A CASE STUDY ON SUSTAINABLE LIVELIHOODS OF AGRICULTURE-DEPENDENT RURAL COMMUNITIES IN DROUGHT PRONE DISTRICT OF HIMACHAL PRADESH THROUGH CLIMATE SMART SOLUTIONS

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BACKGROUND
Himachal Pradesh is rapidly progressing towards achieving high economic growth while ensuring environmental sustainability and addressing the cross-cutting concerns of climate change. Climate change is likely to pose serious threats to both rural and urban development livelihood practices in the State of Himachal Pradesh. Consequences of climate change are expected to critically impact water resources, ecosystem services, and agricultural dependent rural communities, all of which are critical barriers towards eradicating poverty and attaining sustainable development in the State.

CASE:
Sirmour district of Himachal Pradesh has the second-highest level of rural population growth. During the last decade, State has been experiencing moisture stress, water scarcity, loss, and damage due to climate-related changes. The recent drought history of the district indicates that most of the tehsils remained drought-affected in the past decade.

Fig 1. Map of Sirmour district of Himachal Pradesh

Agriculture and horticulture are the main sources of income and livelihood of 90% of rural inhabitants in the district. Both sectors are most climate change sensitive which creates negative impacts on the livelihood of the rural community. Negative consequences of livelihood resulted in increased poverty, which put rural, marginal and small farmers including women at risk, as lack of adaptive capacities of the rural community to climate change poses a serious threat to their livelihood.

1 http://desthp.nic.in/HPKCCC/reports/Executive-Summary.pdf
The district has experienced an increase in maximum temperature up to 1°C in summer resulting in the early melting of snow which leads to increased vulnerability of agriculture and horticulture sectors. Higher temperature resulting in the shifting of apple orchard towards higher altitude seeking lower temperatures and its production decreased in the last decade. It is also declined the production of wheat and potatoes. Increased temperature has also reduced fodder production and experienced scarcity of feeding for livestock which has adversely impacted the health of livestock and their productivity. They were not able to adapt to micro-irrigation to protect farm crops as they didn’t have rainwater harvesting and conservation structure in the project area.

There is an increase in extreme rainfall intensity with 90% rainfall occurring in monsoon. During the rainy season, extreme rainfall increases the runoff. There is a lack of check dams and reservoirs for the harvesting of rainfall and conserving rainwater to arrest runoff. Increased runoff carries a higher amount of sediment. Therefore sedimentation and a flash flood occur in the project area due to steeper mountain slope which accelerates the rate of siltation. It reduces groundwater recharge and causes soil erosion affecting soil health which affects crop production and productivity.

There is also an increase in instances of sudden weather events like hailstorm cloud burst and landslide as compared to the past. These all-climate change signals and drivers like temperature, rainfall, and snowfall are affecting the rural people. Farmers and women who are totally dependent on agriculture and horticulture for their livelihood.

The absence of any other livelihood options is leading to the migration of productive labourer to cities. Thus, an increase in temperature, deficit, erratic rainfall and shorter winters, result in increased pest and disease incidences damaging the crops and severely affecting the socio-economic system of the rural community in the district.

The rural community in the project area is less equipped with advanced climate-smart technologies and practices. Their knowledge about traditional agricultural practices is compatible with the earlier climatic scenario and is not relevant to changing situations. As the district has the second-highest level of the growing population, rural population growth is expected to place further pressure on the resources. The increasing use of groundwater will lead to falling groundwater tables and the increased salinity in the project area. It is projected that climate change will intensify existing water challenges, posing additional risks to food security and livelihood practices.

In order to reduce the climate change vulnerability and improve the adaptive capacity of small and marginal farmers including rural women, Department of Agriculture, Government of Himachal Pradesh, implemented the project on Sustainable Livelihoods of Agriculture-Dependent Rural Communities in the most vulnerable Rajgarh and Sangrah blocks of drought-prone Sirmour district of Himachal Pradesh. The project promoted climate-smart agriculture and horticulture interventions to adapt to drought and related impacts. Thus, the project enabled farmers to attain sustainable livelihood and increased income.

Under the project, 12 farm ponds of small rainwater harvesting structure (size 45m*32m)² have been constructed in the said district to improve the agricultural activity in the area with agricultural and horticultural interventions for improving the economic

http://www.news.milegi.in/pdf/SLADRC_DPR.pdf
condition of the small and marginal farmers. It

Fig 2: Farm ponds of small rainwater harvesting structure in Sirmour District

has enhanced the improved recharge of water in the project command area to meet the needs for crop water requirement for increased productivity and livelihood security.

Point for discussion:

1. What are different climate signals and physical impact-related treats/hazardous events in the District Sirmour, in the state of Himachal Pradesh?
2. Identify the different areas of climate change impacts - who and what affect due to climate variability?
3. Why these elements are susceptible to these threats/climate hazards?
4. Determine sensitivity, coping, the adaptive capacity of different elements exposed to climate hazards? (Details are given in trainers note)
5. Is there knowledge or experience available/missing which might enhance capacity? Are there technical options available or missing that could enhance capacity?
6. Identify different risks and opportunities due to climate-related hazards?
7. Systemize and prioritize the factors that drive the risk to find its magnitude and probability?
8. Based on the identified different hazards, and risks and opportunities, to build the climate change chain for the project?

3 http://desthp.nic.in/HPKCCC/reports/Executive-Summary.pdf
Trainers' Note

1. Introduction:

The Case study is based on a project “project “Sustainable Livelihoods of Agriculture-Dependent Rural Communities in Drought Prone District of Himachal Pradesh through Climate Smart Solutions under NAPCC, Ministry of Environment, Forest & Climate Change” which is carried out in Sirmour district by Department of Agriculture, Government of Himachal Pradesh.

Sirmour is the southernmost districts of Himachal Pradesh. The district has been divided into three-sub division viz., Nahan, Poanta Sahib & Rajgarh and have ten tehsils & sub-tehsils Nahan, Poanta Sahib, Puchad, Rajgarh, Shalai, Renuka, Nohra, Rohnat, Dadahu, Kamrau.

The rural population mainly depend on agriculture and horticulture for their subsistence and adopt several traditional practices suitable for farming in sloping terrains. The climate of the district is sub-tropical to temperate depending upon the elevation. Maximum precipitation in the form of rain occurs from July to September. The average annual rainfall in the district is about 1405 mm with a mean maximum and minimum temperatures of 30°C and 0°C respectively.

Groundwater potential in the area is very low due to its hydro-geomorphic set up as a major part of it is hilly and mountainous with hard rock. Springs are the main groundwater structures that provide water supply for domestic and irrigation in rural areas.

This project's aim was to construct the water harvesting structures as one of the smart components and improve the agricultural activity in the area of horticultural and agricultural interventions. For effective implementation, they formed farmer producer organizations (FPOs) for improving the economic condition of the small and marginal farmers in the drought-prone project area.

2. Objective:

The objective of the case is to enhance the understanding and skill of the trainees to

a) identify and categorize different hazards that affect the elements' under exposure to climate change.

b) identify the different climate signals like increased rainfall, change in monsoon pattern, and its direct physical impacts like drought and flood,

c) find out risks and opportunities due to climate change?

d) prioritize risk and opportunity based on its magnitude and probability?

e) develop climate change impact change for the Sirmour District based on a case study.
3. Target Group:

Field experts, consultants, NGOs, central and state government officials, academicians, and policy planners who are involved in the project, policy design and development, NABARD, private sector organizations, and philanthropic organizations and FPOs.

4. Session Plan & Time Required :

Total Time required will be 45 minutes
a) Case reading: 10 minutes
b) Mapping Exercise: 35 minutes

Session plan: Participants will spend time 10 minutes reading the story and after reading the case, they will discuss hazard/climate change drivers, elements under exposure risk, and opportunities for intervention. As the next step, trainees will spend the remaining time in building its climate change impact chain.

5. How to administer session /Process of Session

Step 1: Trainer will divide the trainees into a different group of 4 to 5 members per group and tell them the objective of the group activity that is building a climate change impact chain. He / She will handover the case study to read by them and further discussion. After the case reading, Trainer will ask trainees different questions one by one based on the case study and facilitate the discussion.

Step 2 : He/she will guide trainees to identify and categorize different hazards like climate signal and direct physical impact that are affecting the different elements under consideration in Sirmour District in Himachal Pradesh.

The trainee will identify The different climate signals like increased temperature, increased precipitation, less snowfall, intense rainfall, and increased runoff. etc for the example given in Fig. 3

Some examples of climate signals are given below (Fig 3)

![Fig 3 Different Climate signals](image)

a) As climate signals have direct physical impact on the geo physical system like drought, floods, flash flood, as given in fig 4
Fig 4: Different geo physical climate change impact – Hazards

Table 1: Categorized different climate signal and physical impact

<table>
<thead>
<tr>
<th>Hazards</th>
<th>Climate signal</th>
<th>Physical Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased Temperature</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Drought</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

For example

Table 2: Exposed elements and its category

Step 3: After identification of climate drivers/climate signal and different hazard in the area of Sirmour district, they will identify and analyze different elements under exposure like who and what affected by climate change

For example

a) Who is exposed to and affected by climate change?
Small and marginal farmers, their families, women, productive labour force.
b) What is exposed to and affected by climate change?
Wheat, potato, soil, groundwater, rivers, springs, apple orchards

Step 4: Trainee will determine the features that make the different elements susceptible to those identified hazards

a) Sensitivity: they will analyze the intensity of these different elements exposed to climate change for current and future hazards
b) Coping Capacity: they will analyze different elements exposed to climate change that are capable or have the ability to respond to current and future hazards
c) Adaptive Capacity: they will analyze different elements exposed to climate change that are capable or have the ability to prepare for current and future hazards

Step 5: Trainee will identify risks and opportunities for the area in the agricultural and horticultural sector for identified hazards, exposure, and vulnerability

Training & Capacity Building...
Table 4 Risk Category

<table>
<thead>
<tr>
<th>Risk Categories</th>
<th>Financial</th>
<th>Health</th>
<th>Assets</th>
<th>Culture</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduced income</td>
<td>Livestock</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shifting of Apple farm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Opportunity Categories

<table>
<thead>
<tr>
<th>Opportunity Categories</th>
<th>Financial</th>
<th>Health</th>
<th>Assets</th>
<th>Culture</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased income</td>
<td>Improved</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>health</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

Step 6: Based on the analysis trainees will identify probability for hazards as well as the magnitude of risk and opportunity that affect the element under consideration

Table 5 Intensity analysis of different climate hazards

<table>
<thead>
<tr>
<th>Probability</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>The occurrence of risk /opportunity</td>
<td>Not very likely</td>
<td>Deemed possible</td>
<td>Deemed very likely</td>
</tr>
<tr>
<td>Yes/no</td>
<td>Yes/no</td>
<td>Yes/no</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Magnitude</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk / Opportunity</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Step 7: Based on the probability hazard and magnitude of risk trainees will prioritize the risks and opportunities using colour codes

Step 8: Based on the all finding from step 2 to 6 trainees will build and design Climate Change Impact Chain as given in fig
Climate Change Impact Chain for Agri-Horti (Livelihood) in Sirmour District

1st Hazard

- Warming Trend
- Variation in rainfall
- Snow fall
- Variation in rainfall
- Drought
- Higher temperature
- Less precipitation
- Flash flood
- Humidity
- Dry spell
- Drought
- Increase temperature lead shifting of apple
- Impact agril-horti production
- Livelihood of Farmer , women
- Fodder

2nd Hazard

- Lower production Reduced income
- Soil erosion and Soil health
- Water table, soil Health
- Livestock health
- Migration of Productive labour
- Food insecurity
- Water Harvesting Structure
- Farmers Producer Group

Fig 5 Climate Change Impact Chain Tool