Climate and Natural Disasters in South Asia: Scope for Regional Cooperation on the Conservation, Use and Exchange of Crop Genetic Resources

Reflection from Nepal

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Disaster

“a sudden, calamitous event that seriously disrupts the functioning of a community or society and causes human, material, and economic or environmental losses that exceed the community’s or society’s ability to cope using its own resources. Though often caused by nature, disasters can have human origins”-IFRC (Accessed on 25.08.2015)

Climate Change

“a change in the state of the climate that can be identified (e.g. using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. It refers to any change in climate over time, whether due to natural variability or as a result of human activity” -UNFCCC , 2011
Climate change, food and farming: 2010s

According to the Fifth Assessment Report of the IPCC, climate change is affecting food and farming now.

It is affecting crop yields
Maize and wheat yields show climate impacts

<table>
<thead>
<tr>
<th>Crop</th>
<th>Country</th>
<th>Yield Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize</td>
<td>China</td>
<td>-7%</td>
</tr>
<tr>
<td></td>
<td>Brazil</td>
<td>-8%</td>
</tr>
<tr>
<td></td>
<td>France</td>
<td>-3%</td>
</tr>
<tr>
<td>Wheat</td>
<td>China</td>
<td>-2%</td>
</tr>
<tr>
<td></td>
<td>Russia</td>
<td>-14%</td>
</tr>
<tr>
<td></td>
<td>France</td>
<td>-5%</td>
</tr>
</tbody>
</table>

Global: Maize (-4%), Wheat (-5%)

It is putting up prices
Recent price spikes for food have been linked to extreme weather events

Seasonal Climate Extremes and the Food Price Index

1. Australia wheat
2. US maize
3. Russia wheat
4. US wheat, India
5. Australia wheat
6. Argentina maize, soy
7. Russia wheat
8. US maize

Tropical regions are most vulnerable
Percentage of people undernourished (2011-13):

- Sub-Saharan Africa: 25%
- South Asia: 17%

Poor people are worst affected
Poor people spend a higher proportion of their income on food – so price rises affect them more

<table>
<thead>
<tr>
<th>Country</th>
<th>Proportion of Income on Food</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malawi</td>
<td>78%</td>
</tr>
<tr>
<td>Pakistan</td>
<td>75%</td>
</tr>
<tr>
<td>Vietnam</td>
<td>74%</td>
</tr>
<tr>
<td>USA</td>
<td>21%</td>
</tr>
</tbody>
</table>

Adaptation is happening, but is not enough

Farmers are:
- Changing planting dates
- Adjusting marketing arrangements
- Using different crop cultivars and species

The future of food and farming: 2030s

In the 2030s, climate change will affect food and farming more strongly, particularly small-scale producers in poor countries.

Crop and pasture yields are likely to decline in many places

- North-East Brazil: Maize -10%, Rice -14%, Wheat -14%
- Central America: Wheat -9%, Rice -10%, Bean -4%
- East Africa: Maize -3%, Bean -1.5%
- New Zealand: Pasture for beef and dairy -4%

Small-scale producers with fewer assets will need most support to adapt — such as disaster relief, farm insurance and weather forecasts.

Adaptation will be key

**CROPS**
Temperate regions will benefit more from adaptation than tropical regions.
- Switching to varieties tolerant to heat, drought or salinity
- Optimising irrigation
- Managing soil nutrients and erosion

**LIVESTOCK**
Key adaptations for small-scale producers include:
- Matching animal numbers to changes in pastures
- More farms that mix crops and livestock
- Controlling the spread of pests, weeds and diseases

**FISHERIES**
Key adaptations for small-scale fisheries include:
- Switching to more abundant species
- Restoring degraded habitats and breeding sites like mangroves
- Strengthening infrastructure such as ports and landing sites

The future of food and farming: 2050s

By 2050, climatic impacts on food security will be unmistakable. There are likely to be 9 billion people on the planet, most people will live in cities and demand for food will increase significantly.

Widespread impacts on food and farming are highly likely

Average decline in yields for eight major crops across Africa and South Asia

Marine fisheries will also be affected

Fisheries yields in high latitudes

Fisheries yields in the tropics

Heat and water may pass critical thresholds

Temperature increases of more than 4°C will endanger the ability of farms and ecosystems to adapt

Water cycles will be very different and less predictable

Changes in the intensity, frequency and seasonality of precipitation

Sea-level rises and melting glaciers

Changes in groundwater and river flows

We will need major innovations in how we eat and farm

To cope with climatic changes, we may need to consider:

- Completely different diets
- Shifting production areas for familiar crops, livestock and fisheries
- New approaches to managing waste, water and energy in food supply chains
- Restoring degraded farmlands, wetlands and forests


## Climate Risk Index (1994-2013)

“analyses to what extent countries have been affected by impacts of weather-related loss events”

<table>
<thead>
<tr>
<th>Countries</th>
<th>CRI Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Afghanistan</td>
<td>NA</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>6</td>
</tr>
<tr>
<td>India</td>
<td>17</td>
</tr>
<tr>
<td>Myanmar</td>
<td>2</td>
</tr>
<tr>
<td>Nepal</td>
<td>19</td>
</tr>
<tr>
<td>Pakistan</td>
<td>10</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>55</td>
</tr>
</tbody>
</table>

Germanwatch, 2015
Major disasters in Nepal

In Terai, of the total, 58% forest fires are due to deliberate act for the purpose of grazing, poaching, hunting and non-timber-forest product collection. Forest fire due to negligence shares 22% and 20% by accident (International Forest Fire News, 2006). Additionally, slash and burn agriculture is one of the main reasons common for forest fire in the hills.

<table>
<thead>
<tr>
<th></th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>28</td>
<td>113</td>
<td>416</td>
<td>740</td>
<td>99</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>37</td>
<td>42</td>
<td>1478</td>
</tr>
<tr>
<td>2009</td>
<td>39</td>
<td>156</td>
<td>576</td>
<td>1191</td>
<td>64</td>
<td>29</td>
<td>3</td>
<td>2</td>
<td>11</td>
<td>6</td>
<td>25</td>
<td>35</td>
<td>2137</td>
</tr>
<tr>
<td>2010</td>
<td>70</td>
<td>68</td>
<td>648</td>
<td>1785</td>
<td>94</td>
<td>22</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>3</td>
<td>12</td>
<td>87</td>
<td>2793</td>
</tr>
<tr>
<td>2011</td>
<td>13</td>
<td>66</td>
<td>287</td>
<td>970</td>
<td>111</td>
<td>9</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>9</td>
<td>31</td>
<td>108</td>
<td>1613</td>
</tr>
<tr>
<td>2012</td>
<td>38</td>
<td>86</td>
<td>605</td>
<td>1563</td>
<td>784</td>
<td>146</td>
<td>1</td>
<td>1</td>
<td>6</td>
<td>38</td>
<td>69</td>
<td>3341</td>
<td></td>
</tr>
</tbody>
</table>

Source: Sharma S.P., UNISDR-Regional SA Wildland Fire Network

“Conservation, Use and Exchange of Crop Genetic Resources: Promoting Regional Cooperation for a Food-Secure, Climate-Resilient South Asia” in Kathmandu on 26-27 August 2015
Number of landslides per year in Nepal (ICSU, 2008)
Context of climate change (Chaudhary and Aryal 2009)

Global warming

Impact on Ecosystem processes
- Drought
- Evapotranspiration
- Soil warming
- Snow melting
- Sea level rise
- Desertification
- Erosion & landslides
- Hydro-chemistry
- Extreme weather
- Ocean circulation

Impact on Biological systems
- Biodiversity decline
- Phenology shift
- Morphology change
- Range shift
- Reduced ecological resilience
- Change in community composition

Agricultural system
- Crop failure from insect and disease pest, drought, flooding; livestock killing

Human health
- Drinking water shortage, poor sanitation, diseases spread

Environmental health
- Lake outburst, erosion and landslides, and other eco-health problems

Economic loss
- Yield loss, damage of roads, bridges, and other properties

Threats to human wellbeing
Context of climate change in Nepal

- 0.06 degrees Celsius each year
- Weather is irregular
- Rainfall pattern uncertain and unpredictable
- Less snow
- Rapid snow melting

(Chaudhary and Bawa 2011)

(Source: Perception study of 250 respondents from Ilam)
Impacts of climate change in Nepal

- Agricultural system
- Plants and animals
- Environmental health
- Human health
- Economic loss
- Loss of life
- Wellbeing

(Chaudhary and Bawa 2011)

(Source: Perception study of 250 respondents from Ilam)
**List of SA countries with natural disaster risk**

<table>
<thead>
<tr>
<th>Country</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nepal</td>
<td>68</td>
</tr>
<tr>
<td>India</td>
<td>100</td>
</tr>
<tr>
<td>Pakistan</td>
<td>101</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>113</td>
</tr>
<tr>
<td>Afghanistan</td>
<td>134</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>168</td>
</tr>
<tr>
<td>Maldives</td>
<td>NA</td>
</tr>
</tbody>
</table>

Germanwatch, 2015
## Comparative effects of disasters on industrialized and developing countries

<table>
<thead>
<tr>
<th>Industrialized Countries</th>
<th>Developing Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suffer higher short term economic losses</td>
<td>Cause setbacks to long term economic and social development of the country</td>
</tr>
<tr>
<td>Have mechanisms in place to avoid or reduce loss of life, e.g. early warning systems and building regulations to ensure development in high risk areas is designed to withstand forces</td>
<td>Lack of resources for early warning systems; unplanned squatter developments are not designed to withstand natural forces</td>
</tr>
<tr>
<td>Have immediate emergency and medical relief infrastructure available which reduces casualty numbers</td>
<td>Inflicts massive casualties due to lack of relief infrastructure and resources</td>
</tr>
<tr>
<td>Insurance against property and infrastructural losses</td>
<td>Forced to divert funds from development programs to emergency relief and recovery</td>
</tr>
<tr>
<td>One of mechanisms to avoid or reduce losses of life is their ability to predict disasters and early preparedness plan</td>
<td>Poor ability to predict the nature of disasters and thus inadequate early preparedness</td>
</tr>
</tbody>
</table>

"Conservation, Use and Exchange of Crop Genetic Resources: Promoting Regional Cooperation for a Food-Secure, Climate-Resilient South Asia" in Kathmandu on 26-27 August 2015
Valuing crop genetic resources

Research: improvement as per the farmer’s and market needs and demands
Income: for livelihoods of farmers specially of small holders and women farmers
Indigenous knowledge and practices: No/Low cost way to conserve, protect and use of different crops
Food security: important crop for food security specially in the hills and suited even for marginal lands
Cultural values linked with identity:
Diversity in culture, diversity of needs of different crop genetic resources
Threats to agrobiodiversity conservation

- Loss of agrobiodiversity or genetic erosion is rapid
- 1900s-todate: ~75% plant genetic diversity has been lost
- 30% livestock breeds and 63% of avian breeds at risk of extinction, 6 breeds lost each month.
- Local knowledge is also eroding
Scope for regional cooperation
Treaties and Policies related to Crop Genetic Resources Conservation, Use and Exchange

Convention on Biological Diversity (conservation, mgmt., use and equitable benefit sharing)

Millennium Devt. Goals (poverty & hunger, equity and empowerment, environmental sustainability, global partnership)

Intergovernmental Panel on Climate Change (Climate change, impacts, response; adaptation and mitigation)

Intergovernmental Platform on Biodiversity & Ecosystem Services (science-policy interface for biod & ES for cons., use of biod for long-term human wellbeing and SD)

Globally Important Agricultural Heritage Systems (areas rich in cultural and biological diversity of global significance)

World Summit on Sustainable Development Integration of social, economic and environmental goals

International Treaty on PGR and Food & Agric. (Conservation & sustainable use, Farmers’ rights, MLS-SMTA, funding strategy)

Agrobiodiversity conservation related policy (Seed related act, policies and laws)

Access and Benefit Sharing

Nagoya Protocol (equitable benefit sharing among stakeholders)

Trade-related Intellectual Property Rights (governance of products developed from farmers varieties and using their knowledge)

“Conservation, Use and Exchange of Crop Genetic Resources: Promoting Regional Cooperation for a Food-Secure, Climate-Resilient South Asia” in Kathmandu on 26-27 August 2015
Legal and Institutional Frameworks

**Technology Transfer in the ITPGRFA**

- Article 13.2 (b): “Contracting Parties undertake to provide and/or facilitate access to technologies for the conservation, characterization, evaluation and use of [PGRFA] which are under the Multilateral System”

- Technology Transfer Mechanisms in the Treaty is envisaged through crop-based thematic groups, research and development partnerships, and commercial joint ventures (ITPGRFA, 2004)

- The process should be “On fair and most favorable” and “concessional and preferential” terms which also recognize and are “consistent with the adequate and effective protection of intellectual property rights”
Type of transferable technologies

**Soft technologies**
Knowledge, skill, information

**Hard technologies**
Tangible goods (equipment, seeds, hardware)

**Germplasm-based**
Improve variety seeds, PBS-potato, sub-merge rice

**Non germplasm-based**
Molecular marker, in vitro propagation, MAS

“Conservation, Use and Exchange of Crop Genetic Resources: Promoting Regional Cooperation for a Food-Secure, Climate-Resilient South Asia” in Kathmandu on 26-27 August 2015
Conclusion

• Increased trend of climate induced natural disasters in South Asia region

• Scope for regional cooperation in Conservation, Use and Exchange of Crop Genetic Resources (defining implementation modalities)
  – Crop Genetic Resource exchange
  – Technology transfer and innovations (research collaboration/IPR)
  – Use of existing regional institutional mechanism e.g. SAARC

• Potential risks for not opting functional regional cooperation
  – Narrowing of genetic resource bases
  – Biopiracy
  – Food insecurity
  – Trigger conflict
  – Displacement and loss of identity
Thank you for your kind attention and feedback