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NOTES ON AN INFORMATION SYSTEM ON DAMAGE AND LOSSES FROM DISASTERS ON CROPS, LIVESTOCK, FISHERIES AND FORESTRY

A STRATEGIC PROGRAMME 5 – RESILIENCE INITIATIVE

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A Strategic Programme 5 – Resilience initiative

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Notes on an information system on damage and losses from disasters on crops, livestock, fisheries and forestry

A Strategic Programme 5 – Resilience initiative

1) Justification and starting points

Between 1980 and 2014, natural hazard-induced disasters caused USD 2.6 trillion in damages worldwide, affecting 6.4 billion people[1]. Furthermore, the frequency of weather and climate related disasters has increased significantly since the 1980s[2]. Such figures and trends are particularly worrying for the agriculture sector, which is highly dependent on weather and climatic patterns, and greatly suffers from the consequences of disasters.

In spite of the high impact of disasters on agriculture (including crops, livestock, forestry and fisheries), this effect is cannot be measured and monitored at national, regional or global levels because it is not systematically recorded or reported by governments, nor collected within existing global databases on disaster losses. Global statistics on the economic impact of disasters are collected and reported as a total sum for all sectors, and often do not accurately capture the impact on individual sectors. More specifically, the impact on agriculture is not always recorded and often remains unreported at national, and also global, level[3]. As a result, there is no clear understanding of the extent to which natural hazards and disasters impact the agriculture sector and sub-sectors in developing countries. Yet, sector-specific quantitative data on disaster losses are necessary to understand the breadth and scope of disaster impact on agriculture and livelihoods so as to design adequate responses. Better information on damage and losses from disasters can also be used to assess the benefits of increased investment in prevention, adaptation to and mitigation of risks.

In order to fill the knowledge and data gaps on disasters impact on agriculture, FAO will launch an initiative for the development of an information system on damage and losses caused by disasters on the sector and its subsectors (crops, livestock, fisheries and forestry). As part of its commitment to enhancing the resilience of agriculture and rural livelihoods, FAO will support member countries to collect and report relevant data on the immediate physical damage caused

[1] Data from the International Disaster Database – Centre for Research on the Epidemiology of Disasters (EM-DAT CRED). Total damage is likely to be an underestimate, as only 36 percent of disasters reported in EM-DAT CRED include an estimation of damage.

[2] Based on data from EM-DAT CRED, the average annual number of climate-related disasters more than doubled in the decade 2003-2013 with respect to the 1980s.

[3] The Damage and Loss Assessment (DaLA) methodology (GFDRR, 2010) and the Post Disaster Needs Assessment (PDNA) Guide (EC, World Bank and United Nations, 2013) proposed the assessment of impact in different economic sectors, including agriculture. However, detailed information on the sector is in fact seldom available.

by disasters on agricultural assets, as well as on the cascading negative effects of disasters on agricultural production, and value chains.

Starting points of this initiative are the FAO study on "The impact of natural hazards and disasters on agriculture, food security and nutrition" (FAO, 2015) and the Rapid Agricultural Disaster Assessment Routine - RADAR (FAO, 2008).

In particular, FAO (2015) study presents the following analyses and findings:

- Trends on damage and losses caused by medium to large–scale disasters on crops, livestock, fisheries and forestry from 78 disasters occurred in 48 developing countries in Africa, Asia and Latin America over the past decade (2003-2013), based on information obtained from post-disaster needs assessments (PDNAs). According to this analysis, agriculture absorbed 22 percent of total damage and losses caused by natural hazard-induced disasters between 2003 and 2013, a figure much higher than previously reported[4].
- Crop and livestock production reductions associated with medium-to-large scale disasters that took place between 2003 and 2013 in 67 developing countries in Sub-Saharan Africa, Asia, Latin America and Caribbean (LAC), and the Near East. These are calculated for a selected number of agricultural commodities, as decreases in yields and production quantities after the occurrence of natural hazards, compared to linear trend values. According to this analysis, crop and livestock production losses averaged more than USD 7 billion per year between 2003 and 2013.
- Changes in trade flows associated with 116 disasters affecting 59 countries. Increases in imports are calculated as increases in the monetary value of imports in the year of disaster and following year, compared to the linear trend; decreases in exports are calculated as decreases in the monetary value of exports in the year of disaster and following year, compared to the linear trend. The analysis revealed that significant changes in agricultural trade flows occurred after medium- and large-scale disasters in developing countries. In particular, a positive correlation was found between disasters and increases in agricultural imports, as well as decreases in agricultural exports.
- A presentation of how disasters impact agricultural value chains, manufacturing and industrial output, trade flows, the balance of payment, the sectoral GDP growth, national GDP.
- An in-depth analysis of drought in Sub-Saharan Africa, based on trends since 1980 in the geo-spatial and temporal distribution of droughts across the sub-regions; this part includes details on crop and livestock production reductions associated with drought, as well as changes in trade flows, agriculture GDP growth and national GDP, as well as food security and nutrition. The study found that sub-Saharan African countries suffered significant crop and livestock production losses after droughts, with the highest losses experienced in eastern Africa.

[4] In the 2013 Global Assessment Report, the monetary value of disaster impact was calculated based on physical impact indicators reported into 45 national disaster loss databases. Physical impact indicators included: houses damaged and destroyed; hospitals damaged; education centers damaged; damages in roads; crop hectares damaged; and livestock units lost. According to the estimated figures, agriculture (crops and livestock) absorbed about 13 percent of the total monetary value of disaster impact. See: UNISDR. 2013. *Global Assessment Report on Disaster Risk Reduction*.

The study was largely based on available secondary data. In the longer term, the FAO initiative aims at taking a broader perspective, to include primary data and improve the amount and quality of the information available and the methodology. For this purpose, a key methodological starting point is RADAR, a framework developed by FAO for data collection and analysis of disaster impact on agriculture (FAO, 2008).

The RADAR is an operational framework proposed by the Environment, Climate Change and Bioenergy Division (NRC) to analyze the interaction of the components of agricultural outputs with an extreme physical event. RADAR integrates physical models, knowledge-bases, databases and GIS technology in order to assess the short- and long-term impact of disasters on agriculture. RADAR is a first attempt of combining empirical and model analysis in order to analyze the interactions between a given natural hazard and the agricultural environment in a defined geographical area. The historical data on disasters impact should feed the calibration of a set of "transfer functions" that link the magnitude of the hazard with its intensity, and the intensity with the monetary impact on agriculture. RADAR was successfully tested to assess the impact of Hurricane Mitch on the Honduran agricultural production system, and more recently resumed and applied to Typhoon Haiyan in the Philippine, on crop production, livestock, forestry and fisheries. The aim of this new application is to tackle some of the methodological issues raised in Section 4 and Annex 1 of this paper.

The RADAR approach can be further expanded, to host a statistically robust procedure for assessing the causal relationships between disasters and their impact on agriculture. This paper describes how to achieve this goal, using also the experience gained with FAO (2015) study.

2) Scope of the FAO initiative

The *geographic coverage* of the initiative is global: it should not be limited to developing countries; rather the focus should be global, and the experience of countries that successfully coped with disasters should be analysed in view of replicating it in other countries. The initiative will initially rely on six pilot countries. As discussed below, countries will be classified for the frequency of disasters, and the pilot countries will be selected among those with higher frequency, ensuring also the representation of all sub-sectors -- crops, livestock, forestry and fisheries. Pilot data collection can be implemented, for use within the RADAR framework, for the definition of damage and losses in agriculture, fisheries and forestry.

The initiative aims at obtaining specific, standardized and comparable data and metadata for monitoring damage and losses suffered by agriculture and their consequences in terms of food security conditions. Focus should be on the multiple threats that can impact the sector. The goal is gaining a more complete and comprehensive understanding of, and response to disasters and crises in agriculture.

This information system is meant to provide policy-makers, and stakeholders at large, with a sound information base for decisions making. Ideally, the information should allow implementing *ex-ante* cost-benefit analysis of prevention as well as *post-disaster* resource allocation. Importantly, the analysis of data on historical events, combined with information

from early warning systems (e.g. GIEWS, EMPRES, IPC tool) could improve anticipation of disaster impact, and support actions to be taken before, during and in the immediate aftermath of an event.

In terms of scope, the initial focus of the initiative is going to be on disasters triggered by natural hazards, following the approach of the FAO (2015) study. The scope however will be gradually widened to include more types of hazards and shocks, taking advantage of the flexibility of RADAR's framework. Through time, the initiative should include:

a) Natural hazard-induced disasters (e.g., geophysical and climate-related disasters - droughts, floods, fires, landslides, volcanic eruptions, tsunamis, earthquakes, storms, extreme temperatures, hailstorms, etc.). Among these, particular attention should be devoted to silent, neglected disasters, intensely affecting a limited number of people. Note that such a degree of precision entails the need to improve data calibration within the RADAR framework.
b) Food chain emergencies of transboundary or technological threats (e.g., transboundary plant, forest, animal, aquatic and zoonotic pests and diseases, food safety events, radiological and nuclear emergencies, dam failures, industrial pollution, oil spills).
c) Man-made disasters, such as conflicts and civil unrest[5].

In fact the difference between natural hazard and human-induced disasters is not clear-cut. Disasters triggered by natural hazards bear variable consequences depending upon human behaviour and human environment in which they occur. Typically, damage and losses from droughts and floods can vary considerably depending on the level of investment in mitigation and adaptation in the affected regions (Vogel et al., 2007; Shreve and Kelman, 2014). All disasters impact, therefore, are dependent on the socio-political framework to some extent[6].

3) Expected outputs

The initiative will deliver two main products.

- First, **a periodic report** will be produced – possibly bi-annual – taking stock of the main disastrous events that affected agriculture around the world, with a special emphasis on poor regions and fragile economic and social environments. Initially this will be based mostly on secondary data, and be conceived as a follow-up and a refinement of the FAO