THE COST OF DISASTERS TO AGRICULTURE

A methodology to assess direct damage and loss in crops, livestock, fisheries, aquaculture and forestry
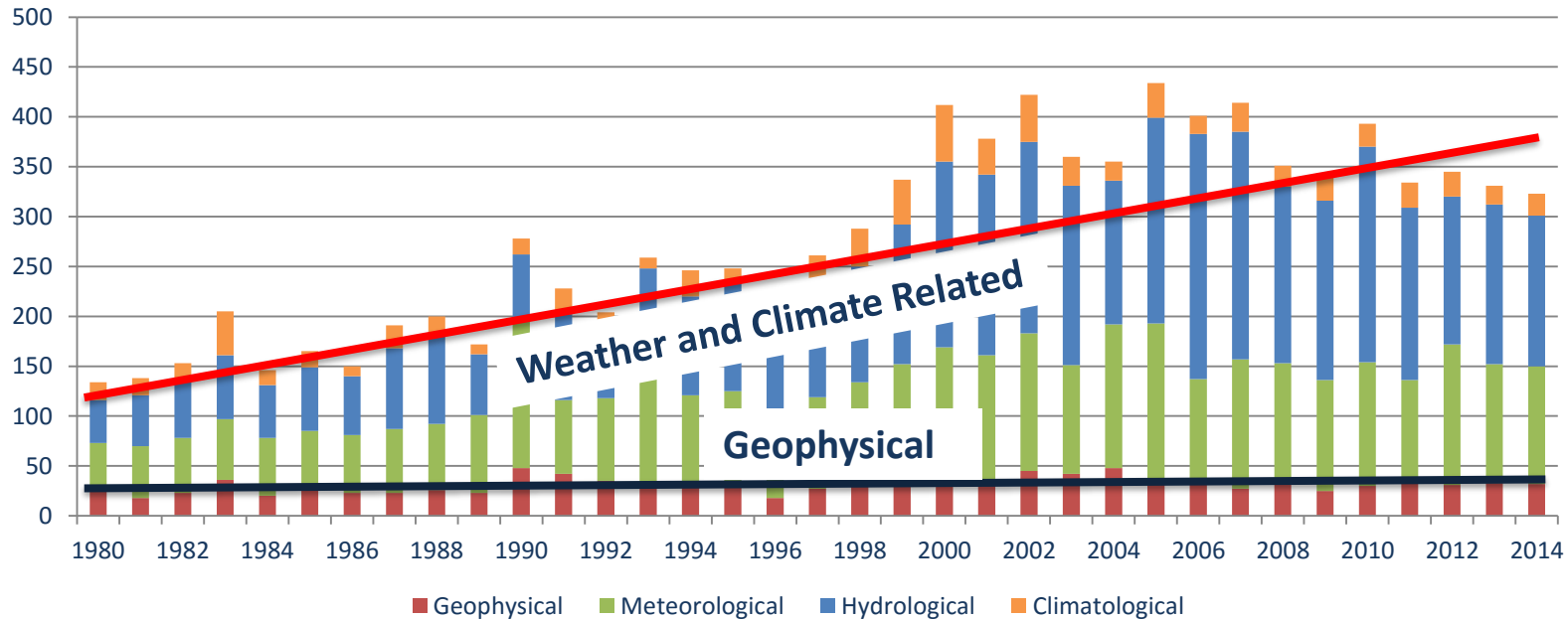
Mira Markova
FAO Statistics Division

Increasing disasters, increasing impacts

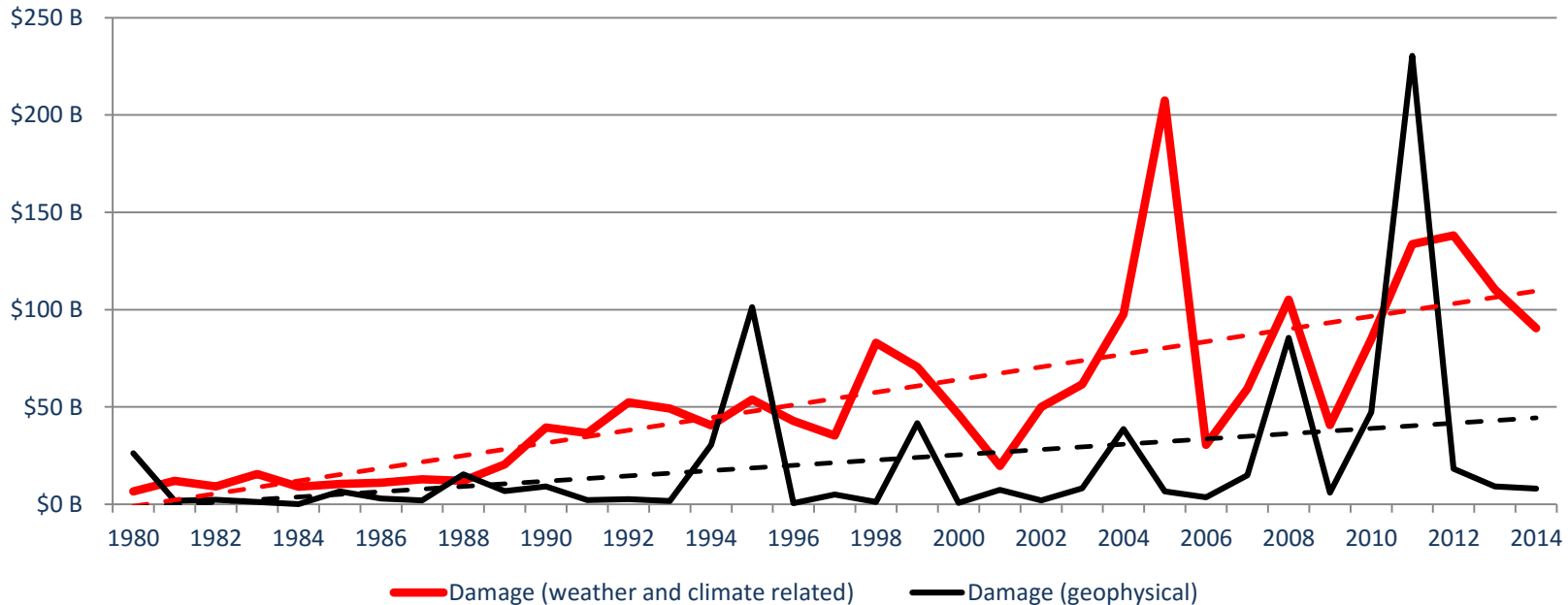Number of disasters triggered by natural hazards worldwide, 1980 - 2014

Weather and Climate Related

Geophysical

Legend: Geophysical, Meteorological, Hydrological, Climatological

Source: FAO (2015), based on EM-DAT CRED

Increasing disasters, increasing impacts

Economic damage of disasters triggered by natural hazards worldwide, 1980 - 2014

Source: FAO (2015), based on EM-DAT CRED

BACKGROUND

Increasing disasters, increasing impacts

- Analysis of 140 medium- and large-scale disasters in 67 countries

  - **USD 80 billion lost as a result of declines in crops and livestock after disasters in developing countries (b/n 2003-13)**

  - Total crop and livestock losses after droughts, between 1991 and 2013, cost more than USD 30 billion

- Review of 78 PDNAs of disaster events in 48 countries b/n 2003-2013

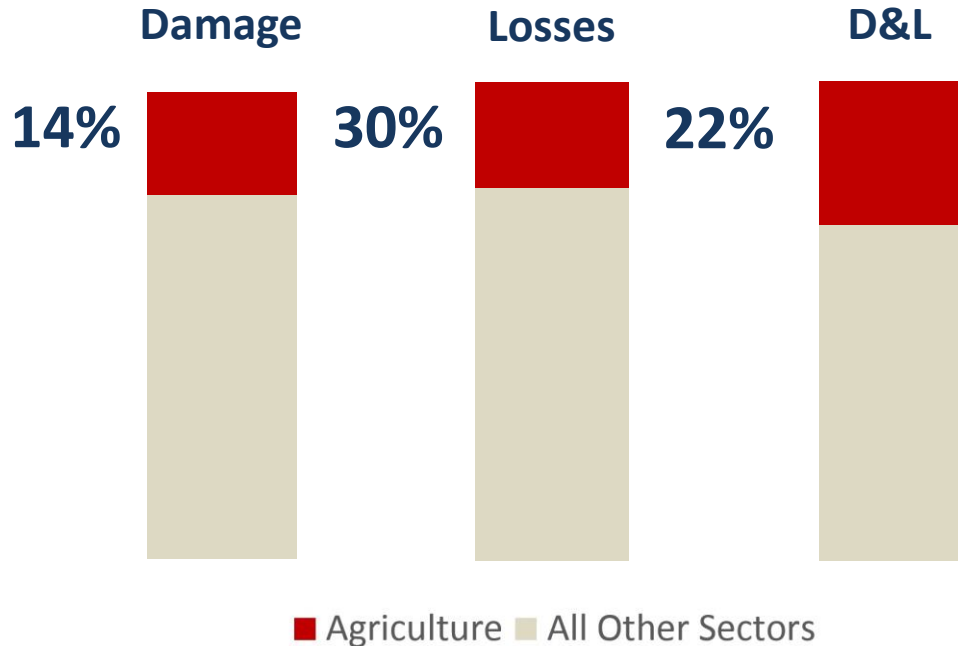 - **22% of disaster damage and loss absorbed by the agriculture sector**

Food and Agriculture Organization of the United Nations

The impact of disasters on agriculture and food security
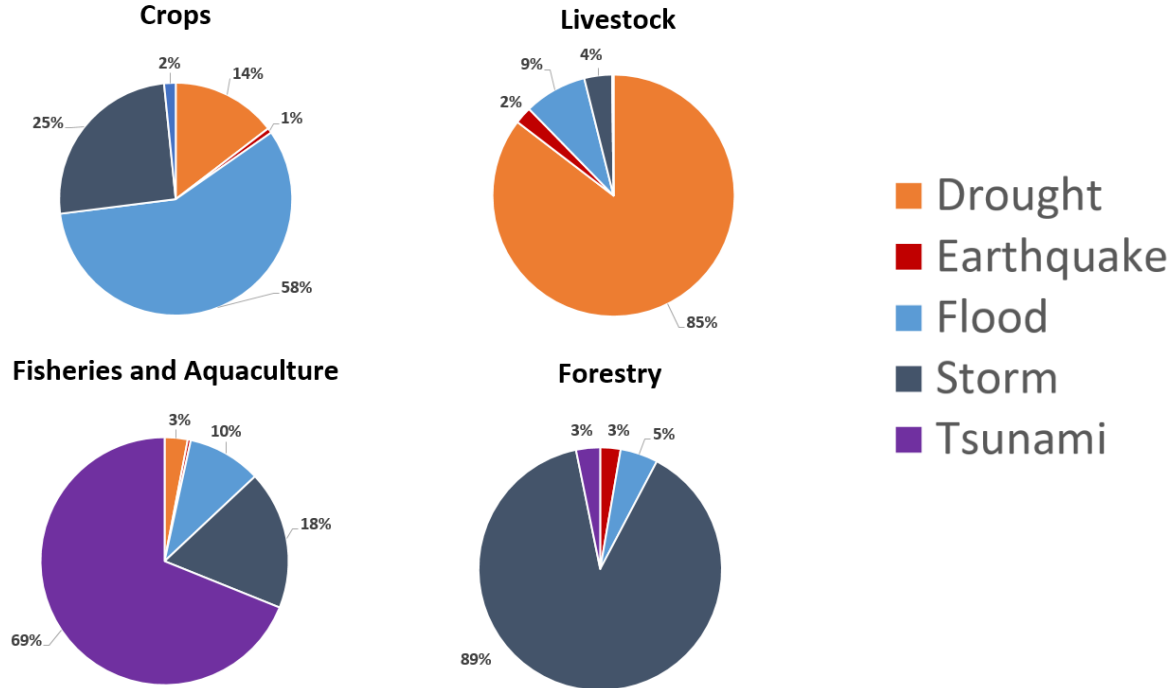
IMPACT OF DISASTERS ON AGRICULTURE
Share of D&L absorbed by agriculture (2003-2013)

Damage	Losses	D&L
14%	30%	22%

■ Agriculture ■ All Other Sectors

Source: FAO (2015), based on 78 PDNAs

IMPACT OF DISASTERS ON AGRICULTURE
Varying sectoral vulnerabilities to disasters

Crops
- 2%
- 14%
- 1%
- 25%
- 58%

Livestock
- 9%
- 4%
- 2%
- 85%

Fisheries and Aquaculture
- 3%
- 10%
- 18%
- 69%

Forestry
- 3%
- 3%
- 5%
- 89%

Legend:
- Drought
- Earthquake
- Flood
- Storm
- Tsunami

Source: FAO (2015), based on 78 PDNAs

IMPACT OF DISASTERS ON AGRICULTURE
Varying sectoral vulnerabilities to disasters

Sub-Saharan Africa
9% 2%
89%

Asia
4% 9% 10%
77%

LAC
10% 3% 27%
55% 5%

Near East
41%
59%

Legend:
- Drought
- Earthquake
- Flood
- Storm
- Volcanic Eruption
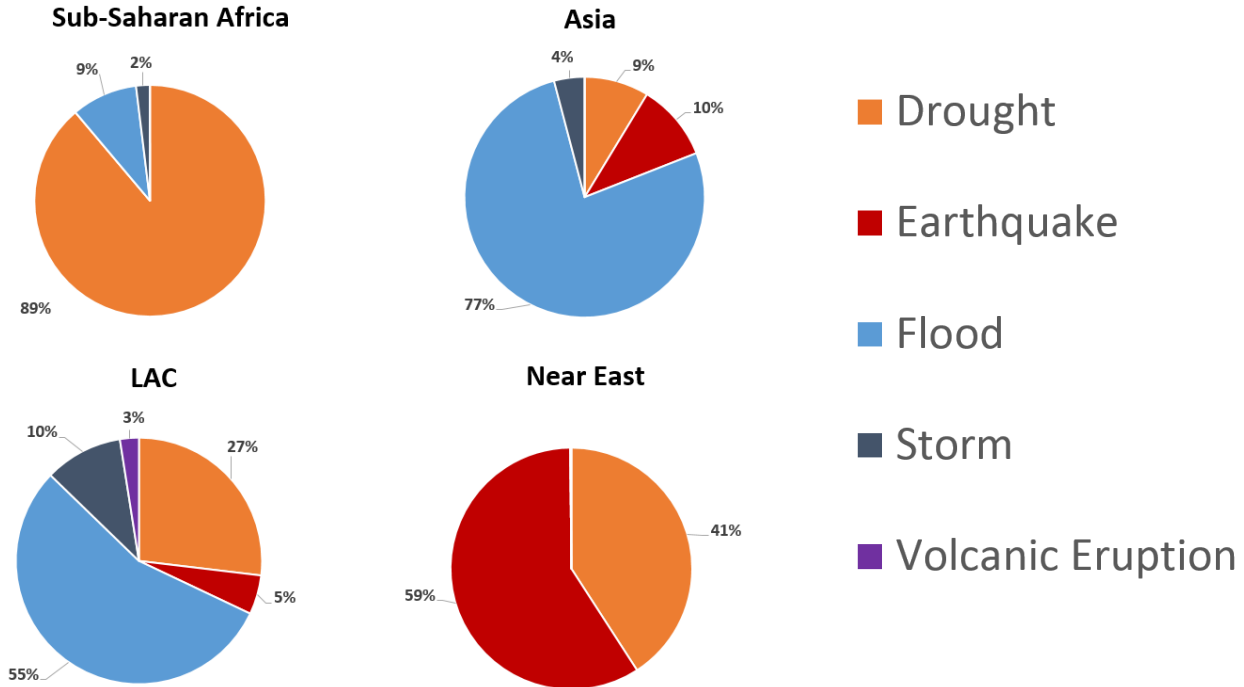
Source: FAO (2015), based on FAOSTAT data

FILLING THE KNOWLEDGE GAP

Steps required to improve data quality and quantity

- Standardised methodology for D&L assessment
- Comprehensive D&L database
- Strengthened country capacities
- Better informed DRR planning

The methodology proposed by FAO includes the measuring of the value of **production damage and losses** attributed to disasters in the crops, livestock, fisheries, aquaculture and forestry sectors, together with the **value of damaged agricultural assets and infrastructure**.

Methodology will be used to track progress of:

- SFDRR indicator C2 – *Direct agricultural loss attributed to disasters*
- SDG indicator 1.5.2 – *Direct disaster economic loss in relation to GDP*

This indicator is calculated based on five sub-indicators:

- C2(C):   Impact to crops
- C2(L):   Impact to livestock (and apiculture)
- C2(FO):   Impact to forestry
- C2(AQ):   Impact to aquaculture
- C2(FI):   Impact to fisheries

Impact to Agriculture: $C2 = C2(C) + C2(L) + C2(FO) + C2(AQ) + C2(FI)$

Components

Damage and loss

Damage is defined as the replacement/repair cost of totally or partially destroyed physical assets and stocks in the disaster-affected area

Loss refers to changes in economic flows arising from the disaster (i.e. declines in output in crops, livestock, fisheries, aquaculture and forestry)

Production and assets

Each sub-sector is sub-divided into two main sub-components, namely **production** and **assets**. The production sub-component measures both damage and loss from disaster on production inputs and outputs, while the assets sub-component measures damage on facilities, machinery, tools, and key infrastructure related to agricultural production.

		Damage	Losses
Crops Livestock	Production	Pre-disaster value of destroyed stored production and inputs	Value of lost crop production (disrupted economic flows)
Fisheries Forestry	Assets	Replacement or repair value of destroyed assets – machinery, equipment, tools	

C2-C (Crop damage and loss) = *Annual crop production damage + Perennial crop production damage + Annual crop production loss + Perennial crop production loss + Crop assets damage (complete and partial)*

- ***Annual crop production damage***
  1) Pre-disaster value of destroyed stored annual crops and inputs

- ***Perennial crop production damage***
  1) Replacement value of fully damaged perennial trees
  2) Pre-disaster value of destroyed stored perennial crops and inputs

- ***Annual crop production loss***
  1) Difference between expected and actual value of crop production in non-fully damaged harvested area in disaster year; 2) Pre-disaster value of destroyed crops in fully-damaged areas; 3) Short-run post-disaster maintenance costs

- ***Perennial crop production loss***
  1) Difference between expected and actual value of crop production in non-fully damaged harvested area in disaster year; 2) Pre-disaster value of destroyed standing crops in fully-damaged areas and discounted expected value of crop production in fully damaged harvested area until full recovery; 3) Short-run post-disaster maintenance costs

- ***Crop assets damage***
  1) Repair cost of partially destroyed assets and the replacement cost of fully destroyed assets at pre-disaster price.

C2-FO (Forestry damage and loss) = *Forestry production damage + Forestry production loss + Forestry asset damage (complete and partial)*

Follows formula for Perennial crops

C2-L (Livestock damage and loss) = *Livestock production damage + Livestock production loss + Livestock asset damage (complete and partial)*

- ***Livestock production damage***   1) Pre-disaster value of stored inputs (feeds, fodder and forage) and stored livestock (aquaculture) products destroyed by the disaster

    2) Pre-disaster net value of dead livestock (fish) (minus any obtained revenue from dead livestock sold)

- ***Livestock production loss***   1) Difference between expected and actual value of production (of livestock and fish products) in disaster year 2) discounted foregone value of products from dead livestock until full recovery

    3) Short-run post-disaster maintenance costs

- ***Livestock assets damage***   1) Pre-disaster value of partially or fully destroyed assets (boats, machinery, equipment, storage)

**Any obtained revenue from dead livestock (fish) sold should be subtracted**

C2-FI (Fisheries damage and loss) = *Fisheries production damage + Fisheries production loss + Fisheries asset damage (complete and partial)*

- ***Fisheries production damage***   1) the pre-disaster value of stored inputs and stored capture destroyed by the disaster

- ***Fisheries production loss***   1) the difference between expected and actual value of fisheries capture in disaster year

- ***Fisheries assets damage***   1) the pre-disaster value of assets used for fisheries partially or fully destroyed by disaster (vessels, fishing boats, tools, equipment, cold storage, etc.)

TESTING THE METHODOLOGY
## Typhoon Haiyan, Philippines 2013 (Case Study Application)
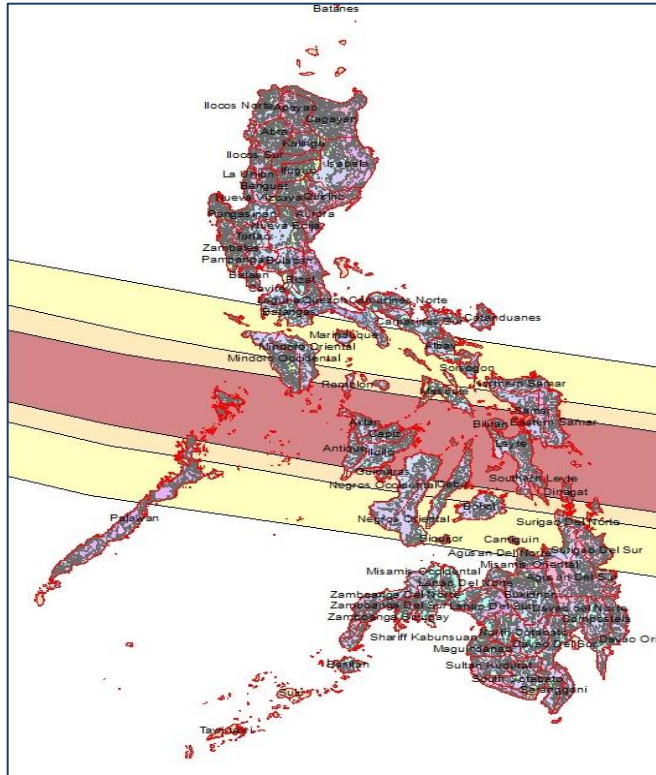
○ Typhoon Haiyan (Yolanda) hit central Philippines in Nov 2013

○ Winds registered at over 300 km per hour (Figure) - strongest wind speed recorded in the country for the landfall of a cyclone

○ Storm surges reached up to 5.3 meters in height, causing devastation and loss of lives in affected coastal provinces

○ At least 6,300 deaths recorded (Nov '13), estimated 16 million people affected, over 1.1 million houses damaged/destroyed, overall damage to public infrastructure and agricultural land across 41 provinces

Typhoon Haiyan, Philippines 2013 (Case Study Application)

Typhoon Haiyan: Damage and Losses in Agriculture, by Sub-Sector
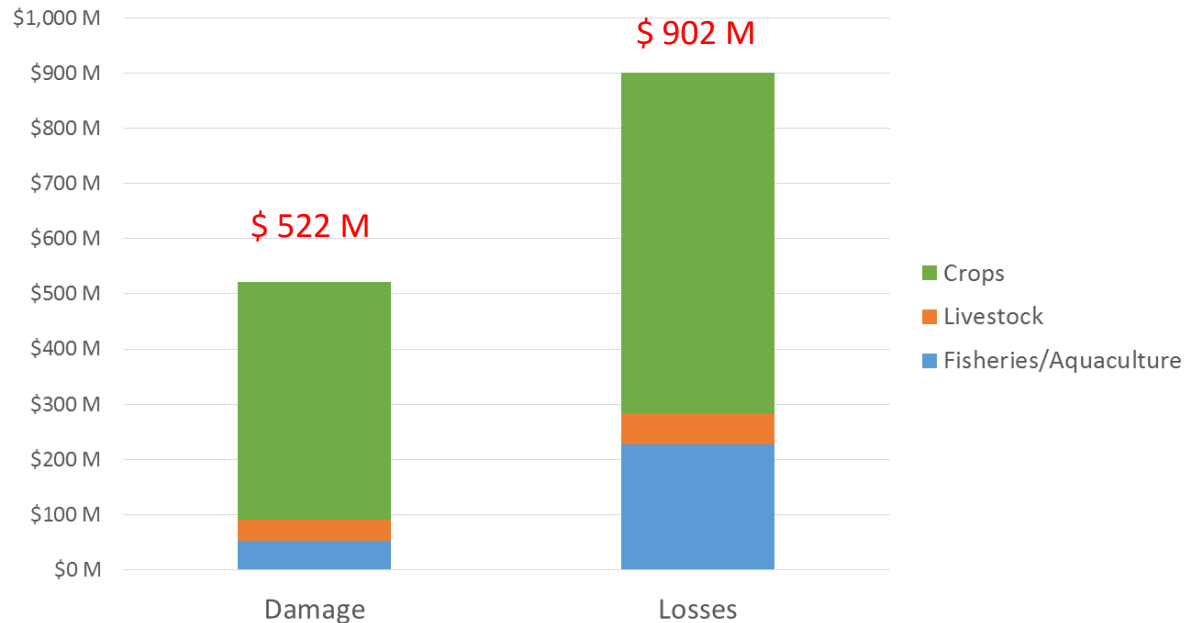
Key Results

○ **Total D&L in Agriculture**: USD 1.4 billion – in line with government assessment (but different distribution of damage and losses).

○ **Most affected sub-sectors**: crops, followed by fisheries and livestock.

○ **Losses are almost 80 percent higher than damages** – in government assessment damage and losses are almost equal → different computation methods.

WAY FORWARD

Towards an integrated disaster impact information system

- Cooperation/coordination with UNISDR on monitoring indicator C-2

- **Further testing and validation of the methodology** on different hazards and regions – 2011 drought in Ethiopia

- Development of a **systematic, harmonized data collection and reporting process** on D&L in agriculture

- **Second periodic FAO Report** on *The Impact of Disasters on Agriculture and Food Security*

- **Country capacity enhancement** to (a) collect disaster impact data; and (b) make use of data for DRR/M planning

- Development of a **global information system on damage and loss** in agriculture, linked to existing national and international disaster loss databases (e.g. EM-DAT CRED, Desinventar)

THANK YOU