### Notes for completing Table 5.8:

- » Column A is for the number or quantity of totally destroyed assets.
- » Column B refers to the estimated average cost of replacement of each of the totally destroyed assets.
- » Column C is for the number or quantity of partially damaged assets.
- » Column D refers to the estimated average repair cost of each partially damaged asset.
- » The total value of damage in column E will be the quantity of totally destroyed assets multiplied by their average cost of replacement plus the quantity of partially damaged assets multiplied by their average cost of repair
- » In formula, column E = (column A × column B) + (column C × column D)
- » The table can be expanded if there are other important assets that were damaged, as may be determined by the agriculture sector PDNA team.

### 5.5.5 Step 2.5.5: Assets and infrastructure for irrigation/drainage systems

#### Damage information no. D9: Damage to irrigation/drainage systems

The damage to irrigation/drainage systems can be estimated using **Table 5.9**.

Table 5.9: Damage to irrigation/drainage systems

Name of irrigation facility/locationn	Totally damaged	Replacement cost (F\$)	Partially damaged	Repair/ rehabilitation cost (F\$)	Total value of damage (F\$)
	A	B	C	D	E
1					
2					
3					
4					
N					
Total					

Source: European Commission, United Nations Development Group and World Bank (2013b); consultant research.

#### Notes for completing Table 5.9:

- » The extent of damage is either partial or total. Tick the space under the column.
- » The value of the damage is equal to the repair cost if partially damaged, or the replacement cost of the asset if totally destroyed. The repair cost can be estimated by visiting the irrigation/drainage systems after the disaster.
- » In formula, the value of damage is column E = (column A × column B) + (column C × column D).



### 5.5.6 Step 2.5.6: Assets and infrastructure for fisheries and aquaculture production

#### Damage information no. D10. Damage to farm roads network

The damage to the farm roads network can be estimated using **Table 5.10**.

Table 5.10: Damage to farm roads and bridges

Name/ location of farm road	Grade	Length (metres)	Totally damaged	Replacement cost (F\$)	Partially damaged	Repair/ rehabilitation cost (F\$)	Total value of damage (F\$)
		A	B	C	D	E	F
1							
2							
3							
4							
5							
...							
Total							

Source: European Commission, United Nations Development Group and World Bank (2013b); consultant research.

#### Notes for completing Table 5.10:

- » Different grades of farm roads will have varying replacement and repair cost.
- » The extent of damage is either partial or total. Tick the space under the column.
- » The value of the damage is equal to the repair cost if partially damaged, or the replacement cost of the asset if totally destroyed. The repair cost can be estimated by visiting the farm roads after the disaster.
- » In formula, the value of damage is column F = (column A × column B × column C) + (column A × column D × column E).

### 5.5.7 Step 2.5.7: Administrative assets, infrastructure and equipment

#### Damage information no. D11: Damage to administrative infrastructure and equipment

The damage to the administrative infrastructure, assets and equipment can be estimated using **Table 5.11**.

Table 5.11: Damage to administrative infrastructure and equipment

Assets	Number totally destroyed	Average replacement cost (F\$)	Number partially damaged	Average repair/rehabilitation cost (F\$)	Total value of damage (F\$)
	A	B	C	D	E
Physical assets					
• District buildings/offices					
• Regional buildings/offices					
• National buildings/offices					
• Research and development infrastructure					
• Office furniture					
• Office equipment					
• Other					
<b>Total</b>					

Source: European Commission, United Nations Development Group and World Bank (2013b); consultant research.

#### Notes for completing Table 5.11:

- » Column A is for the number or quantity of totally destroyed assets.
- » Column B refers to the estimated average cost of replacement of each of the totally destroyed assets.
- » Column C is for the number or quantity of partially damaged assets.
- » Column D refers to the estimated average repair cost of each partially damaged asset.
- » The total value of damage in column E will be the quantity of totally destroyed assets multiplied by their average cost of replacement plus the quantity of partially damaged assets multiplied by their average cost of repair.
- » In formula, column E = (column A × column B) + (column C × column D).

**Table 5.12** presents a summary of the total disaster effects of the La Soufriere volcanic eruption on the agriculture sector of Saint Vincent and the Grenadines. The total damage on the sector was estimated at 103.85 million Eastern Caribbean dollars (US\$38.46 million). The estimated damage represented 45.1 percent of the total disaster on the sector.

Table 5.12: Summary of total effect of La Soufriere volcanic eruption on the agriculture sector of Saint Vincent and the Grenadines

Description	Private (EC\$'000')	Public (EC\$'000')	Total (EC\$'000')	%
Total damage	17,148.15	86,700.23	103,848.38	45.1
	% distribution			
Crops subsector	15,465.24	1,885.72	17,350.96	16.7
	Of which:			
• Plantains	3,585.82	340.25	3,926.07	3.8
• Banana	5,589.88	561.96	6,151.84	5.9
• Other fruit tree crops	3,611.90	350.25	3,962.15	3.8
• Roots and tubers	1,490.63	511.86	2,002.49	1.9
• Fruits and vegetables	1,187.01	121.40	1,308.41	1.3
Livestock	835.51	673.50	1,509.01	1.5
Fisheries	630.10	88.00	718.10	0.7
Apiculture	217.30		217.30	0.2
Forestry		84,053.01	84,053.01	80.9
Total loss	105,385.91	20,911.00	126,296.91	54.9
	% distribution			
Crops subsector	98,685.58		98,685.58	78.1

Description	Private (EC\$'000')	Public (EC\$'000')	Total (EC\$'000')	%
	Of which:			
• Plantains	16,096.89		16,096.89	12.7
• Banana	10,458.13		10,458.13	8.3
• Other fruit tree crops	40,969.05		40,969.05	32.4
• Roots and tubers	17,746.31		17,746.31	14.1
• Fruits and vegetables	13,415.20		13,415.20	10.6
Livestock	1,399.27	254.35	1,653.62	1.3
Fisheries	4,923.76	90.00	5,013.76	4.0
Apiculture	377.30		377.30	0.3
Forestry		20,566.65	20,566.65	16.3
<b>Total disaster effects</b>	<b>122,534.06</b>	<b>107,611.23</b>	<b>230,145.29</b>	<b>100.0</b>

Source: Saint Vincent and the Grenadines (2021).

6



## STEP 3

# 6 Estimate the economic value of loss within the agriculture sector

## 6.1 Overview

Loss is estimated by calculating the changes in economic flows arising from the disaster, and are evaluated until the recovery is complete. These changes in economic flows are linked to and generated from three categories of effects:

- » Disruption in the delivery of services and availability/access to goods and services
- » Disruption of governance and social processes
- » Increased risks and vulnerabilities

They are expressed in the current monetary value of goods and services that were not and/or will not be produced over a timespan due to the disaster, and are evaluated until full recovery is attained. This can take several years, especially in the case of perennial crops.

The agriculture sector PDNA team may identify loss in the sector under the following areas:

- » Foregone income from productive physical assets and infrastructure (e.g. planted crops, livestock, fisheries, apiculture, forestry) after they were destroyed by disasters
- » Future income from harvests due to the destruction of permanent crops and trees

- » Production losses from a reduction in yields due to the negative effects of the disaster on physical assets and infrastructure
- » Production losses due to delays in restarting production operations
- » Higher production cost due to:
  - Higher use of inputs, including irrigation water
  - Cost of replanting crops affected by the disaster
  - Cost associated with the need for equipment rental
  - Cost associated with the removal of debris and boulders around the farm
  - Cost associated with the re-enforcement of risky and vulnerable sites
  - Output and income loss related to the lack of ability to sell production due to disrupted market chains

The typical effects of a disaster that can be classified as loss in the sector are presented in **Table 6.1**.

Table 6.1: Typical effects of a disaster that can be classified as loss in the agriculture sector

Crops	Livestock	Fisheries and aquaculture	Exploited trees and forestry	Apiculture
<p><b>Crop production losses (to be estimated first as the quantity not produced and then multiplied by the farm gate price under normal/pre-disaster conditions):</b></p> <ul style="list-style-type: none"> <li>• Loss of standing annual crops</li> <li>• Loss from perennial crops</li> </ul> <p><b>Crop yield decline:</b></p> <ul style="list-style-type: none"> <li>• Decline in standing annual crop yields</li> <li>• Decline in standing perennial crop yields</li> </ul> <p><b>Higher production costs</b></p> <ul style="list-style-type: none"> <li>• Higher use of inputs required</li> <li>• Higher use of irrigation required</li> <li>• Cost of replanting crops affected by a disaster</li> </ul> <p><b>Inability to sell products due to disrupted market chains</b></p>	<p><b>Production loss:</b></p> <ul style="list-style-type: none"> <li>• Production losses due to the death of animals resulting in loss of: <ul style="list-style-type: none"> <li>- milk production</li> <li>- meat production</li> <li>- egg production</li> <li>- leather production</li> <li>- honey production</li> </ul> </li> <li>• Production losses due to disease or illness of animals resulting in loss of: <ul style="list-style-type: none"> <li>- milk production</li> <li>- meat production</li> <li>- egg production</li> <li>- leather production</li> <li>- honey production</li> </ul> </li> </ul> <p><b>Higher production cost:</b></p> <ul style="list-style-type: none"> <li>• Higher use of inputs (e.g. feed – grains, fodder)</li> <li>• Veterinary cost (medicine and veterinary fees)</li> </ul> <p><b>Inability to sell products due to disrupted market chains</b></p>	<p><b>Production and income loss due to:</b></p> <ul style="list-style-type: none"> <li>• Decline in fish yields for aquaculture</li> <li>• Decline in fish catch</li> <li>• Damaged vessels, gear and infrastructure</li> <li>• Decreased fishing frequency resulting from lack of shore-based infrastructure</li> <li>• Reduced access to fishing stock</li> <li>• Disruption in the breeding cycle of farmed fish</li> </ul> <p><b>Higher production cost:</b></p> <ul style="list-style-type: none"> <li>• Higher input cost for aquaculture hatcheries</li> <li>• Higher production cost due to equipment rental</li> <li>• Higher cost of fuel to reach fish after migration to other areas</li> <li>• Higher production cost due to fuel, labour and repair cost increase</li> </ul> <p><b>Lack of ability to sell products due to disrupted market chains</b></p>	<p><b>Production and income loss:</b></p> <ul style="list-style-type: none"> <li>• Loss of timber and other non-wood forest products (fuelwood products are accounted for under the environment)</li> </ul> <p><b>Higher production costs:</b></p> <ul style="list-style-type: none"> <li>• Cost for protecting the forestry</li> <li>• Higher cost for alternative construction materials</li> </ul> <p><b>Lack of ability to sell products due to disrupted market chains</b></p>	<p><b>Production loss:</b></p> <ul style="list-style-type: none"> <li>• Death of animals resulting in loss of honey production</li> <li>• Disease within colonies resulting in loss of honey production</li> </ul> <p><b>Higher production cost:</b></p> <ul style="list-style-type: none"> <li>• Higher production cost due to labour and repair cost increase</li> </ul> <p><b>Lack of ability to sell products due to disrupted market chains</b></p>

Source: European Commission, United Nations Development Group and World Bank (2013b); consultant research.

Note: The list of typical loss by subsectors presented in **Table 6.1** is indicative, not exhaustive.

## 6.2 Disruption in the production of and access to goods and services

Typical loss for the agriculture sector includes lower agricultural, livestock, fishery/aquaculture and forestry production, and possibly higher production cost, which translate into low revenues and high operational cost in the provision of services.

In the case of permanent loss of fruit trees, the agriculture sector must estimate production losses over several years, the time required for the new trees to mature and be productive again. As an example, a coconut palm requires eight years, and a coffee tree at least five years.

To estimate lost production in the livestock sector, there are two possible scenarios: (1) the total loss of production due to the death of the animals; and (2) partial loss of production due to decline in the field caused by stress, lack of buildings, lack of food, and health problems attributable to the disaster.

To estimate the lost production in the fishing sector, there are three possible scenarios: (1) the total loss of production by aquaculture tanks; (2) the total loss of production from land-caught fish; and (3) the total loss of the production of captured fishing, due to the inability to fish.

Other loss includes the unexpected expenses to meet human needs during the post-disaster emergency phase. Losses are expressed in present values.

## 6.3 Disruption to governance and decision-making processes

Additional or unexpected cost may be incurred by the government to continue the provision of services and manage the recovery process in the agriculture sector, as the disaster may impact:

- » Agriculture sector infrastructure, equipment, human resources, public services and information systems
- » Agriculture sector policy and regulatory implications
- » Taxes, regulations and policies relevant to the agriculture sector

- » Knowledge, skills, resources, accounting and reporting systems that are available to support resource recovery
- » Institutions and networks that can support the recovery process

In this context, loss may result from:

- » Rental of office space
- » Replacement/repairation of equipment lost
- » Unexpected expenditure to meet humanitarian needs
- » Increased rental and transportation
- » Hiring of new personnel
- » Increased taxation

## 6.4 Increased risks and vulnerability

The PDNA loss assessment process should take into consideration additional cost that should be incurred to deal with immediate threats or potential new threats that may result in increased risk and vulnerabilities if the necessary measures are not taken quickly. These may be associated with:

- » Additional hazards, e.g. further landslides due to continued rainfall, fire risk
- » Climate forecast as it relates to rains, heat, dry season, etc.
- » Secondary shocks, e.g. restocking or loss of processed fish due to prolonged lack of market access
- » Environmental risks, e.g. deforestation, soil erosion, forest fires
- » Social and political risks, e.g. upcoming elections and conflict between social groups
- » New vulnerabilities created by the disaster that could cause additional hazards
- » Population groups (economic, social, geographic) that are especially vulnerable or food insecure



## 6.5 Step 3.1: Calculating the economic value of crop loss

### 6.5.1 Production loss

The estimated loss in the agriculture sector are the differences between the expected pre-disaster and post-disaster production levels of various agricultural products within the year that the disaster occurred. The MALF can utilize the following tables to show the estimated reduction in production and/or income levels for agricultural products.

### 6.5.2 Step 3.1.1: Calculate production loss for destroyed perennial crops

#### Production loss information no. L1: Production loss for destroyed perennial crops

The production loss for destroyed perennial crops is represented by the value of the harvests not obtained during the entire period that newly planted trees need to obtain normal production again. This production loss can be estimated using **Table 6.2**.

Table 6.2: Table of production loss for destroyed perennial crops

Description of crops/ commodity	Pre-disaster information				Post-disaster information	Estimated value of production loss (F\$ '000')
	Area under production (ha)	Expected yield/ hectare (kg)	Age of the crop at the beginning of the production cycle (years)	Farm gate price of output (F\$)	Estimated area destroyed (ha)	
	A	B	C	D	E	F
Coconut						
Coffee						
Cocoa						
Mangoes						
Citrus						
Avocadoes						
Plantain						
Bananas						
Other						

Source: European Commission, United Nations Development Group and World Bank (2013b); consultant research.

**Notes for completing Table 6.2:**

- » Column C should include all years that the crops will not be productive, until the replaced perennial crops start producing.
- » In formula, column F = column B × column C × column D × column E.

**6.5.3 Step 3.1.2: Calculate production loss for affected perennial crops**

**Production loss information no. L2: Production loss for destroyed perennial crops**

For perennial crops that are affected by the disaster but not destroyed, and will have reduced production due to affected branches, dry periods, temporary flooding etc., the value of the reduced yield is calculated. **Table 6.3** can be used to estimate the production loss for affected perennials.

Table 6.3: Table of production loss for affected perennial crops

Description of crops/ commodity	Area under production (ha)	Expected yield/ hectare (kg)	Estimated hectares damaged	Yields not produced ('000'kgs)			Farm gate price of output (F\$)	Estimated value of production loss (F\$ '000')
				Decline in crop yields	Delays in replanting	Total		
	A	B	C	D	E	F	G	H
PERMANENT/ TREE CROPS								
• Coconut								
• Coffee								
• Cocoa								
• Mangoes								
• Citrus								
• Avocadoes								
• Plantain								
• Bananas								
• Other								

Source: European Commission, United Nations Development Group and World Bank (2013b); consultant research.

**Notes for completing Table 6.3:**

- » Column D is determined by estimating the expected decline in outputs per hectare due to the impairment of productive assets and infrastructure multiplied by column B.
- » Column E is determined by taking the time loss before replanting as a fraction of the entire length (time) of the cropping cycle multiplied by (column B × column D).

**6.5.4 Step 3.1.3: Calculate production loss for destroyed annual crops****Production loss information no. L3: Production loss for destroyed annual crops**

The total destruction of annual crops ready for harvest, or when they can no longer be replanted in the same year, are considered as losses, and the value of the total production expected to be harvested is calculated. In the event that crops can be replanted, only the inputs and production cost that were spent up to that moment are calculated.

**Table 6.4** can be used to estimate the production loss for destroyed annual crops.

Table 6.4: Table of production loss for totally destroyed annual crops

Description of crops/commodity	Pre-disaster information			Post-disaster information	Estimated value of production loss (F\$ '000')
	Area under production (ha)	Expected yield/ hectare (ha) (kg)	Farm gate price of output (F\$)	Estimated area destroyed (ha)	
	A	B	C	D	E
<b>1. Root crops</b>					
• Cassava					
• Dalo					
• Dalo-ni-tana					
• Ginger					
• Kawa					
• Kumula					
• Potato					
• Turmeric					
• Yam					
• Yagona					

Description of crops/commodity	Pre-disaster information			Post-disaster information	Estimated value of production loss (F\$ '000')
	Area under production (ha)	Expected yield/ hectare (ha) (kg)	Farm gate price of output (F\$)	Estimated area destroyed (ha)	
	A	B	C	D	E
• Other root crops					
<b>2. Vegetables</b>					
• Bele					
• Capsicum					
• Carrot					
• Cauliflower					
• Celery					
• Chili					
• Chinese cabbage					
• Coriander					
• Curry leaves					
• Cucumber					
• Eggplant					
• English cabbage					
• French beans					
• Garlic					
• Gourd					
• Lettuce					
• Long bean					
• Okra					

Description of crops/commodity	Pre-disaster information			Post-disaster information	Estimated value of production loss (F\$ '000')
	Area under production (ha)	Expected yield/ hectare (ha) (kg)	Farm gate price of output (F\$)	Estimated area destroyed (ha)	
	A	B	C	D	E
• Onion					
• Parsley					
• Pumpkin					
• Radish					
• Rock melon					
• Spring onion					
• Tomatoes					
• Watercress					
• Watermelon					
• Winged bean					
• Zucchini					
<b>3. Pulses</b>					
• Cowpea					
• Lablab bean					
• Mung					
• Peanuts					
• Pigeon peas					
• Urd					
• Vanilla					
<b>4. Other vegetables</b>					

Description of crops/commodity	Pre-disaster information			Post-disaster information	Estimated value of production loss (F\$ '000')
	Area under production (ha)	Expected yield/ hectare (ha) (kg)	Farm gate price of output (F\$)	Estimated area destroyed (ha)	
	A	B	C	D	E
<b>5. Cereals</b>					
• Maize					
• Rice					
• Sorghum					

Source: European Commission, United Nations Development Group and World Bank (2013b); consultant research.

**Notes for completing Table 6.4:**

» In formula, column E = (column B × column C × column D).

### 6.5.5 Step 3.1.4: Calculate production loss for affected annual crops

#### Production loss information no. L4: Production loss for destroyed annual crops

For annual crops that are affected but not destroyed by the disaster (dry period, temporary flooding), and will have reduced production, the value of the reduction in harvest is calculated. **Table 6.5** can be used to estimate the production loss for affected annual crops.

Table 6.5: Table of production loss for affected annual crops

Description of crops/ commodity	Pre-disaster information			Post-disaster information		Estimated value of production loss (F\$ '000')
	Area under production (ha)	Expected yield/ hectare (kg)	Farm gate price of output (F\$)	Estimated area destroyed (ha)	Percentage reduction in yields	
	A	B	C	D	E	F
<b>1. Root crops</b>						
• Cassava						
• Dalo						
• Dalo-ni-tana						
• Ginger						
• Kawa						
• Kumula						
• Potato						
• Turmeric						
• Yam						
• Yagona						
• Other root crops						
<b>2. Vegetables</b>						
• Bele						
• Capsicum						
• Carrot						

Description of crops/ commodity	Pre-disaster information			Post-disaster information		Estimated value of production loss (F\$ '000')
	Area under production (ha)	Expected yield/ hectare (kg)	Farm gate price of output (F\$)	Estimated area destroyed (ha)	Percentage reduction in yields	
	A	B	C	D	E	F
• Cauliflower						
• Celery						
• Chili						
• Chinese cabbage						
• Coriander						
• Curry leaves						
• Cucumber						
• Eggplant						
• English cabbage						
• French beans						
• Garlic						
• Gourd						
• Lettuce						
• Long bean						
• Okra						
• Onion						
• Parsley						
• Pumpkin						
• Radish						
• Rock melon						



Description of crops/ commodity	Pre-disaster information			Post-disaster information		Estimated value of production loss (F\$ '000')
	Area under production (ha)	Expected yield/ hectare (kg)	Farm gate price of output (F\$)	Estimated area destroyed (ha)	Percentage reduction in yields	
	A	B	C	D	E	F
• Spring onion						
• Tomatoes						
• Watercress						
• Watermelon						
• Winged bean						
• Zucchini						
<b>3. Pulses</b>						
• Cowpea						
• Lablab bean						
• Mung						
• Peanuts						
• Pigeon peas						
• Urd						
• Vanilla						
<b>4. Other vegetables</b>						
<b>5. Cereals</b>						
• Maize						
• Rice						
• Sorghum						

Source: European Commission, United Nations Development Group and World Bank (2013b); consultant research.

**Notes for completing Table 6.5:**

» In formula, column F = (column B × column C × column D × column E)

### 6.5.6 Step 3.1.5: Calculate production loss resulting from higher production cost for crops and forests

#### Higher production cost information no. L5: Higher production cost for crops and forests

The production loss due to higher production cost associated with crops and forestry can be estimated using **Table 6.6**.

Table 6.6: Table of higher production cost for crops and forests

Description of crops/commodity	Area under production (ha)	Expected yield/ha (kg)	Cost of production (F\$/ha)	Estimated hectares damaged	Higher production cost (F\$'000')						Estimated value of higher production cost (F\$)
					Higher use of inputs	Cost of replanting crops	Equipment rental	Removal of debris and boulders	Reinforce risky/vulnerable sites	Other	
	A	B	C	D	E	F	G	H	I	J	K
Crops											
1. Permanent/tree crops											
• Avocado											
• Banana											
• Breadfruit											
• Citrus											
• Cocoa											
• Coconut											
• Coffee											
• Drumstick											
• Duruka											
• Kura											
• Mango											
• Mint											

Description of crops/commodity	Area under production (ha)	Expected yield/ha (kg)	Cost of production (F\$/ha)	Estimated hectares damaged	Higher production cost (F\$'000')						Estimated value of higher production cost (F\$)
					Higher use of inputs	Cost of replanting crops	Equipment rental	Removal of debris and boulders	Reinforce risky/vulnerable sites	Other	
	A	B	C	D	E	F	G	H	I	J	K
• Passion fruit											
• Papaya											
• Pineapple											
• Plantain											
• Soursop											
• Sugar cane											
• Other											
<b>2. Root crops</b>											
Cassava											
Dalo											
Dalo-ni-tana											
Ginger											
Kawa											
Kumula											
Potato											
Turmeric											
Yam											
Yagona											
Other root crops											
<b>3. Vegetables</b>											
Bele											
Capsicum											

Description of crops/commodity	Area under production (ha)	Expected yield/ha (kg)	Cost of production (F\$/ha)	Estimated hectares damaged	Higher production cost (F\$'000')						Estimated value of higher production cost (F\$)
					Higher use of inputs	Cost of replanting crops	Equipment rental	Removal of debris and boulders	Reinforce risky/vulnerable sites	Other	
	A	B	C	D	E	F	G	H	I	J	K
Carrot											
Cauliflower											
Celery											
Chili											
Chinese cabbage											
Coriander											
Curry leaves											
Cucumber											
Eggplant											
English cabbage											
French beans											
Garlic											
Gourd											
Lettuce											
Long bean											
Okra											
Onion											
Parsley											
Pumpkin											
Radish											
Rock melon											
Spring onion											

Description of crops/commodity	Area under production (ha)	Expected yield/ha (kg)	Cost of production (F\$/ha)	Estimated hectares damaged	Higher production cost (F\$'000')						Estimated value of higher production cost (F\$)
					Higher use of inputs	Cost of replanting crops	Equipment rental	Removal of debris and boulders	Reinforce risky/vulnerable sites	Other	
	A	B	C	D	E	F	G	H	I	J	K
Tomatoes											
Watercress											
Watermelon											
Winged bean											
Zucchini											
4. Pulses											
Cowpea											
Lablab bean											
Mung											
Peanuts											
Pigeon peas											
Urd											
Vanilla											
5. Other vegetables											
6. Cereals											
Maize											
Rice											
Sorghum											
7. Forests											

Source: European Commission, United Nations Development Group and World Bank (2013b); consultant research.

#### Notes for completing Table 6.6:

» In formula, column K = column E + column F + column G + column H + column I + column J.

## 6.6 Step 3.2: Calculate the economic value of livestock/apiculture loss

### 6.6.1 Step 3.2.1: Calculating livestock/apiculture production loss due to death

#### Production loss information no. L6: Livestock and bee colonies loss

The loss of the animals killed by the disaster is determined by the value of the production of the products (e.g. milk, eggs, honey, wool) not obtained during the entire period that it takes for the replacement animal to reach maturity and be able to produce normally again. The value of offspring not obtained during that period is also included. Meat production is not included, because it is accounted for by the value of the dead animal paid for under damage.

**Table 6.7** can be used to estimate the production loss from deaths.

Table 6.7: Livestock and bee colony loss due to animals killed in the disaster

Post-disaster information		Pre-disaster information								Total estimate production loss (F\$'000')
Breeding and producing animals (excluding fatteners)	Number of animals lost	The period until replacement animal produces again (days/weeks/months)	Unit of period	Production of animal (kg/l) per day/week/month	Product	Production period	Farm gate price of output (F\$/kg - l)	Average number loss per period before production restarts	Average value (F\$/unit)	
	A	B		C			D	E	F	G
Cows										
Goats										
Sheep										
Layers (poultry)										
Bee colonies										

Source: European Commission, United Nations Development Group and World Bank (2013b); consultant research.

#### Notes for completing Table 6.7:

- » Column B should include the entire period that dead animals will not be able to produce until they are replaced and start producing again.
- » In formula, column G = (column A × column B × column C × column D) + (column A column × column E × column F).

### 6.6.2 Step 3.2.2: Calculating livestock/apiculture production loss due to animals/bees affected but not killed

#### Production loss information no. L7: Livestock and bee colony loss

For animals/bee colonies that are not killed but are affected by the disaster (lack of fodder, poor pasture quality, increased disease incidence, etc.), but have reduced production, the value of reduced production of animal/bee products is calculated. **Table 6.8** can be used to estimate production loss due to animals/bees affected.

Table 6.8: Livestock and bee colony loss due to animals/bees affected by the disaster

Post-disaster information					Pre-disaster information				Total estimated production loss (F\$'000')
Types of animals (including meat-producing)	Number of animals affected by the event	The period until replacement animals produce again (days/weeks/months)	*Percentage reduction in production for the period	Unit of period	Production of animal products (kg/l) per day, week, month, year	Products	Production period	Farm gate price of product per unit (F\$/kg – l)	
	A	B		C			D	E	F
Goats									
Dairy cow									
Beef animal									
Pigs									
Sheep									
Broilers									
Layers									

Source: European Commission, United Nations Development Group and World Bank (2013b); consultant research.

#### Notes for completing Table 6.8:

- » Column B should include the period that affected animals produce less.
- » In formula, column F = column A × column B × column C × column D × column E.

### 6.6.3 Step 3.2.3: Calculating livestock/apiculture production loss due to higher production cost

#### Higher production cost information no. L8: Higher production cost for livestock and apiculture

The production loss due to higher production loss incurred for livestock/bee colony can be estimated using **Table 6.9**.

Table 6.9: Table of higher production cost for livestock

Description of livestock subsector	No. of animals lost	Higher production cost (F\$'000')						Total estimated higher production costs (F\$'000')
		Higher cost of inputs	Veterinary costs (fees and medicine)	Equipment rental	Removal of debris and boulders	Re-enforce risky/vulnerable sites	Other	
	A	B	C	D	E	F	G	H
1. Cattle								
Beef								
Dairy								
2. Poultry								
Broilers								
Layers								
3. Sheep								
4. Goats								
5. Pigs								
6. Beekeeping								
Total								

Source: European Commission, United Nations Development Group and World Bank (2013b); consultant research.

#### Notes for completing Table 6.9:

» In formula, column H = column B + column C + column D + column E + column F + column G.



## 6.7 Step 3.3: Calculate the economic value of fisheries and aquaculture loss

### 6.7.1 Step 3.3.1: Calculating production loss in fisheries and aquaculture

#### Production loss information no. L9: Fisheries and aquaculture

For losses in fishing and aquaculture, the value of the production not made or lost due to total or partial destruction of the boats, equipment or aquaculture tank is calculated, during the period until production recovers. The production loss may be due to:

- » Decline in fish catch
- » Decline in aquaculture yields
- » Decline in fish yields due to damaged vessels, gear and infrastructure
- » Decreased fishing frequency resulting from a lack of shore-based infrastructure
- » Reduced access to fishing stock
- » Disruption in the breeding cycle of farmed fish

The production loss in fisheries and aquaculture can be estimated with the use of **Table 6.10**.

Table 6.10: Production loss in the fishing industry due to the disaster

Type of fishing	Post-disaster information			Pre-disaster information				Total estimated production loss (F\$'000')
	Number of units totally destroyed	Type of production	*Number of days, and weeks that fishing is not carried out	Production period	Production quantity per unit type of fish ((kg/day, week)	Production period	Average price per unit of fish products (F\$/kg)	
	A		B		C		D	E
Fish line and hooks								
Nets								
Canoes and nets								
Boats with nets								
Semi-industrial boats								
Industrial boats								

Source: European Commission, United Nations Development Group and World Bank (2013b); consultant research.

**Notes for completing Table 6.10:**

- » Column B should indicate the period until fishing operation is re-established, with pre-disaster level of boats and equipment achieved.
- » In formula, column E = (column A × column B × column C × column D).

**6.7.2 Step 3.3.2: Calculating production loss in fisheries and aquaculture due to higher cost**

**Higher production cost information no. L10: Higher production cost for fisheries and aquaculture**

The production loss due to higher cost incurred for fisheries and aquaculture can be estimated using **Table 6.11**.

Table 6.11: Table of higher production loss for fisheries

Description of fisheries subsector	Total estimated higher production cost (F\$'000')						Total estimated production loss (F\$'000')
	The extent of damage to fisheries	Aquaculture hatcheries: higher input cost for fingerlings	Higher production cost due to equipment rental	Higher cost of fuel to reach fish after migration to other areas	Higher production cost due to fuel, labour and repair cost increases	Other	
	A	B	C	D	E	F	G
Marine fish							
• Marine							
• Prawns							
Inland fisheries							
• Eels							
• Mussels							
• Pearl oysters							
• Prawns/ shrimps							
• Tilapia							
• Other							
Total							

Source: European Commission, United Nations Development Group and World Bank (2013b); consultant research.

#### Notes for completing Table 6.11:

» In formula, Column G = column B + column C + column D + column E + column F.

## 6.8 Step 3.4: Calculate the economic value of forestry loss

### Production loss information no. L11: Forestry industry

For forest tree plantations that are affected but not destroyed by the disaster (drought period, temporary flooding), and will have reduced production, the loss represents the value of the reduction in the production of wood, firewood and other forest products (e.g. fruits, bark). **Table 6.12** can be utilized to estimate the production loss in the forestry industry.

Table 6.12: Loss in the forest industry due to the disaster

Post-disaster information			Pre-disaster information		
Type of trees	Area affected (ha)	Percentage reduction in timber yield	Average timber production (m <sup>3</sup> /ha)	Average producer price of timber (F\$/m <sup>3</sup> )	Total estimated production loss (F\$'000')
	A	B	C	D	E
Mahogany					
Pine					
Other					

Source: European Commission, United Nations Development Group and World Bank (2013b); consultant research.

#### Notes for completing Table 6.12:

» In formula, column E = column A × column B × column C × column D.

## 6.9 Step 3.5: Calculate the economic value of production loss from irrigation system

### Production loss information no. L12: Production loss from irrigation fees

If irrigation facilities charge fees, their destruction, whether fully or partial, will result in the loss of income from fees. The production loss due to non-availability of irrigation fees can be estimated using **Table 6.13**.

Table 6.13: Loss from irrigation fees

Name of irrigation system/ location	Estimated production loss (F\$) <sup>5</sup>				Total loss	
	Pre-disaster (m <sup>3</sup> )	Total fees (F\$'000')	Post-disaster (m <sup>3</sup> )	Total fees (F\$'000')	m <sup>3</sup>	(F\$'000')
	A	B	C	D	E	F
.						
.						
.						
.						
Total						

Source: European Commission, United Nations Development Group and World Bank (2013b); consultant research.

#### Notes for completing Table 6.13:

- » In formula, column E = column A – column C.
- » Column F = column B – column D.

## 6.10 Step 3.6: Calculate the economic value of loss in remuneration of salaried labour

### Production loss information no. L13: Production loss from remunerated salaried labour

The losses in the remuneration of wage labour (day labourer, temporary, permanent) are calculated using the lost days and the price of the daily wage (specified by gender) for each of the rural activities that will not be carried out due to the destruction of annual/perennial crops or physical goods (boats, equipment, animals, tanks, etc.).

Only labour obtained from outside the family farms is counted, because the members of family farms are remunerated for the production that would have already been obtained, which has already been taken into account as production losses. The production loss from remunerated salaried labour can be calculated using **Table 6.14**.

<sup>5</sup> Pre-disaster refers to the period before the event (such as a hurricane). Post-disaster refers to the period after the event (such as a hurricane).

Table 6.14: Loss in remuneration due to the disaster

Cost of production	Post-disaster	Pre-disaster				Total estimated production loss (F\$'000')
	Affected area (ha)	Number of workdays required per ha (men)	Remuneration (F\$/day) (men)	Number of workdays required per ha (women)	Remuneration (F\$/day) (women)	
	A	B	C	D	E	F
Land preparation						
Planting						
Fertilizing						
Controlling weeds						
Controlling pests and diseases						
Cultivating labour						
Harvesting						

Source: European Commission, United Nations Development Group and World Bank (2013b); consultant research.

#### Notes for completing Table 6.14:

- » In formula, column F = (column A × column B × column C) + (column A × column D × column E).

## 6.11 Step 3.7: Calculate the economic value of other types of loss

### Production loss information no. L14: Production loss from other activities

There are other unexpected expenditures that will add to the loss in the agriculture sector, such as clearing of land, lack of ability to sell farm products due to disruption in the market chain, agricultural services, input supplies, and credit and loans. Loss may also occur as a result of the lack of the Government's capacity to respond to the recovery needs in the sector.

Loss could also be associated with the other dimensions of the PDNA process, to include:

- » The disruption of governance and social processes, such as the need to rent office space for the agriculture sector, increased transportation cost, the hiring of additional extension officers, lower taxes on agricultural inputs, and the formulation of new agricultural policies and regulations

- » Increased risk and vulnerabilities, such as the cost of limiting the risk of further landslides, new animal deaths due to water-borne diseases as a result of the catastrophe, and loss of processed fish due to disruption in or destruction of storage cooling facilities
- » Unexpected expenses to meet humanitarian needs during the post-disaster emergency phase

Losses are expressed in current costs just before the event. The production loss due to other factors can be estimated using **Table 6.15**.

Table 6.15: Other losses

Subsector	Inability to sell due to disruption in market chain (F\$)	Land clearing operations (F\$)	Other (related to the three dimensions of loss) (F\$)	Total (F\$)
	A	B	C	D
1. Crops				
1.1. Permanent/tree crops				
• Avocado				
• Banana				
• Breadfruit				
• Coconut				
• Sugar cane				
• N				
1.2. Root and tubers				
• Cassava				
• Dalo				
• Dalo-ni-tana				
• Ginger				
• N				
1.3. Vegetables				
• Bele				
• Capsicum				

Subsector	Inability to sell due to disruption in market chain (F\$)	Land clearing operations (F\$)	Other (related to the three dimensions of loss) (F\$)	Total (F\$)
	A	B	C	D
• Carrot				
• Cauliflower				
• N				
1.4. Pulses				
• Cowpea				
• Lablab bean				
• Mung				
• N				
1.5. Other vegetables				
2. Livestock (no.)				
2.1 Cattle				
• Beef				
• Dairy				
2.2 Poultry				
Broilers				
Layers				
2.3 Sheep				
3.1 Goats				
3.2 Pigs				
3.3 Rabbits				
2.8. Other animals				
3. Fisheries				
3.1. Marine fisheries				
• Marine				

Subsector	Inability to sell due to disruption in market chain (F\$)	Land clearing operations (F\$)	Other (related to the three dimensions of loss) (F\$)	Total (F\$)
	A	B	C	D
• Prawns				
3.2 Inland fisheries				
Tilapia				
Prawns				
Other				
4. Other products				
• Honey				
• Other				
Total				

Source: European Commission, United Nations Development Group and World Bank (2013b); consultant research.

**Notes for completing Table 6.15:**

- » In formula, column D = column A + column B + column C.

## 6.12 Step 3.8: Estimate production loss beyond the year the disaster occurred

**Production loss information No. L15: Estimate loss beyond the year the disaster occurred**

One of the devastating impacts of natural disasters on crops, livestock, fisheries, apiculture and forestry is the long-term damage they can cause to physical assets and infrastructure within the sector. The damage can result in reduced production, loss of livelihood, and reduction of the future supply of agricultural produce. For example:

- » Damage to perennial tree crops and forestry can result in significant reduction in the supply of fruits and timber, and disrupt ecosystem services beyond the year of the disaster.
- » Landslides and floods can alter topography or render lands unsuitable for crops for a long time, and can result in the reduction of grazing lands for livestock.
- » Storm surges and tsunamis can wash out farms and increase the salinity of bodies of water, making land and water unproductive for a longer period.

The loss incurred beyond the disaster year can be calculated by comparing the estimated production in future years if the disaster did not occur and the estimated production after the disaster. **Table 6.16** can be used to prepare for the long-term losses in the agriculture sector.



Table 6.16: Damage due to long-term damage to production areas

Subsector	Foregone production for the year after the disaster occurred								Total loss (F\$)
	Year 1		Year 2		Year 3		Year N		
	Unit	F\$	Unit	F\$	Unit	F\$	Unit	F\$	
1. Crops									
1.1. Permanent/tree crops									
• Avocado									
• Banana									
• Breadfruit									
• Coconut									
• Sugar cane									
• N									
1.2. Root and tubers									
• Cassava									
• Dalo									
• Dalo-ni-tana									
• Ginger									
• N									
1.3. Vegetables									
• Bele									
• Capsicum									
• Carrot									
• Cauliflower									
• N									
1.4. Pulses									
Cowpea									
Lablab bean									

Subsector	Foregone production for the year after the disaster occurred								Total loss (F\$)
	Year 1		Year 2		Year 3		Year N		
	Unit	F\$	Unit	F\$	Unit	F\$	Unit	F\$	
Mung									
N									
1.5. Other vegetables									
2. Livestock (no.)									
2.1 Cattle									
• Beef									
• Dairy									
2.2 Poultry									
• Broilers									
• Layers									
2.3 Sheep									
2.4 Goats									
2.5 Pigs									
2.6 Rabbits									
2.7 Other animals									
3. Fisheries									
3.1 Marine fisheries									
• Marine									
• Prawns									
3.2 Inland fisheries									
• Tilapia									
• Prawns									
• Other									

Subsector	Foregone production for the year after the disaster occurred								Total loss (F\$)
	Year 1		Year 2		Year 3		Year N		
	Unit	F\$	Unit	F\$	Unit	F\$	Unit	F\$	
4. Other products									
• Honey									
• Other									
5. Forestry									
• Standing timber plantation									
• Natural forest									
• Forest access roads									
Total									

Source: European Commission, United Nations Development Group and World Bank (2013b); consultant research.

### 6.13 Step 3.9: Summarize the estimated damage and loss to the agriculture sector

The total estimated effects of the disaster can be summarized by combining the values of damage and loss for the year the disaster occurred and beyond. The consolidation can be done by District Offices across all subsectors, Regional Administrative Offices across all subsectors, and/or national-level offices across all subsectors. What is important is that damage and loss estimated for the sector are disaggregated and presented under both public and private sectors. **Table 6.17** can be used to present the damage and loss at the national level.

Table 6.17: Summary of damage and loss by subsector nationwide

Subsector	Damage			Loss			Total effects (F\$'000')
	Public	Private	Total damage (F\$'000')	Public	Private	Total loss (F\$'000')	
Crops							
Permanent tree crops							
Root crops							
Vegetables							
Pulses							
Pastures							
Livestock							
Cattle							
Sheep							
Goats							
Pigs							
Poultry							
• Broiler							
• Eggs							
Fisheries							
• Marine							
• Aquaculture							

Subsector	Damage			Loss			Total effects (F\$'000')
	Public	Private	Total damage (F\$'000')	Public	Private	Total loss (F\$'000')	
Apiculture							
Forestry							
Irrigation							
Farm roads							
Other							
Total							

Source: European Commission, United Nations Development Group and World Bank (2013b); consultant research.

## 6.14 Step 3.10: Validate the information on damage and loss

To ensure the integrity of the data collected, and that there is no double counting across the sectors, a meeting among the various sectoral PDNA teams should be conducted. The meeting can be a one-day event where all the teams can share their data collected and challenges experienced in the field, among other subjects. At the end of this meeting, all teams must have validated and reconciled their data collected from the field, and make the necessary adjustments to their reporting forms.

**Table 5.12** presents a summary of total disaster effects of the La Soufriere volcanic eruption on the agriculture sector of Saint Vincent and the Grenadines, of which the total loss to the sector was estimated at EC\$126.30 (US\$46.78) million. The estimated loss represented 54.9 percent of the total disaster on the sector.

7



## STEP 4

# 7 Conduct disaster impact assessment from an agriculture sector perspective: Macroeconomic and human development indicators

## 7.1 Overview

**Disaster impact refers to the short-, medium- and long-term consequences of the effects of an event on the agriculture sector.**

These consequences focus on the macroeconomic and human development indicators, and can be described through “business-as-usual”, worst-case and best-case scenarios. The methodology to assess the macroeconomic, microeconomic and human impacts of the disaster impact is presented below.

During the PDNA evaluations, a team should be formed by the Government of Fiji, made up of the ministries related to finance and development, economy, investments, the NDMO, and other relevant agencies, that will be responsible for carrying out the impact assessments. This should be conducted in coordination with the sector teams and experts; if necessary, support could be requested from international institutions.

The evaluation consists of estimating the impact that the disaster will have, in the aggregate, through the use/calculation of a set of macroeconomic indicators such as economic growth measured in GDP, the balance of payments (trade balance, services and capital), fiscal indicators and inflation. The evaluation will also examine the human impact that the disaster will have, and the implications of both for the sustainable development of the country.

## 7.2 Step 4.1: Evaluate the macroeconomic impacts

In the PDNA methodology, the macroeconomic impact is defined as the consequences of the loss (changes in economic flows) generated by the disaster for the agriculture sector, and its consequences and influence on the indicators of the economy of the country.

The impact of the disaster in macroeconomic terms is measured in relation to the pre-disaster baseline or to the economic predictions of the sector made when the disaster had not yet occurred, and is carried out by examining three scenarios:

- » No recovery actions taken (the most unfavourable situation)
- » Recovery actions taken
- » Recovery actions taken, plus investments in a resilient and sustainable recovery plan – BBB

Baseline information must be carefully collected, particularly for sectoral indicators. The most important indicators to calculate in the PDNA methodology are:

- » Agricultural GDP<sup>6</sup>
- » Contribution of the agriculture sector to the country’s balance of payments (exports from the sector and imports for the sectoral use)

<sup>6</sup> Including crops, livestock, fishing and aquaculture, apiculture and forestry.

- » Contribution of the fiscal balance of the agriculture sector to the national fiscal position of the country
- » Foreign and domestic investments into the sector
- » Inflation, or the producer price index of agricultural, livestock, fishing/aquaculture and forestry products

The historical information of the sector of the last years, and its projections in the year of the disaster and subsequent years, are required.

For the analysis of the macroeconomic impact, only the values of the loss are used, that is, the values corresponding to the changes in the production flows of goods and services in the agriculture sector. The values corresponding to physical damage to infrastructure and physical assets are used separately to estimate the impacts on stock (inventories) and capital.

In order to make the calculations of the impact of the disaster, the agriculture sector PDNA team has to provide, to the team that leads the evaluation of macroeconomic and human impacts, the data on the total loss and damage of the sector, as well as the sector's baseline information as it relates to the macroeconomic indicators. This team is the one who makes the calculations of the impact, taking into account all the sectors evaluated in a PDNA process.

With a knowledge of the value of the agricultural GDP and its contribution to the national GDP of previous years, it is possible to estimate the percentage in the value of the agricultural GDP attributed to the disaster based on the loss incurred by sector.

Based on the damage and loss estimates, the agriculture sector PDNA team is now able to estimate the likely impact of the disaster on four key macroeconomic variables: disaster-induced changes in agricultural GDP, agricultural trade (reduced exports and increased imports), government budget (higher government expenditure and lower tax revenue) and food price inflation. The possible impact on overall inflation can be estimated once the post-disaster impact data from all sectors become available.

Specifically, the agriculture sector PDNA team should conduct the following estimations and provide them to the macroeconomic team:

- » Gross value of production that will not be obtained because of the disaster, in each of the agriculture subsectors (crops, livestock, fisheries, apiculture and forestry), in the calendar year of the disaster and in subsequent calendar years
  - **Value of the total loss of the sector (table of loss)**
- » Gross value of higher cost of production that will be incurred as a result of the disaster in each of the subsectors, again in the current and subsequent calendar years
  - **The total value of additional production cost, calculated as a loss**
- » Amounts and cost of the above-normal imports of crops, livestock, fisheries, apiculture and forest products, imported to counterbalance the production losses caused by the disaster
  - **Value of imported inputs for the relaunch of agriculture sector production as it relates to crops, livestock, fishing and aquaculture, apiculture, and forestry (table of recovery costs)**
- » Amounts and cost of the below-normal exportable production that will not happen due to the loss in production, for which export prices (and not farm gate prices) are used
  - **Quantities and the total value of export products lost (detailed in table of loss)**
- » Amount and value of imported materials and equipment required for the reconstruction of destroyed sector assets due to the lack of domestic production as a result of the disaster, for which international import prices plus transport unit cost (not farm gate prices) are used
  - **The total value of recovery costs, as well as materials, equipment, machinery, etc. needed for recovery (table of recovery costs)**



- » Any additional current expenditure that the government will have to make in the agriculture, livestock, fisheries and aquaculture, apiculture and forestry subsectors of as a result of the higher cost of production due to the disaster, including the Government's share, if any, in the provision of inputs such as seeds for replanting, fertilizer, pesticides and irrigation water to ensure production recovery, and the Government's share in the cost of importing food when required.
- **Total value accounted for in the heading of governance and risk reduction (tables of loss and recovery cost)**
- » Amount of tax revenues that will not be collected by the Government because of the lower production level out turned achieved after the disaster, or if food is required to be imported and the food imports are to be exempted from import duties
- **Value of income that the Ministry of Agriculture and the Ministry of Finance will not obtain (table of detailed governance loss)**
- » The extent of food price increases as a result of imbalances in the supply and demand of foods due to the disaster
- **National food price inflation**

## 7.3 Step 4.2: Estimate food requirements per year

### Food balance sheet information no. M1: Estimate of food requirements per year after the disaster

The destruction of crops, livestock and other agricultural outputs due to the disaster may adversely affect the balance of food supply within and outside the areas affected. Once production loss has been estimated, if the results reveal that a sizeable fraction of food products have been lost due to the disaster, the agriculture sector PDNA team should assess the gaps in food supply (food balance sheet) within the disaster year and beyond, to enable the Government to stabilize food supply and prices. This food balance sheet is an essential input for the estimation of recovery needs. The cost of stabilizing the food supply will be the value of the supply gaps multiplied by the unit cost of the respective food items over a specified period. It should be noted, however, that in estimating the food requirements, the supply of food from aid donors should be factored in, including those integrated with food-for-work schemes. The various agencies must be able to estimate the food supply gaps. **Table 7.1** can be used by the MALF to consolidate the overall food requirements needed to stabilize the food supply in the country.

Table 7.1: Pre- and post-disaster estimated food requirements per year in the country ('000'kgs)

Food items	Pre-disaster level			Disaster year		Year 1		Year...N	
	Output	Consumption	Gap	Output	Gap	Output	Gap	Output	Gap
	A	B	C	D	E	F	G	H	I
Rice									
Root crops									
Vegetables									
Pulses									
Beef									
Milk									
Pork									
Goat meat									
Sheep meat									
Poultry meat									
Eggs									
Fish									
Other									
<b>Total</b>									

Source: European Commission, United Nations Development Group and World Bank (2013b); consultant research.

**Notes for completing Table 7.1:**

- » Column 1 (“Food items”) is for the food items normally consumed in the country.
- » Columns A and B are for the pre-disaster (without disaster scenario) output (production) and consumption of the food items by the population.
- » “Gap” in column C refers to the food items consumed but not produced in the country. The gap represents the imports as they must be filled from outside the country in order to augment or fill the food requirements of the population. In formula, column C = column A – column B.
- » Columns D and E are for the post-disaster estimated output or production of the food items in the country for the year that the disaster occurred. The “gap” refers to the difference between the pre-and post-disaster gaps.

The post-disaster gap will be the post-disaster output (column D) less the pre-disaster consumption (column B). In formula, column E = column D – column B.

- » The same will apply for the years after the disaster. For the year 1 gap, column G = column F – column B, while for the year N gap, column I = column H – column B.
- » Table 7.1 assumes that pre-disaster consumption will not change and that no large migration out of the country will occur.
- » The estimated food supply gaps will enable recovery planners to design measures, like food importation, to maintain the food requirements and health conditions of the affected population.
- » The cost of stabilizing the food supply will be the value of the supply gaps multiplied by the unit cost of the respective food items over a specified time period.

## 7.4 Step 4.3: Evaluate human impacts

Disasters can also have a lasting socio-economic and human development impact which should be assessed during the PDNA when appropriate, and particularly depending on the severity of the disaster. Any disaster that significantly affects the agriculture sector and the rural population has serious consequences for rural poverty, particularly for small and marginal farming and landless rural households. Populations affected by disasters may experience a significant loss of employment and household and personal income, an increase in food and nutrition insecurity, a deterioration of livelihood options and opportunities, a decline in the provision of and access to critical services, and other negative effects which may increase the size of the population living below the poverty line.

When evaluating the human development impact, the agriculture sector PDNA team should consider the main subsectors and systems affected; the comparative impacts on agriculture, fisheries and aquaculture, livestock, forestry; the relative importance of the impact on the sector in the broader socio-economic context; share of employment/ income lost in the sector; the share of damage and loss in the crops, fisheries, livestock and forestry subsectors; and the general condition of livelihoods-related environmental and natural resources; and spontaneous recovery efforts.

To estimate the human development impact of the disaster it is useful for the agriculture sector PDNA team to:

- » Analyse the performance of human development components before the disaster, utilizing a pre-crisis baseline (pre-disaster human development trends)
- » Project/forecast human development performance into the future, both for the year in which the disaster occurred and for the following year/s, based on past performance, utilizing clearly stated assumptions

To estimate the human and social impact of the disaster, the agriculture sector PDNA team has to provide certain sector data to the PDNA team responsible for the analysis of the human and social impact on the sector. Specifically, the agriculture sector PDNA team should provide the information specified below for the following indicators:

- » Living conditions, education and health -> multidimensional poverty:
  - Access to water, sanitation, electricity, fuel for cooking and basic family goods, type of housing
  - Morbidity rate, mortality rate, increased barriers to essential health services
  - Access to primary education, school drop-out rate

- **The total number of producers who lost their income, or with production loss from the agriculture subsectors**
- » Access to livelihoods, income, productive assets and resources -> poverty level:
  - Livelihoods lost, unemployment
  - Number of people who lost income, total loss of income in value
  - Loss of assets, number of people who lost productive assets
  - **The number of producers who lost their livelihoods or their employment (permanent, temporary, day labourers) in the agricultural subsectors and an estimate of the duration of the interruption of the need for labour**
- » General levels of food and nutrition -> food security:
  - Pillars of food security: food availability, food access, food utilization, food stability
  - Coping strategies at home: rationing, changing diet, increasing short-term food availability in households, decreasing number of people to be fed
  - Food safety
  - **Quantities of staple foods lost due to the event**
  - **The number of producers who lost their self-sufficiency or suffered a reduction in their level due to losses in their agricultural production**
- » Gender equality -> gender inequality
  - Impact of disasters differentiated by gender in relation to productive role, reproductive function and role in the community
  - Access to services, campaign resources and decision-making

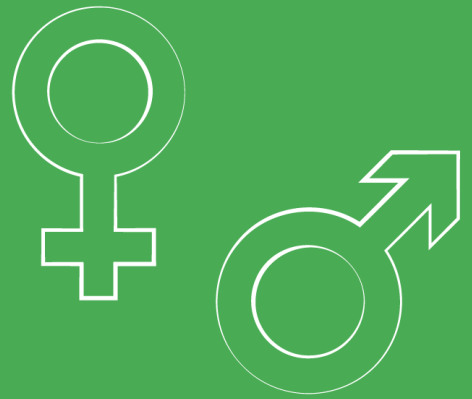
» Social inclusion

- Unequal access to resources: measures the access of disadvantaged groups to basic services and resources such as education, health care, employment and income
- Unequal participation: measures the level of participation of disadvantaged groups in the decision-making process related to the political, civil and cultural aspects of the recovery programme in the aftermath of a disaster.
- Denial of opportunity: measures denial of opportunity on the basis of ethnicity, religion, race, caste, gender, age, physical disabilities and other characteristics that should have no bearing on a person's rights, achievements or well-being



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## STEP 5

### 8 Consider cross-cutting issues

#### 8.1 Overview

There are five key cross-cutting issues that are relevant to the agriculture sector and which should be given due consideration and mainstreamed into the PDNA process to ensure a holistic assessment. These are gender; governance; environment; DRR; and employment, livelihoods and social protection. The assessment should indicate whether these cross-cutting issues will be addressed within the agriculture sector or as a stand-alone chapter for all sectors of the entire national multisectoral PDNA report. In this context, it is important for the agriculture sector PDNA team to establish the required cross-cutting agreements with other sector teams to ensure that these cross-cutting considerations are adequately addressed in the recovery strategy.

#### 8.2 Gender

Gender is particularly important, because women and men have access to different resources available to them and different strategies to face or solve their needs, which must be understood and taken into account in the development of the recovery plan.

**At the same time, women, men and youth have different tasks in agricultural production activities, which often require special efforts and approaches when proposing interventions (International Federation of Red Cross and Red Crescent Societies, 2010).**

Both indigenous Fijian and Indo-Fijian societies have been traditionally patriarchal, with gender roles generally divided across traditional lines. Society's opinion of women is influenced by the perception that

they are more delicate and need protecting. They are generally given less physically arduous jobs and are rarely expected to have full-time jobs or do things for themselves. This paternalism can be hindering for Fijian women in Australia, who may struggle to adjust to working life. Some Indo-Fijian women also carry particular social expectations within their communities as subordinates to their husbands. Despite this traditional view of gender roles, modern Fiji is seeing a rise in the number of female-headed households. The representation of Fijian women in politics is also growing (Evason, 2016).

Available data shows that in 2021, 19 percent of all employed women worked in the agriculture sector, a decrease from 22 percent in 2013. Meanwhile, 34 percent of all employed men worked in the agriculture sector in 2022, compared with 36 percent in 2013 (World Bank, n.d.).<sup>7</sup>

#### 8.3 Governance

Key governance processes and decision-making processes of the agriculture sector may be affected by a disaster. These include:

- » The effect of the disaster on government functions and on civil servants, which disrupts the sector's administrative processes
- » The disruption of basic community functions, social services provided by community-based organizations, and disruption of cultural and community life
- » The effect of disasters on the management and organization of the sector's services that support life and livelihoods

<sup>7</sup> Information based on modeled International Labour Organization, 2023 estimate.

- » The assessment of sectoral, national and local capacities to lead and manage the recovery process itself

Regarding the latter, it is important to note the disruption to women's participation in decision-making forums at all levels, as well as to assess the opportunities where women may take on new decision-making roles, or where support would enhance women's participation in decisions centred on recovery.

In conducting the PDNA, the agriculture sector PDNA team needs to ensure that the important social and governance processes are restored as part of the recovery process. Below are key considerations for assessing governance and social processes:

- » Description of the disaster's effect on sectoral administration processes
- » The effects on the capacity of the sector in question to manage service delivery and continue functions of policy and planning – effects in terms of processes for deliberation, decision-making, consultation, management, and technical and operational capacity
- » Effect on community life, social coherence and power relations including gender power relations, latent conflicts, social support networks, and division of labour
- » Additional burdens placed on local governments and civil society organizations as a result of the disaster, and ways in which they cope
- » Capacity of sector authorities to lead and manage the recovery process (European Commission, United Nations Development Group and World Bank, 2013a)

Based on the changes the disaster brings to functional and technical capacities, the agriculture sector PDNA team should evaluate the following five broad issues:

- » Knowledge and skills lost or now required
- » Human, financial and material resources lost or now required given new demands

- » Systems of information, management and communication required, given the new demands or destruction of previously existing systems
- » Legal authority, policies and regulations, as they may need amendments or changes due to the disaster
- » Accountability, monitoring and reporting specifically made for the recovery and reconstruction processes, given that under the emergency phase some of these systems are not applied as they would be under normal circumstances. This may be due to special legal provisions allowing for fast-track authorization, tender and contract allocation in emergency situations, or due to the disruption of the institutions in charge of these processes in normal circumstances

## 8.4 The environment and natural resources

Sustainable management of the environment is a critical consideration in the development of successful agricultural livelihood programmes, as the agriculture sector is dependent on environmental resources such as arable land, forests, and water including rainfall. Coordination with the environmental assessment team is necessary to complement the development of recovery actions, and avoid double counting in the assessment of agriculture sector-related natural resources and environmental concerns.



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## 8.5 Disaster risk reduction

### 8.5.1 Resilient, sustainable livelihoods and building back better

The recovery strategy for agricultural livelihoods must not only address issues related to the repair of damage caused by the disaster, but also the building of resilience to future crises. To achieve this, the assessment team should identify the underlying risks and propose measures that should be taken during the recovery process to protect agricultural livelihoods, reduce vulnerability, and enhance the resilience of farmers, fishers, beekeepers and foresters against similar shocks. The negative impact of the disaster and related threats can be effectively reduced, mitigated or prevented, by ensuring that investments in recovery strategies and plans promote sustainable models of food production, including the applications of appropriate agricultural technologies that improve yields and increase productivity.

**This should enhance the country's ability to recover loss and increase agricultural production in the aftermath of a disaster.**

### 8.5.2 Agriculture sector technologies and management practices that build resilient and sustainable livelihoods

One starting point is to understand the threat environment, such as naturally occurring events, invasive plant pests and animal diseases that often endanger livelihoods in affected areas. This can be done based on available hazard/risk maps and historical information from previous disasters. Given the interconnection between disasters, the environment and livelihoods, the assessment will need to consider the environmental conditions of the affected area and the connection between natural resources and livelihoods. This includes assessing the impact of disasters on the degradation of ecosystems, such as increased soil erosion, decreased quality of grasslands, salinization of soils and water supplies, deforestation, and loss of biodiversity. It also includes the impact this has had on livelihoods (e.g. reducing the availability of goods and services to sustain livelihoods, loss of arable land, and reduced economic opportunities and livelihood options). Some of this information can be obtained or exchanged with the PDNA sector team that covers the environmental assessment. If necessary, the assessment and

recovery strategy may need to consider climate change and necessary adaptation measures.

The assessment identifies appropriate technologies and practices that can be effective in protecting livelihoods against these threats. This includes considering local knowledge and positive response strategies that can be supported in the recovery process.

The assessment should, therefore, identify measures that should be integrated and reflected in the national recovery strategy. Examples include:

- » Development and promotion of crop varieties, livestock breeds and fish species that are more resilient to stress (e.g. floods, droughts, saline conditions)
- » Development of efficient seed distribution systems
- » The breeding of resistant animals
- » Conservation fodder
- » Promotion of conservation agricultural practices, including fodder conservation, land management practices, and diversification and promotion of more sustainable livelihood strategies

Natural resource management technologies and practices must also be considered, particularly those related to correcting underlying risk factors and making livelihoods more resilient. Examples include:

- » Improving water management and conservation to increase the efficiency and productivity of its use (rainwater harvesting, water storage and conservation techniques)
- » Agroforestry systems that make use of trees and shrubs as protection, windbreaks and living fences
- » Restoring degraded grasslands through grazing and revegetation management



### 8.5.3 Safer location and design of agricultural infrastructure

Another element that contributes to the development of better agricultural livelihoods is the appropriate design and location (a safe location to minimize exposure to natural hazards) of new farm infrastructure to be constructed during the recovery process. To achieve this, it will be necessary to evaluate the following:

- » Infrastructure at risk or exposed to risk (e.g. irrigation networks, shelters, storage and/or energy facilities)
- » Whether it is safe and sustainable to farm, fish or raise livestock on the same land
- » Whether it is safe to rebuild the community in the same place, or if there is a need to move the population or infrastructure, and where and how it would be implemented

Potential obstacles that need to be addressed to ensure safe land and agriculture sector-based housing include the need to:

- » Establish limits offshore or on continental beds to reduce future risk
- » Determine how the infrastructure on the coasts can be improved to offer greater protection in the future
- » Determine whether fishing or aquaculture should be reduced or redirected to reduce pressure on scarce resources
- » Improve the design of the infrastructure (e.g. irrigation systems, fishing boats, shelters for livestock)
- » Identify and address areas of deficiencies in the laws, policies, regulations and management practices to provide greater support for more sustainable and resilient crops, livestock, apiculture and sustainable fisheries, as well as long-term and sustainable management of forests and other natural resources

### 8.5.4 Strengthening and management of risk and disaster reduction

In some cases, there may be opportunities in the recovery process to strengthen the overall capacity of the country and communities in DRR to reduce vulnerability and strengthen resilience to future disasters. In such cases, the PDNA should identify key areas of need that can be integrated into the recovery strategy for the agriculture sector. In addition, technologies, management practices and other measures that need to be integrated into recovery strategies and plans to build resilient livelihoods should be considered. The sector assessment team should consider the following:

- » The favourable environment in risk and disaster reduction for food security, including:
  - Strengthening of the institutional mechanisms and legal and regulatory environments that allow and facilitate strategies and financial investments in risk reduction for the agriculture sector
  - Strengthening the capacity of the Ministry of Agriculture and other relevant ministries and institutions to develop and implement national DRR legislation, policies and strategies through technical advice, human resources and expertise supports, training, and practical tools and services
  - Integrating risk analysis and DRR measures into rural and agricultural development policies and plans
  - Developing specific national strategies for the agriculture sector on DRR through the subsectors of crops, livestock, fisheries/aquaculture, apiculture, forestry and natural resource management
  - Supporting policies, laws and management systems that can improve the capacity of the agriculture sector in the future

- » Food safety information systems and early warning, including:
  - Improving the information systems on food security, such as statistical baselines, livelihood profiles, and vulnerability and risk analyses, and their links with policy formulation
  - Improving early warning and communication systems related to agricultural livelihoods and food security (e.g. harvest forecasting, monitoring of food prices, control of plant pests, animal diseases, fish diseases, biosecurity risks, forest fires, etc.) and natural disasters (e.g. droughts, floods, storms)
  - Strengthening the links between early warning, preparedness and response mechanisms, including decision-making processes
- » Preparation, including:
  - Improving national and local preparedness planning in the crops, livestock, fisheries and aquaculture, apiculture, and forestry subsectors
  - Promoting agricultural technologies and management practices to strengthen the sector's recovery at the national and local levels
  - Strengthening the capacity and skills of key ministries and departments in emergency preparedness and planning

Socio-economic or cultural or ethnographic differences can have important implications for rural communities and their relations with external institutions. It is important to note that the crops, livestock, fisheries and apiculture subsectors are often associated with certain socio-economic groups or ethnic groups, and this can affect their levels of participation or exclusion in decision-making in local institutions. This may also influence their vulnerability to disaster and their ability to participate in rehabilitation and reconstruction efforts.

The employment and livelihoods sector PDNA team will use the decline in personal income as one of the contributing parameters to calculate the multidimensional poverty index, as well as to determine the impact of the disaster and its corresponding human development index. Estimates of agricultural production loss and increased production cost are inputs for estimating employment effects and the decrease in income. These estimates of production loss and increased costs are also reflected in the agriculture sector estimates of the demand for labour in the affected areas and the apparent demand for employment or its reduction due to the event.

Loss in agricultural production and other effects of the disaster may result in a decrease in employment in the sector in the short and medium term. This decrease in employment is estimated for each of the agricultural subsectors and is expressed in terms of months per person. Due to important differences in data sources and estimation methodology, the employment impact is generally analysed separately for the agricultural and non-agricultural sectors.

## 8.6 Employment, livelihoods and social protection

Social equity is a key factor in post-disaster recovery. An equitable response is necessary as disasters affect different groups of people in different ways.

**Recovery processes have the potential to reinforce social inequities or contribute to greater equality between differentiated social groups, such as those based on age, ethnicity or gender.**



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## STEP 6

### 9 Consider intersectoral linkages

#### 9.1 Overview

Both in undertaking the assessment and planning the recovery programme for the PDNA, it is important to remember that society and economy form an integrated system, and therefore the agriculture sector does not exist by itself but is related to several other sectors. Therefore, it is critical to factor interlinkages among sectors and cross-cutting issues that could disrupt plans for BBB into the PDNA process. The reality is that constraints in related sectors could negate plans for recovery in each sector.

It is important that the agriculture sector PDNA team identifies the intersectoral linkages that present themselves for the sector, including those related to:

- » Direct sectoral linkages: backward and forward linkages between the agriculture sector and other sectors (supply chain linkages)
- » Intermediary sector: transportation, distribution and logistics (efficiency and effectiveness)
- » Transaction costs
- » Financial and capacity constraints

A few examples of intersectoral linkages and how they could impact the recovery process are as follows:

- » Plans for the accelerated reconstruction of farm roads and related bridges are often affected (slowed) by procurement procedures for importing materials.
- » Capacity constraints regarding technical skills can slow the implementation of the agriculture sector's recovery plan.

- » Import constraints with regard to inputs for agricultural production (e.g. seeds, fertilizers, chemicals) may cause delays in activating agricultural production at the farm level.

The assessment should indicate how these issues can be addressed in the recovery process, and should establish the necessary cross-sectoral agreements with the other relevant sector teams to ensure that these issues are adequately addressed in the recovery strategy.

**It is important to note that strong context analysis allows for enhanced clarity in the identification of intersectoral linkages and the development of recovery measures.**

It is also important to have intersectoral team discussions to identify the linkages in society and economy. This presents a realistic and practical approach to developing a robust recovery strategy, as both direct and indirect linkages can be clarified, and double counting prevented. Presented below are some of the areas with which the agriculture sector has close ties.

#### 9.2 Food and nutrition security

Information exchange and coordination with the health sector are important, considering the close links between food and nutrition security and consequently the health of the population. The evaluation of food or income losses after the disaster, the estimation and updating of food balances at local and/or national levels, and the estimation of possible food imports, are inputs required for calculating the food and nutrition security situation of the country's population. At the same time, it is important to know the response mechanisms used by the affected population to face

short or long-term impacts on their livelihoods; taking into account parameters to measure human impact.

### 9.3 Industry, trade, transport and tourism linkages to the sector

These sectors are key throughout the entire value chain of the agriculture sector, for the sector to be able to fully carry out its activities. On the one hand, the subsectors depend on the production and supply of inputs (e.g. seeds, fertilizers, feed, ice, tools and fuel), as well as equipment and machinery for production. On the other hand, the agriculture sector also depends on the commercialization of some of its products through processing, transport and/or trade.

**The destruction of infrastructures or the interruption of the activities of the other sectors (transport, commerce and industry), as links along the value chain can have direct implications on the activities of production and the supply of inputs or products of the agriculture sector in the marketplace.**

Given the lack of a developed manufacturing sector, the focus of Pacific island countries has been on strengthening linkages between the hotel and agriculture sector. Berno (2006) noted that hotels in Fiji spent about F\$30 million annually on imported food that Fiji could have grown or produced. Scheyvens and Russell (2012) noted that small- to medium-sized hotels and resorts in Fiji had a higher likelihood of using local food suppliers, with some

purchasing up to 70 percent of their food from within the country. Pratt (2013) demonstrated that one eco-resort in Fiji reduced the amount of imported food offered to their guests in a 12-month period from 18 percent to 6 percent, with a concerted effort to provide more local ingredients. Nevertheless, whether these initiatives could be intensified and adopted by larger, higher-quality resorts, remains in question. “Farm-to-fork” initiatives, such as the development of cookbooks highlighting Pacific cuisines using local ingredients, are a step in the right direction; however, enhancing links between local supply chains and the tourism sector remains pressing (Cheer and others, 2018).



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# 10



## STEP 7

# 10 Identify and estimate recovery and reconstruction needs

## 10.1 Introduction

Recovery needs in the agriculture sector include restoration and resumption of the research, development and production processes in all the agricultural subsectors, including crops, livestock, fisheries and aquaculture, apiculture, and forestry. It involves the following:

- » **Reconstruction of infrastructures and physical assets:**
  - Estimated cost of rebuilding destroyed physical assets, including the costs of BBB and more resilient in the future. This is a combination of the value of damage plus the additional costs to improve quality, introduce modern production technology, and reduce disaster risk
  - Estimated cost of replacing stocks of animals that died from the disaster
  - Estimated cost of restoring lands affected by erosion, sedimentation or other natural hazards, so they can recover the quality and productivity levels they had before the disaster
- » **Resumption of production and ensuring access to goods and services:**
  - Supply of agricultural inputs to restart the agriculture sector production in the affected localities, for example with the supply of seeds, tools, fertilizers and chemicals, depending on the agricultural calendar and type of crop
  - Agrifood products that may need to be supplied to the affected population or the country in general
- Necessary imports due to the restriction of supply in the country
- Agricultural support services for agricultural rehabilitation, such as extension services, the Farmer Field School and other agricultural educational institutions, and development organizations providing technical expertise, human resources, capacity-building and training
- Requirements to clear agricultural land and farm access roads to resume agricultural activities
- Requirements to rehabilitate farm/forest roads to access productive areas, especially in rural areas
- Necessary measures to restore access to food
- The actions that are necessary to recover access to markets, employment and financing services (credit and loan plans)
- » **Recovery of governance and social processes:**
  - Restore the capacity of the research facilities and administrative and extension offices at the national, regional and district levels
  - Enhance the technical knowledge and address the human resource needs (staffing of the Ministries of Agriculture, Fisheries and Forestry)
  - Support the different forms of local or community organizations that exist, including agricultural cooperatives, farmers' organizations, the Association of Women's

Farmers and the Red Cross of Fiji, so that they can fully function again in support of the affected local population

- Provide support services as needed, such as information systems, training and decision-making on agricultural and rural development policies

» **Reduction of risks and future vulnerability by taking the following actions:**

**Immediate disaster risks:**

- Guarantee the same or larger crop area in the next planting season to avoid greater food insecurity
- Avoid or combat outbreaks of agricultural pests and diseases
- Decontaminate agricultural lands and soils

**In the medium and long term**

- Conduct spatial planning with risk reduction principles for agricultural recovery
- Resilient livelihoods, such as the use of improved agricultural technologies
- Protect agricultural investments made in the recovery process (e.g. dikes to protect farmland and aquaculture from flooding)

» **Implementation of specific climate change adaptation measures for the agriculture sector**

The recovery strategy should be aligned with national laws and existing national and sectoral development policies, strategies and plans. In this context, the frame of reference should take on board the following important policy documents, among others are:

- » Fiji (2023). *Report on the Mapping of Adequacy of Fiji's Agriculture Sector Database System for the PDNA Methodology*. Suva. UNDP audit, August 2023.<sup>8</sup>

- » Fiji, Ministry of Agriculture (2020). *Fiji 2020 Agriculture Sector Policy Agenda*. Suva.
- » Fiji, Ministry of Economy (2017). *5-Year & 20-Year National Development Plan: Transforming Fiji*. Suva.
- » Draft report on the assessment of the extent of the mainstreaming of DRR and climate change adaptation measures within the agriculture sector of Fiji.<sup>9</sup>

In addition, current best practices should be adopted. As such development of the sector recovery strategy should include:

- » Agreed vision and guiding principles for the sector recovery process
- » Outline of reconstruction and recovery needs to restore and resume the agriculture sector to pre-disaster levels, along with BBB measures to strengthen the resilience of the Government and communities and reduce risks and vulnerabilities to future disasters
- » Outline of a results-based recovery plan for the agriculture sector
- » Outline of implementation arrangements

## 10.2 Step 7.1: Identify recovery and reconstruction strategies

Ideally, while DaLA is being undertaken, the agriculture sector PDNA team should start the process of developing the strategy to be endorsed and implemented for the recovery and reconstruction of the agriculture sector. The agriculture sector PDNA team must ensure that the strategy:

- » Responds to the needs and priorities of the affected population
- » Focuses on the most vulnerable and most affected
- » Restores capacities and capabilities

8 Accompanying document to the agriculture sector PDNA guide.

9 Accompanying documents to the agriculture sector PDNA guide.



- » Supports spontaneous recovery processes
  - » Ensures national ownership and leadership of the agriculture sector recovery strategy
  - » Works in partnership with civil society, donors, NGOs and international donor institutions
  - » Maintains synergies with humanitarian actions and development goals
  - » Considers and supports national strategies for the agriculture sector and rural development, poverty reduction, food security and sustainable development
  - » Reinforces national and local plans for DRR and climate change adaptation measures in the agriculture sector
- Temporary freeze on basic charges in the utilization of certain services during the recovery phase
  - Exemption from the payment of certain taxes, duties and fees for the replacements of the destroyed equipment and machinery over a certain period

The strategy could include some of the following broad elements:

- » Specific factors which will contribute to BBB of the sector, such as enhancing and strengthening medium- to long-term DRR measures
  - » Set of criteria for the prioritization of reconstruction programmes and projects
  - » Possibilities of relocation of some facilities and farm production operations situated in high-risk areas
  - » Possible incentives to the farmers to enable them to recover immediately and reconstruct damaged structures with higher standards of resilience, without necessarily having to depend on the Government directly financing of the cost, such as:
    - Exemption from payment of building permits and other related fees
    - Duty-free importation of construction materials and equipment during the recovery and reconstruction phase
    - Temporary reduction or freeze or deferment in the collection of property tax
- ### 10.3 Step 7.2: Estimate the recovery needs
- Recovery needs are intended to restore normalcy to all affected areas and sectors as soon as possible. The agriculture sector is one of the very important sectors that will expedite a quick recovery. It is important that special considerations should be given to the reality that a greater number of people, especially people who are poor, are engaged in the agriculture sector, and it is therefore one of the sectors that should be prioritized.
- Recovery needs in the sector are estimated as a direct function of production loss and higher production cost. Usually, the needs are a fraction of the value of production loss, which are the amounts required to restart productive activities (in terms of the value of raw materials and inputs, working capital for the enterprises, or for the individual activities involved). In estimating the overall recovery needs in the agriculture sector, the agriculture sector PDNA team should consider the following issues:
- » The cost associated with recovery of crop production, such as inputs for planting the next crops (e.g. seeds, fertilizer, pesticides), which are usually expressed as a fraction of the value of production loss
  - » Any financing required – through a combination of cash grants and/or soft-term credit lines provided through the appropriate channels (microcredit institutions, the development bank and private commercial banks) – to refinance non-performing pre-disaster loans and finance working capital for the resumption/restoration of agriculture sector production

- » The higher-than-normal cost of providing veterinary care to animals, and of artificial feeding of young animals, when required
- » The cost of food assistance when the food balance reveals that post-disaster production would not suffice to meet people’s needs and that a food deficit would ensue. It should be noted that not all cases of a food deficit mean that food assistance is required. Some governments may opt for importing food to sell to the population, without providing food assistance
- » Any costs of required cash-for-work assistance would be estimated by the employment and income sector PDNA team after production loss for all sectors have been completed

costs of land acquisition, and basic services provision (e.g. water, sanitation, electricity) should be included

- Soft-term credit for reconstruction and repair of private agribusinesses. Such schemes can be accompanied by technical assistance for improved disaster-resilient standards of construction
- Other mitigation measures such as the construction of support infrastructure to prevent serious landslides and floods from impacting farms, and common storage facilities where farmers can safely store their produce

## 10.4 Step 7.3: Estimate the reconstruction need

Reconstruction needs are quantitative estimations of destroyed physical assets that need to be rebuilt or repaired. These needs are generally long-term in nature (three years or more) and are intended to BBB from the ruins of a disaster. The agriculture sector PDNA team could consider the following reconstruction-related activities in the sector:

- » The estimated cost of reconstruction of destroyed physical assets. This is a combination of the value of the damage and additional cost to improve quality, introduce modern production technology, and reduce disaster risks. These needs have a value higher than the estimated damage. Critical components that the agriculture sector PDNA team could consider include:
  - Reconstruction and repair of irrigation systems, post-harvest facilities, markets and other structures under a BBB strategy to ensure future disaster resilience through the adoption and enforcement of improved construction standards
  - Structural retrofitting of undamaged or partially damaged farm facilities so that they are not affected by disaster events in the future
  - Relocation of vital agricultural facilities to safe areas as necessary. In this case, the additional

- » The estimated cost of replacing animals that died due to the disaster. It is important to note that the replacement cost would be higher than the value of the dead animals if disaster-resistant breeds are introduced to reduce risk. Also note that in the absence of sufficient funding for these purposes, the animal stock may be left to recover naturally, which would have no cost, but would generate production loss over a longer period
- » The cost of restoring lands affected through erosion, siltation or other processes, so that they return to their pre-disaster quality and levels of productivity
- » The cost of replanting forests under exploitation so that they may achieve the pre-disaster level of sustainability. As mentioned in the case of replacing animal stock, in the absence of sufficient funding, forests under exploitation may be left as they are after a disaster until they achieve natural recovery. In addition, to avoid double counting, note that the replanting of natural forests is not considered by the forestry subsector of the agriculture sector PDNA team, but by the environment PDNA team

The prioritization of interventions and the classification into short (first-year), medium (second- and third-year) and long-term (fourth- and fifth-year) implementation periods, can be based on the following selection criteria:

- » Temporal priority of activities (which depend on the agricultural calendar)

- » High number of beneficiary producers
- » Urgency to re-establish production of certain foods
- » How quickly a recovery activity can be implemented
- » Existing capacity and means for immediate recovery activities
- » Low cost of recovery compared to high final value to obtain
- » Give priority to small, vulnerable and subsistence producers whose livelihoods depend on the agriculture sector
- » The Ministry of Agriculture and other relevant ministries' prioritization of certain activities in relation to their institutional strategic plans

For each event (e.g. socio-economic, agroecological and political) and type of disaster, these aspects may change and need to be agreed upon within the group responsible for developing recovery activities in the sector.

## 10.5 Step 7.4: Summarize the estimated recovery and reconstruction needs

### Recovery and reconstruction costs assessments: Summary of recovery and reconstruction needs/costs

Based on the estimated recovery and reconstruction needs, a summary can be created by the agriculture sector PDNA team using **Table 10.1**.

The agriculture sector PDNA team should prioritize and sequence (short-, medium- and long-term) recovery needs, as appropriate. The sector team may develop the criteria to guide the prioritization process or utilize previously developed criteria by other PDNA teams. This should include prioritizing critical needs expressed by the affected population and the Government, but also prioritizing vulnerable population groups, geographic areas most affected, and conflict prevention and peacebuilding objectives when relevant, among others.

Table 10.1: Recovery needs for the agriculture sector

Description of intervention/activity	Priority (1 to 5)	Sub-sector	Effects			Short term	Medium term	Long term	Total Needs (F\$'000')
			Damage	Loss	BBB				
RECOVERY NEEDS									
1. Employment and income									
• Cash-for-work									
• Food-for-work									
2. Food assistance/ stabilization									
3. Crop production inputs									
• Seeds/seedlings									
• Fertilizers									

Description of intervention/activity	Priority (1 to 5)	Sub-sector	Effects			Short term	Medium term	Long term	Total Needs F\$'000'
			Damage	Loss	BBB				
• Pesticides									
• Weedicides									
• Other									
4. Production credits/grants									
5. Direct subsidy									
6. Provision of veterinary care to animals									
7. Provision of grains and fodder to animals									
8. Other									
<b>TOTAL RECOVERY NEEDS</b>									
<b>RECONSTRUCTION NEEDS</b>									
9. Reconstruction of destroyed assets, including BBB									
• Reconstruction and repairs of irrigation and drainage systems									
• Reconstruction and repairs of post-harvest facilities									
• Reconstruction and repairs of markets and other structures									

Description of intervention/activity	Priority (1 to 5)	Sub-sector	Effects			Short term	Medium term	Long term	Total Needs F\$'000')
			Damage	Loss	BBB				
• Structural retrofitting of undamaged or partially damaged farm facilities									
• Relocation of vital agricultural facilities to safe areas									
• Provision of short-term credit for reconstruction and repair of private business									
• Mitigation measures									
• Other									
10. Estimated cost of animals dead due to disaster									
11. Cost of restoring lands affected by erosion, siltation and other processes									
12. Cost of restoring pastures affected by erosion, siltation and other processes									
13. Cost of replanting forests to achieve pre-disaster sustainability levels									
Total reconstruction needs									
GRAND TOTAL									

Source: European Commission, United Nations Development Group and World Bank (2013b); consultant research.

**Notes for completing Table 10.1:**

- » The provision of short-term credit for reconstruction needs normally refers to the assistance that will be extended for damaged facilities owned by the private sector, and is expected to be repaid over time. If the Government will extend assistance to the private farmers without requiring repayment, the amount of assistance should be considered a grant.
- » Government-owned facilities are assumed to be financed by the Government without repayment. As such the amount should be considered as a grant. However, if the Government will finance the needs of for-profit firms and statutory bodies through credit, the amount should be considered as credit.

11



## STEP 8

### 11 Develop a recovery strategy

Based on the information from the previous sections of the evaluation, the agriculture sector PDNA team led by NADMO and with support from the Ministry of Finance and Strategic Planning, National Development and Statistics should develop a sectoral recovery strategy in a participatory manner involving all relevant stakeholders in the sector. Such a recovery strategy should include the following items:

#### 11.1 Step 8.1: Define the vision and guiding principles

The vision describes the desired long-term outcome of recovery in the agriculture sector, and should include measures to improve the performance of the sector and create resilient livelihoods, through appropriate sustainable crops, livestock, fisheries and aquaculture, apiculture, and forestry management practices and technologies.

The guiding principles for agricultural recovery must be defined to guide both the recovery strategy of the sector and the recovery process in an effective, transparent and responsible manner. These must be agreed upon in the agriculture sector PDNA team under the direction of the Government.

Some examples of recovery guiding principles are as follows:

- » Responding to the needs and priorities of the affected population
- » Focusing on the most vulnerable and most affected
- » Restoring capacities and aptitudes
- » Implementing interventions, with high demand for labour where possible, to create temporary jobs

for affected people in the agriculture sector

- » Supporting spontaneous recovery processes
- » Ensuring national control and leadership of the recovery strategy for the agriculture sector
- » Working in collaboration with civil society, donors, NGOs, the World Bank, United Nations agencies, and other national and international institutions
- » Maintaining synergies with humanitarian actions and development goals
- » Accounting for and supporting national strategies for the agriculture sector and rural development, poverty reduction, food and nutrition security and sustainable development
- » Strengthening national and local plans for DRR in the agriculture sector

#### 11.2 Step 8.2: Establish the expected sector results: Recovery needs and recovery costs

The various recovery interventions should lead to:

- » Reconstruction or repair of infrastructures
- » Replacement or repair of physical assets (land, machinery, equipment)
- » Reactivation of agricultural production, for enhanced food and nutrition security and increased supply of food products in the marketplace
- » Replacement of lost animals and the reactivation of livestock production



- » Restoration of fisheries/aquaculture production
- » Ensure the continuation and strengthening of all governance services and decision-making processes
- » Envision a more resilient recovery by reducing risks and vulnerabilities

### 11.3 Step 8.3: Establish the institutional arrangements for the implementation of the sector recovery plan

#### Step 8.3.1: Describe key partnerships, coordination and management arrangements for the recovery process of the agriculture sector

The agriculture sector PDNA team needs to describe:

- » Partnership arrangements within the agricultural cluster
- » Coordination arrangements between the Government, civil society and the private sector
- » Intersectoral arrangements (with other clusters, such as food security, nutrition and employment)
- » Management arrangements within the Government for the agricultural recovery process
- » Inter-agency management arrangements (e.g. coordination unit or similar arrangements, support services to be established such as offices, human resources)

#### Step 8.3.2: Describe the cross-cutting themes

The agriculture sector PDNA team should describe how cross-cutting issues will be addressed during implementation, such as DRR, the environment, gender, human rights, HIV/AIDS and any others deemed necessary. The agriculture sector PDNA team should describe also intersectoral considerations, such as:

- » Other livelihood programmes
- » Employment schemes linked to the agriculture sector

- » Food and nutrition security
- » Food distribution and prices
- » Natural resources and the environment

#### Step 8.3.3: Link agriculture sector recovery to development

The agriculture sector PDNA team should outline the ways in which the agriculture sector recovery will link with and support the country's agricultural development goals and priorities, aligning where possible the recovery process to the broader strategic development objectives for the sector. The agriculture sector PDNA team should consider:

- » National agricultural policies, poverty reduction and food security strategies
- » National development planning instruments and frameworks
- » National objectives for meeting the Sustainable Development Goals

#### Step 8.3.4: Describe the plan for M&E of the sector's recovery plan

The agriculture sector PDNA team should outline the plan for monitoring and evaluation (M&E) in the sector. The plan should be developed by considering the following:

- » What is to be monitored and evaluated?
- » What activities is M&E necessary for?
- » Who is responsible for M&E?
- » When M&E activities are planned (timing)
- » How M&E are carried out (methods)
- » What resources are required, and where they are committed

#### Step 8.3.5: Mobilize resources

Based on the recovery needs assessment in the previous section, as well as taking into account the priority needs listed above, the national PDNA

recovery needs assessment team should calculate the recovery budget that is needed and expected to be mobilized.<sup>10</sup> In this process, the team should answer the following questions:

- » Where can recovery funds be obtained?
- » How much will be raised/collected by the local population?
- » How much can be covered by the current budget (district/regional/national) and national emergency funds?
- » What is expected from other internal sources of financing (e.g. agricultural development banks, the private sector, civil society organizations, microcredit institutions, foundations, donations)?
- » What is expected to be obtained from external financing (e.g. the World Bank, Asian Development Bank, aid from other governments)?

#### Step 8.3.6: Develop a communication strategy

The team in charge of the recovery must also broadly define the communication strategy to be implemented. This should be led by the Ministry of Agriculture communications office, with the following aspects taken into account:

- » To whom are the progress and results communicated?
- » With what means are progress and results communicated?
- » How often are they reported?
- » What are the existing institutional communication arrangements?
- » Are mechanisms available for access to information?
- » Are mechanisms available for complaints and resolving them?

#### Step 8.3.7: Identify key assumptions and constraints

The agriculture sector PDNA team should identify the key assumptions made to successfully complete the recovery of the agriculture sector and the major constraints likely to be encountered during the recovery process, including indicating how they might be overcome.

### 11.4 Step 8.4: Draft the agriculture sector PDNA report

The agriculture sector PDNA team may consider the following format:

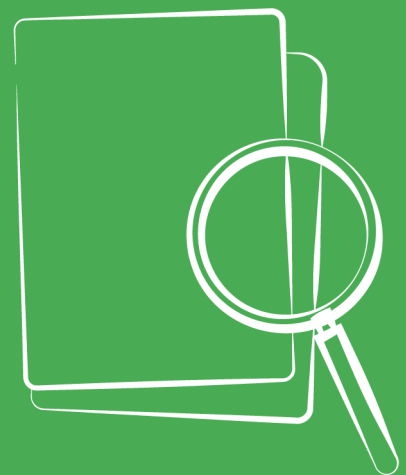
- » Brief description of the agriculture sector in disaster-affected areas
- » Damage in all subsectors by areas and types of facilities affected
- » Losses in all subsectors, emphasizing losses in income, increase in expenditures, estimated period before normalcy will be attained, etc.
- » Impact on the economy, individuals and households, and the consequences to the greater community if no assistance is provided
- » Proposed strategies for recovery and reconstruction of the agriculture sector
- » Needs of the sector by priority, and the draft schedule of implementation with the estimated funds required for each intervention over time

The draft agriculture sector PDNA report should be submitted to the national office responsible for the coordination of the PDNA (i.e. the NDMO) for integration and consolidation into the country's multisectoral PDNA report.

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10 The World Bank and the Global Facility for Disaster Reduction and Recovery have provided technical notes for the estimation of the financial requirements for these programmes (**Appendix 4**).

# 12



## STEP 9

### 12 Step 9: Develop a sector recovery plan

The agriculture sector recovery plan should be formulated following a results-based model, and therefore includes:

- » Priority needs
- » Interventions required in the short-, medium- and long-term
- » Expected outputs
- » Recovery cost in the short-, medium- and long-term
- » Intended outcomes

**Table 12.1** provides an example of how this may be done.

Table 12.1: Indicative example of a results-based recovery plan for the agriculture sector

Priority recovery needs	Interventions	Expected outputs	Recovery costs (US\$)	Intended outcome
To assist farmers affected by the disaster with the rehabilitation of farms	Supply primary production inputs, training and marketing support	Agricultural input package (tools, seeds, fertilizers, training) supplied to 290,000 farmers	\$7,650,000	To rehabilitate and develop the agriculture sector
	Multisector support for traditional small-scale irrigation	Irrigation networks were repaired to cover 15,000ha of agricultural land.		
	Agricultural technical assistance and capacity-building support	3 training centres were established, and 340 government staff were trained		
	Restore farmers' access to agricultural land	450,000m <sup>3</sup> of debris was cleared to open up agricultural areas		
	Rebuild agricultural infrastructure	8 processing and 34 storage facilities rebuilt		

To assist fishers affected by the disaster with the rehabilitation of the fisheries sector	Supply primary fisheries production inputs	Fisheries livelihood recovery package (vessels, fishing gear) supplied to 120,000 fishers	\$5,330,000	To rehabilitate and develop the fisheries and aquaculture sector
	Rehabilitate aquaculture production, such as fish and shrimp	2,450 fish and shrimp aquaculture ponds rehabilitated		
	Repair damaged fishing harbours, ports and landing facilities, markets and processing facilities	38 fishing harbours, 16 ports and 4 landing facilities repaired		
To diversify and increase livelihood options for income generation	Establish and support new community-led cooperatives providing savings	3 cooperatives were established providing savings and loan services	\$10,900,000	Cooperatives, savings schemes and income generation support are provided to enhance livelihood opportunities
	Provide access to capital to engage in income-generating activities and mobilize savings for the affected population	Mobilize savings for 1,500 households Training and inputs provided to 4,400 households to enhance income		
	Training and distribution of materials to enhance income generation	5 rural roads, 2 bridges and 1 drainage system were rehabilitated		

Source: European Commission, United Nations Development Group and World Bank (2013b).

A good example of a recent Recovery Plan is Pakistan's Resilient Recovery, Rehabilitation, and Reconstruction Framework (4RF).<sup>11</sup> In response to the 2022 floods, the 4RF is the Government of Pakistan's strategic policy and prioritization document which will guide the recovery, rehabilitation and reconstruction of the country. The 4RF follows a globally recognized approach and methodology for recovery strategy development. The 4RF draws from the findings of the PDNA, and presents sequenced priorities across sectors around four strategic recovery objectives, a policy framework, a financing strategy, and implementation and monitoring arrangements (Pakistan, Ministry of Planning Development & Special Initiatives, 2022).

The 4RF was developed through a consultative process with key stakeholders, including federal and provincial governments, civil society organizations, international development partners, and other stakeholders. It will form the basis for the Pakistan Government's comprehensive disaster recovery plans, including a detailed national and provincial recovery plan. The 4RF will further facilitate engagement with development partners for financial and implementation support. It will also support coordination of actors across the public, private, and non-profit sectors on provincial and national programs. Importantly, the 4RF is a living document that can be updated regularly as priorities and resources change. It thus forms the basis for the M&E of the recovery programme. The 4RF and the detailed national and provincial recovery plans will continuously and mutually inform each other.

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11 See <https://www.undp.org/pakistan/publications/pakistan-floods-2022-resilient-recovery-rehabilitation-and-reconstruction-framework-4rf>.

# 13



## STEP 10

### 13 Draft the agriculture sector PDNA report

The agriculture sector PDNA team may consider the following format:

- » Brief description of the agriculture sector in the disaster-affected areas
- » Damage in all subsectors by areas and types of facilities affected
- » Losses in all subsectors, emphasizing losses in income, increase in expenditures, estimated period before normalcy will be attained, etc.
- » Impact on the economy, individuals and households, and the consequences to the greater community if no assistance is provided
- » Proposed strategies for recovery and reconstruction of the agriculture sector
- » Needs of the sector by priority, and the draft schedule of implementation with the estimated funds required for each intervention over time

The draft agriculture sector PDNA report should be submitted to the national office responsible for the coordination of the PDNA (i.e. the NDMO) for integration and consolidation into the country's multisectoral PDNA report.

The draft agriculture sector PDNA report could be structured as follows:

#### 1. Executive summary (1 page)

- » Brief description of the agriculture sector and its subsectors in the areas affected by the catastrophe. Effects of the event and results of the damages, losses and costs of recovery needs, for all subsectors, analysed by geographical area (department or municipality level), highlighting the critical aspects of the recovery strategy, including the areas to prioritize, potential partners and sources of funding

#### 2. Context of the affected area (2–3 pages)

- » Importance of the agriculture sector at the national account level and the employment level
- » Background information on the different subsectors
- » Description of the different production systems (e.g. smallholders, commercial enterprises) and their importance

#### 3. Assessment of the effects of the disaster (3–5 pages)

- » General description of the catastrophe event, geographical scope, affected population, etc.
- » Effects on infrastructure and physical assets
- » Effects on the production and supply of goods and services, access to services and goods
- » Effects on governance and decision-making processes
- » Effects on risks and vulnerabilities
- » Damages in sector by zones and types of goods and facilities affected
- » Loss in the sector, with emphasis on losses in income, increase in expenditures, estimated period before normalcy will be attained
- » Impact on livelihoods, individual households, vulnerable groups and the wider community if recovery assistance is not provided
- » Proposed strategies for the recovery and reconstruction of the sector
- » Sector needs by priority, and the project execution schedule with the estimated funds needed for each project over time



**4. Total value of the effects of the disaster (1 page)**

- » Value of total/partial destruction of infrastructures and assets
- » Value of changes in the production of goods and services, and provision of and access to goods and services
- » Value of governance changes
- » Value of changes in risks

Subsectors	Damage			Loss			Total effects (F\$)
	Public	Private	Total damage (F\$)	Public	Private	Total loss (F\$)	
Crops							
Permanent tree crops							
Root crops							
Vegetables							
Pulses							
Pastures							
Livestock							
Cattle							
Sheep							
Goats							
Pigs							
Poultry							
• Broiler							
• Eggs							
Fisheries							
Marine							
Aquaculture							
Apiculture							
Forestry							

Subsectors	Damage			Loss			Total effects (F\$)
	Public	Private	Total damage (F\$)	Public	Private	Total loss (F\$)	
Irrigation							
Farm roads							
Other							
Total							

Source: European Commission, United Nations Development Group and World Bank (2013b); consultant research.

**5. Disaster impact assessment (1–2 pages)**

- » Macroeconomic impact
- » Impact on human development

**6. Cross-cutting considerations (1–2 pages)**

- » Cross-cutting issues
- » Intersectoral linkages

**7. Identified recovery needs and recovery costs (2 pages)**

- » Reconstruction of infrastructures and physical assets
- » Resumption of production and guarantee of access to goods and services
- » Recovery of governance and social processes
- » Reduction of risks and future vulnerability
- » Estimation of recovery cost
- » Prioritization of sector recovery needs and sequencing

Recovery needs	Interventions	Inputs/services/ materials required	Costs of interventions (F\$)	Expected results
Crops				
Livestock				
Fisheries and aquaculture				
Apiculture				
Forestry				
Governance				
Access to goods and services				
Risk reduction				

Source: European Commission, United Nations Development Group and World Bank (2013b); consultant research.

#### 8. Recovery strategy (3–4 pages)

- » Vision
- » Guiding principles
- » Rebuild and recovery needs, including BBB
- » Implementing provisions
- » Partnerships, coordination and management arrangements to implement the recovery
- » M&E
- » Resource mobilization mechanisms
- » Recovery challenges and key assumptions and limitations

Recovery interventions	Priority	Short-term costs (F\$)	Medium-term costs (F\$)	Long-term costs (F\$)	Total costs (F\$)
Crops • Annuals • Perennials					
Livestock					
Fisheries and aquaculture					
Apiculture					
Forestry					
Governance					
Access to goods					
Risk reduction					
<b>TOTAL</b>					

Source: European Commission, United Nations Development Group and World Bank (2013b); consultant research.

# 14



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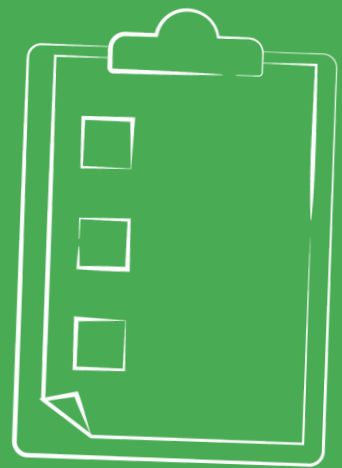
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# 15





## 15 Appendices

### Appendix 1: Glossary of terms

**Affected:** People who are affected, either directly or indirectly, by a hazardous event. Directly affected people have suffered injury, illness or other health effects, and/or have been evacuated, displaced or relocated, and/or have suffered direct damage to their livelihoods and economic, physical, social, cultural and environmental assets. Indirectly affected people have suffered consequences other than or in addition to direct effects, over time, due to disruption or changes in the economy, critical infrastructure, basic services, commerce or work, and/or other social, health and psychological consequences.

**Baseline:** Reference information related to social, economic, administrative, physical and capacity aspects related to the national context and the specific sector of analysis.

**Build back better (BBB):** A strategy aimed at reducing the risk to the people and infrastructure of nations and communities in the wake of future disasters and shocks. It is aimed at improving existing living conditions in the affected community and encouraging and facilitating the necessary adjustments to reduce disaster risk. The approach promotes recovery that is sustainable, resilient and inclusive.

**Capacity:** The combination of all the strengths, attributes and resources available within an organization, community or society to manage and reduce disaster risks and strengthen resilience. Capacity may include infrastructure, institutions, human knowledge and skills, financing, and collective attributes such as social relationships, leadership and management.

**Consultation:** A two-way exchange of information, comments, ideas and suggestions. Consultation outputs are considered as inputs for decision-making; they must be considered, but need not determine decisions.

**Context:** General situation of the social, economic and political dynamics of the affected population before the disaster.

**Cross-cutting sectors:** Gender, governance, environment, DRR, and employment, livelihoods and social protection.

**Damage:** Damage occurs during and immediately after the disaster, and is measured in physical units (i.e. square metres of land lost, kilometres of irrigation pipework or farm roads, etc.). The effects are analysed in **four dimensions:**

- » damage to infrastructure and physical assets;
- » interruption, and lack of access to goods and services;
- » effects on administrative processes or governance and decision-making; and
- » increased vulnerability and risks.

Its monetary value is expressed in terms of the cost of repairing or replacing the infrastructure and physical assets that have been partially or totally affected in each sector, according to prices prevailing just before the event. The value of damage is used as the basis for estimating reconstruction needs.

**Disaster:** A serious disruption of the functioning of a community or a society on any scale, due to hazardous events interacting with conditions of exposure, vulnerability and capacity, leading to one or more human, material, economic and environmental losses and impacts. The effect of the disaster can be immediate and localized, but is often widespread and could last for a long period of time. The effect may test or exceed the capacity of a community or society to cope using its own resources, and therefore may require assistance from external sources, which could include neighbouring jurisdictions or those at national or international levels.

**Disaster damage:** Damage occurs during and immediately after the disaster. This is usually measured in physical units (e.g. square metres of housing, kilometres of roads) and describes the total

or partial destruction of physical assets, the disruption of basic services, and damage to sources of livelihood in the affected area.

**Disaster impact:** The total effect, including negative effects (e.g. economic losses) and positive effects (e.g. economic gains), of a hazardous event or disaster. The term includes economic, human and environmental impacts, and may include death, injuries, disease, and other negative effects on human physical, mental and social well-being.

**Disaster management:** The organization, planning and application of measures preparing for, responding to and recovering from disasters.

**Disaster risk:** The potential loss of life, injury, or destroyed or damaged assets which could occur to a system, society or community in a specific period, determined probabilistically as a function of hazard, exposure, vulnerability and capacity.

**Disaster risk management:** The application of DRR policies and strategies to prevent new disaster risks, reduce existing disaster risks, and manage residual risk, contributing to the strengthening of resilience and the reduction of disaster damage and loss.

**Displaced persons:** Persons who, for varied reasons or circumstances, have been compelled to leave their homes.

**Early recovery:** Recovery that begins early in a humanitarian setting. Early recovery is not intended as a separate phase within the relief-development continuum, but rather as an effort to strengthen the effectiveness of the linkage. Early recovery encompasses livelihoods, shelter, governance, environment and social dimensions, including the reintegration of displaced populations.

**Effects:** Refers to the immediate/direct results of the event to be evaluated. They are classified in damage and loss of each one of the sectors.

**Event:** Natural or human event that generates the effects.

**Exposure:** The situation of people, infrastructure, housing, production capacities and other tangible human assets located in hazard-prone areas.

**Hazard:** A process, phenomenon or human activity that may cause loss of life, injury, or other health impacts, as well as property damage, social or economic disruption, or environmental degradation.

**Human impact:** This measures several indicators referring to personal and family life, taking the following main parameters into consideration: living conditions, employment and livelihoods, food and nutrition security, gender equity, and social inclusion and protection.

**Infrastructure:** The fundamental organizational and physical structure required to run a successful organization, community or country. Communication, transportation, sewage, water, education, health and monetary systems are all examples of basic infrastructure in an organization or a country.

**Infrastructure sectors:** Water and sanitation, community infrastructure, electricity, transport, and telecommunications.

**Loss:** Changes in economic flows arising from or generated by the disaster (lost income, higher operating cost, and unexpected additional expenses). They occur until full economic recovery and reconstruction are achieved, in some cases lasting for several years. Typical losses include the decline in output in productive sectors (agriculture, commerce, industry/manufacturing, and tourism) and lower revenues and higher operational cost in the provision of services (education, health, water and sanitation, electricity, transport, and communications). Also considered losses are the unexpected expenditures to meet humanitarian needs during the post-disaster emergency phase. Losses are expressed in current values.

**Macroeconomic impact:** Alterations in economic flows that have effects on macroeconomic variables, including GDP and public finances, the latter incorporating tax revenues and expenditures, the balance of payments, and inflation.

**Mitigation:** The lessening or minimizing of the adverse impacts of a hazardous event.

**Participation:** A process by which stakeholders are active and equal partners in decision-making and may have shared ownership and control over project/programme design and implementation (and eventual evaluation).

**Physical asset:** An item of economic, commercial or exchange value that has a material existence. Physical assets are also known as tangible assets.

**Preparedness:** The knowledge and capacities developed by governments, response and recovery organizations, communities, and individuals to effectively anticipate, respond to and recover from the impacts of likely, imminent or current disasters. Preparedness action is carried out within the context of disaster risk management, and aims to build the capacities needed to efficiently manage all types of emergencies and achieve orderly transitions from response to sustained recovery.

**Prevention:** Activities and measures to avoid existing and new disaster risks.

**Productive sectors:** Agriculture, commerce, industry and tourism.

**Protected area:** A portion of land protected by special restrictions and laws for the conservation of the natural environment. Large tracts of land are set aside for the protection of wildlife and habitats; areas of great natural beauty or unique interest; areas containing rare forms of plant and animal life; areas representing unusual geologic formations; places of historic and prehistoric interest; areas containing ecosystems of special importance for scientific investigation and study; and areas that safeguard the needs of the biosphere.

**Recovery:** The post-disaster process, including the decisions and actions taken after a disaster, in order to restore and improve existing living conditions in the affected community, while encouraging and facilitating the necessary adjustments to reduce disaster risk and build resilience.

**Rehabilitation:** The full, or at least partial, restoration of degraded landscapes and/or impaired ecosystem services to their state prior to, for example, the site being occupied as a site for transitional shelter for displaced people.

**Resilience:** The ability of a system, community or society exposed to hazards to resist, absorb, accommodate, adapt to, transform and recover in a timely and efficient manner, including through the preservation and restoration of essential basic structures and functions through risk management.

**Sectors:** The categories into which human and economic activity within a society or country can be grouped. These categories are usually defined within what is known as national accounts systems.

**Vulnerability:** The extent to which a community, structure, service or geographic area is likely to be damaged or disrupted by the impact of a particular hazard.

## Appendix 2: Information relevant to Chapter 3

### Baseline information no. BD1: Annual crops, permanent crops, livestock, fisheries, apiculture and forestry

Table A31: Baseline data on permanent/tree crops, root crops, vegetables, livestock, poultry, fisheries, apiculture and forestry

Subsector	Number of farmers			Area under production (ha) or no.)	Expected yield/ha (kg)	Production cost per kg (F\$)	Farm gate price (F\$/kg)
	Male	Female	Total				
1. Crops							
1.1. Permanent/tree crops							
• Avocado							
• Banana							
• Breadfruit							
• Citrus							
• Cocoa							
• Coconut							
• Coffee							
• Drumstick							
• Duruka							
• Kura							
• Mango							
• Mint							
• Passion fruit							
• Papaya							
• Pineapple							
• Plantain							
• Soursop							
• Sugar cane							
• Other							

Subsector	Number of farmers			Area under production (ha) or no.)	Expected yield/ha (kg)	Production cost per kg (F\$)	Farm gate price (F\$/kg)
	Male	Female	Total				
1.2. Root crops							
• Cassava							
• Dalo							
• Dalo-ni-tana							
• Ginger							
• Kawa							
• Kumula							
• Potato							
• Turmeric							
• Yam							
• Yagona							
• Other							
1.3. Vegetables							
• Bele							
• Capsicum							
• Carrot							
• Cauliflower							
• Celery							
• Chili							
• Chinese cabbage							
• Coriander							
• Curry leaves							
• Cucumber							
• Eggplant							
• English cabbage							
• French beans							

Subsector	Number of farmers			Area under production (ha) or no.)	Expected yield/ha (kg)	Production cost per kg (F\$)	Farm gate price (F\$/kg)
	Male	Female	Total				
• Garlic							
• Gourd							
• Lettuce							
• Long bean							
• Okra							
• Onion							
• Parsley							
• Pumpkin							
• Radish							
• Rock melon							
• Spring onion							
• Tomatoes							
• Watercress							
• Watermelon							
• Winged bean							
• Zucchini							
<b>1.4. Pulses</b>							
• Cowpea							
• Lablab bean							
• Mung							
• Peanuts							
• Pigeon peas							
• Urd							
• Vanilla							
<b>1.5. Other vegetables</b>							

Subsector	Number of farmers			Area under production (ha) or no.)	Expected yield/ha (kg)	Production cost per kg (F\$)	Farm gate price (F\$/kg)
	Male	Female	Total				
1.6. Cereals							
• Maize							
• Rice							
• Sorghum							
2. Livestock (no.)							
2.1 Cattle							
• Beef							
• Dairy							
2.2 Poultry							
• Broilers							
• Layers							
2.3 Sheep							
2.4 Goats							
2.5 Pigs							
2.6 Other							
3. Fisheries							
3.1 Marine fisheries							
• Marine							
• Prawns							
3.2 Inland fisheries							
• Eels							
• Mussels							
• Pearl oysters							
• Prawns/shrimps							
• Tilapia							
• Other							

Subsector	Number of farmers			Area under production (ha) or no.)	Expected yield/ha (kg)	Production cost per kg (F\$)	Farm gate price (F\$/kg)
	Male	Female	Total				
4. Other Products							
• Bees/honey							
• Other							
5. Forestry							
• Standing plantation, mainly pine and mahogany							
• Natural/native forest							
• Mangroves							
• Forest access roads							

Source: European Commission, United Nations Development Group and World Bank (2013b); consultant research.

**Notes for completing Table A3.1:**

- » Estimated average yield per hectare per year should be based on past established data sets.
- » Farm gate prices should be those prior to or at the time of the disaster.



### Baseline information no. BD2: Annual crops, permanent crops, livestock, fisheries, apiculture and forestry and their seasons

Table A3.2: Permanent/tree crops, root crops, vegetables, livestock, poultry, fisheries, apiculture and their seasons

Subsector	Estimated production for next year						Planting to harvesting seasons												
	Year 1	Year 2	Year 3	Year 4	Year 5	Year - N	J	F	M	A	M	J	J	A	S	O	N	D	
1. Crops																			
1.1. Permanent/ tree crops																			
• Avocado																			
• Banana																			
• Breadfruit																			
• Citrus																			
• Cocoa																			
• Coconut																			
• Coffee																			
• Drumstick																			
• Duruka																			
• Kura																			
• Mango																			
• Mint																			
• Passion fruit																			
• Papaya																			
• Pineapple																			
• Plantain																			
• Soursop																			
• Sugar cane																			
• Other																			

Subsector	Estimated production for next year						Planting to harvesting seasons												
	Year 1	Year 2	Year 3	Year 4	Year 5	Year - N	J	F	M	A	M	J	J	A	S	O	N	D	
1.2. Root crops																			
• Cassava																			
• Dalo																			
• Dalo-ni-tana																			
• Ginger																			
• Kawa																			
• Kumula																			
• Potato																			
• Turmeric																			
• Yam																			
• Yagona																			
• Other																			
• 1.3. Vegetables																			
• Bele																			
• Capsicum																			
• Carrot																			
• Cauliflower																			
• Celery																			
• Chili																			
• Chinese cabbage																			
• Coriander																			
• Curry leaves																			
• Cucumber																			
• Eggplant																			

Subsector	Estimated production for next year						Planting to harvesting seasons											
	Year 1	Year 2	Year 3	Year 4	Year 5	Year - N	J	F	M	A	M	J	J	A	S	O	N	D
• English cabbage																		
• French beans																		
• Garlic																		
• Gourd																		
• Lettuce																		
• Long bean																		
• Okra																		
• Onion																		
• Parsleys																		
• Pumpkin																		
• Radish																		
• Rock melon																		
• Spring onion																		
• Tomatoes																		
• Watercress																		
• Watermelon																		
• Winged bean																		
• Zucchini																		
• 1.4. Pulses																		
• Cowpea																		
• Lablab bean																		
• Mung																		
• Peanuts																		
• Pigeon peas																		

Subsector	Estimated production for next year						Planting to harvesting seasons												
	Year 1	Year 2	Year 3	Year 4	Year 5	Year - N	J	F	M	A	M	J	J	A	S	O	N	D	
• Urd																			
• Vanilla																			
• 1.5. Other vegetables																			
• 1.6. Cereals																			
• Maize																			
• Rice																			
• Sorghum																			
2. Livestock (no.)																			
• 2.1 Cattle																			
• Beef																			
• Dairy																			
2.2 Poultry																			
• Broilers																			
• Layers																			
2.3 Sheep																			
2.4 Goats																			
2.5 Pigs																			
2.6 Other animals																			
3. Fisheries																			
3.1 Marine fisheries																			
• Marine																			
• Prawns																			
3.2 Inland fisheries																			

Subsector	Estimated production for next year						Planting to harvesting seasons												
	Year 1	Year 2	Year 3	Year 4	Year 5	Year - N	J	F	M	A	M	J	J	A	S	O	N	D	
• Eels																			
• Mussels																			
• Pearl oysters																			
• Prawns/shrimps																			
• Tilapia																			
• Other																			
<b>4. Other products</b>																			
• Bees/honey																			
• Other																			
<b>5. Forestry</b>																			
• Standing plantation, mainly pine and mahogany																			
• Natural/native forest																			
• Mangroves																			
• Forest access roads																			

Source: European Commission, United Nations Development Group and World Bank (2013b); consultant research.

#### Notes for completing Table A3.2:

- » Disasters will only affect the existing types of annual crops, permanent crops and other agricultural activities at the time that the events occur. By knowing the month of the occurrence of a disaster, it will be easier to identify the existing crops that can be affected.
- » The information required in Table A3.2 is normally generated at the extension district and/or regional administrative levels, and submitted to the central office of the MALF. It is then forwarded to the national office responsible for the coordination of the PDNA (i.e. the NDMO).
- » Tick the appropriate boxes under the month for the harvest of specific crops and permanent crops, and other activities. This will indicate how many months in a year that a certain crop's agricultural outputs are harvested.
- » The above information may not drastically vary or change over a year, since the agricultural activities within the extension districts and/or regional administrative offices generally remain the same.

**Baseline information no. BD3: Agricultural assets**

The information on equipment and machinery used in the agriculture sector can assist in the conduct of the assessment and the development of the recovery strategy of the sector, should a disaster occur.

Table A3.3: Baseline information on agricultural assets

Assets	Quantity	Average replacement value (F\$)	Ownership		Number of private owners		
			Public	Private	Male	Female	Total
<b>Physical assets</b>							
• Agricultural land							
• Storage buildings							
• Animal houses							
• Fencing							
• Other							
<b>Equipment and machinery</b>							
• Tractor							
• Hand tractor							
• Thresher							
• Weeder							
• Plough							
• Other							
<b>Other equipment for:</b>							
• Milk production							
• Meat production							
• Broiler production							
• Egg production							
• Food processing							
• Poultry hatcheries							
• Honey production							
• Other							

Assets	Quantity	Average replacement value (F\$)	Ownership		Number of private owners		
			Public	Private	Male	Female	Total
<b>Plantations</b>							
• Fruit trees							
• Pasture							
• Other							
<b>Forestry</b>							
• Standing timber plantation							
• Natural forest							
• Forest access roads							
<b>Stock and raw materials</b>							
• Rice							
• Corn							
• Other crop outputs							
• Seeds							
• Fertilizer							
• Pesticides							
• Herbicides							
• Veterinary supplies							
• Other							
<b>Fisheries</b>							
• Boats							
• Engines							
• Nets							
• Traps and cages							
• Gears							

Assets	Quantity	Average replacement value (F\$)	Ownership		Number of private owners		
			Public	Private	Male	Female	Total
• Ponds							
• Hatcheries							
• Other							

Source: European Commission, United Nations Development Group and World Bank (2013b); consultant research.

**Notes for completing Table A3.3:**

- » The first column of the table includes the type of crops, livestock, fisheries, apiculture and forestry assets in the disaster-affected areas.
- » The average replacement value refers to the average pre-disaster market price (F\$) of the concerned asset.

**Baseline information no. BD4: Irrigation assets**

Irrigation is one of the major components in the agriculture sector that is vital for the sector’s performance which must be accounted for before a disaster to facilitate a post-disaster assessment in the future. The quantity, total construction cost and cost per unit should be included in **Table A3.4**.

Table A3.4: Baseline information on irrigation facilities

Name of irrigation facility/ location	Areas irrigated (ha)	Length (metres)	Cost per metre (F\$)	Monthly income from fees (F\$)	Ownership		Number of beneficiaries (farmers)
					Public	Private	
1							
2							
3							
4							
5							
.							
.							
N							

Source: European Commission, United Nations Development Group and World Bank (2013b); consultant research.



**Baseline information no. BD5: Drainage assets**

Drainage is also an important component in the agriculture sector that is vital for the sector's performance, which must be accounted for before a disaster to facilitate a post-disaster assessment in the future. The quantity, total construction cost and cost per unit should be included in **Table A3.5**.

Table A3.5: Baseline information on drainage systems

Name of irrigation facility/location	Areas drained (ha)	Length (metres)	Cost per metre (F\$)	Monthly income from fees (F\$)	Ownership		Number of beneficiaries (farmers)
					Public	Private	
1							
2							
3							
4							
5							
.							
.							
N							

Source: European Commission, United Nations Development Group and World Bank (2013b); consultant research.

**Baseline information no. BD6: Farm road assets**

Table A3.6: Baseline information on farm roads

Name of farm road/location	Areas covered (ha)	Grade	Length (metres)	Cost per metre (F\$)	Monthly income from fees (F\$)	Ownership		Number of beneficiaries (farmers)
						Public	Private	
1								
2								
3								
4								
5								
.								
.								
N								

Source: European Commission, United Nations Development Group and World Bank (2013b); consultant research.

## Appendix 3: Information relevant to Chapter 4

Table A4: Fiji agricultural calendar for selected crops<sup>12</sup>

Crops	January	February	March	April	May	June	July	August	September	October	November	December
<b>1.1 Tree/perennial crops</b>												
• Banana												
• Breadfruit												
• Cocoa												
• Coconut												
• Duruka												
• Lime												
• Mandarin												
• Papaya												
• Pineapple												
• Sugar cane												
• Vudi												
• Yaqona												
<b>1.2 Root crops</b>												
• Cassava												
• Dalo												

<sup>12</sup> Table developed based on Fiji, Ministry of Agriculture (2016b).

Crops	January	February	March	April	May	June	July	August	September	October	November	December
• Dalo-ni-tana	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue
• Ginger	Blue	Blue							Orange			
	Blue	Blue								Blue	Blue	Blue
			Green	Green	Green	Green	Green					
• Sweet potatoes	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue
• Yams						Orange	Orange	Orange	Orange			
	Blue									Blue	Blue	Blue
		Green	Green	Green	Green							

**1.3 Cereals**

• Maize											Orange	Orange
	Blue											Blue
	Green	Green										
• Rice											Orange	
	Blue	Blue										Blue
			Green									

**1.4 Fruits and vegetables**

• Bele/slippy cabbage	Orange											
		Blue	Blue									
				Green								
• Cabbage				Orange	Orange	Orange						
					Blue	Blue	Blue					
						Green	Green	Green				

Crops	January	February	March	April	May	June	July	August	September	October	November	December
• Carela												
• Chili												
• Cucumber												
• Eggplant												
• Moca												
• Okra												
• Pumpkin												

Crops	January	February	March	April	May	June	July	August	September	October	November	December
• Spring onion						Red						
							Purple	Purple	Purple			
										Green		
• Watermelon				Red	Red	Red	Red	Red	Red			
							Purple	Purple	Purple	Purple	Purple	
							Green	Green	Green	Green	Green	Green

**1.5 Pulses**

Cowpeas	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue
French beans				Red	Red	Red	Red	Red	Red			
					Purple	Purple	Purple	Purple	Purple	Purple		
						Green	Green	Green	Green	Green	Green	
Long beans									Red			
										Purple	Purple	
												Blue
Peanuts		Red	Red	Red	Red	Red	Red	Red	Red	Red		
					Purple	Purple	Purple	Purple				
	Green	Green				Green	Green	Green	Green	Green	Green	Green
Pigeon peas		Red	Red	Red	Red	Red						
			Purple	Purple	Purple	Purple	Purple					
					Green	Green	Green	Green				

Source: Developed from Fiji, Ministry of Agriculture (2016b) and [https://1drv.ms/x/s!AIG70HyP3mOjgTMfwaS\\_16Wh-IH6?e=viO3SC](https://1drv.ms/x/s!AIG70HyP3mOjgTMfwaS_16Wh-IH6?e=viO3SC).

Colour	Production phase
Red	Sowing
Purple	Growing
Green	Harvesting
Blue	All year round

## Appendix 4: Information relevant to Chapter 11

According to the guidance note of the World Bank (2010), the estimation of the financial requirements for these programmes can be made using the following formula:<sup>13</sup>

**Agriculture sector reconstruction needs =  $A \times$  agriculture sector infrastructure damage value**

Where  $A$  is a disaster-resilience coefficient, whose value may range from 1.10 to 1.30, depending on the improved degree of construction standards required in the affected country for this type of structure, which should be defined in the reconstruction strategy adopted after the disaster. Civil, irrigation or agricultural engineers familiar with disaster-resilient construction standards would be able to define the coefficients.

For livestock, the following two formulas can be used for such estimation:

**Livestock replacement needs =  $L \times$  value of animal stock**

Where  $L$  is a coefficient for the introduction of disaster-resilient animal varieties, whose value may range from 1.10 to 1.30. The actual value of the coefficient that should be adopted would depend on the degree of resilience to be achieved, in comparison to the existing animal stock. An experienced veterinarian would be required for the definition of this coefficient.

**Livestock infrastructure reconstruction needs =  $Li \times$  value of livestock infrastructure**

Where  $Li$  is a disaster-resilience coefficient, whose value may range from 1.10 to 1.30, depending on the improved degree of construction standards required in the affected country for this type of structure, which should be defined in the reconstruction strategy adopted after the disaster. Civil or agricultural engineers familiar with disaster-resilient construction standards would be able to define the coefficients.

For fisheries, the following formulas may be used for the estimation of financial requirements for reconstruction in this sector:

**Equipment replacement needs =  $F \times$  damage to fishing equipment**

Where  $F$  is a disaster-resilient coefficient whose value may range from 1.10 to 1.35, depending on the desired degree of improvement and disaster resiliency that is defined in the reconstruction strategy. Fishery experts with long-standing experience in the sector would be able to define the adopted value of this coefficient.

**Reconstruction needs =  $Fi \times$  damage to fishery infrastructure**

Where  $Fi$  is the fishery and aquaculture infrastructure disaster-resilience coefficient, whose value may range from 1.10 to 1.40, depending on the desired degree of disaster resiliency to be achieved, as defined in the BBB reconstruction strategy. Civil engineers and fishery/aquaculture experts with long-standing experience in their sector should define the values to be adopted.

13 Damage, Loss, and Needs Assessment Guidance Notes: Volume 3. Estimation of Post-Disaster Needs for Recovery and Reconstruction (worldbank.org)

