AGENDA FOR CLIMATE ACTION

ANIMAL HUSBANDRY AND LIVESTOCK

Linking the Vulnerability and Risk Assessment for Uttarakhand with policy implications for the State

Prepared under the project, “strengthening State strategies for Climate Actions” being implemented by United Nations Development Programme (UNDP) and State Climate Change Centre, Uttarakhand. The project is funded by Swiss Agency for Development Cooperation (SDC)

NOTE: This sectoral brief provides insights into linking of Vulnerability and Risk Assessment for Uttarakhand with policy implications with respect to Animal Husbandry and Livestock sector of Uttarakhand. It also suggests areas of action to be undertaken in the livestock and animal husbandry sector over the next five years based on findings of the top-down VRA, a bottom-up review of community trends, and a review of existing State and national priorities.
1. OVERVIEW OF ANIMAL HUSBANDRY AND LIVESTOCK SECTOR IN UTTARAKHAND

India has the largest cattle and buffalo population in the world and accounts for over 18% of the world’s dairy production globally. Livestock owners however face multiple challenges which could be further aggravated by climate change.

There has been a significant rise in the overall population of livestock in Uttarakhand including cattle, buffalo, goat, sheep, pig, horses, ponies, mules and poultry. Cattle and poultry are the dominant species in the State, although the cattle population has been recently declining. Only 15% of the total cattle are cross-breds often reared for commercial use, but that number is on the rise according to the 2012 livestock census, albeit from a relatively small base. Districts such as Pauri Garhwal, Pitrogarh, Almora, Dehradun, Nainital, Chamoli and Haridwar have the highest number of livestock; and milk production is concentrated in Haridwar.

Livestock in Uttarakhand, while high in number, offer low productivity. Over 80% of rural households – largely small holders – own livestock and earn part of their living from it.

Families with small land holdings rely heavily on natural fodder resources, including forest areas, to feed their livestock. The livestock sector is therefore inextricably linked to local livelihoods and rural prosperity. In dryland and mountain ecosystems, livestock can contribute anywhere between 50% and 75% of the total household income of the rural population.

The vulnerability and risk assessment report (VRA) for Uttarakhand notes that, “Although the income share earned from livestock directly is not high, livestock keepers obtain indirect benefits, such as the capacity of livestock to buffer against shocks such as drought or flood. Thus higher livestock population in a region implies greater ability to cope with climatic aberrations.”

There are a number of challenges faced by the livestock sector in Uttarakhand. There is a 36% fodder deficit in the State; production of milk per animal is low. Infrastructural facilities are underdeveloped at veterinary hospitals, and support institutions. There is limited mobility among animals as well as veterinarians and other support staff because of the difficult geographical terrain, and there are frequent dropouts amongst para-vets in the hills. Climate change can therefore further exacerbate existing vulnerabilities.

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2. CLIMATE VULNERABILITY IN THE ANIMAL HUSBANDRY AND LIVESTOCK SECTOR IN UTTARAKHAND

Climate change is expected to impact animal health, reproduction, and productivity both directly and indirectly. Higher levels of heat and humidity can affect health and feed intake thereby reducing growth rates, milk yield, reproductive performance, and even result in death in extreme cases. Changing trends in temperature and precipitation can also impact agricultural growth in turn affecting fodder quality and availability.

Temperature humidity index (THI) is a value combining temperature and humidity and is a measure of the degree of discomfort experienced. It is indicative of the extent of heat stress borne by animals. For instance, dairy cattle experience heat stress when the THI value is more than 72. Above this value, milk production can decrease by 10 to 25% (see Figure 1).
<table>
<thead>
<tr>
<th>Heat Index</th>
<th>Stress Level</th>
<th>Degree of comfort or discomfort</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below 65</td>
<td>Mild</td>
<td>None</td>
</tr>
<tr>
<td>66-70</td>
<td>Mild</td>
<td>Dairy cows will adjust by seeking shade, increasing respiration rate and dilation of the blood vessels. The effect on milk production will be minimal.</td>
</tr>
<tr>
<td>71-74</td>
<td>Moderate</td>
<td>Both saliva production and respiration rate will increase. Feed intake may be depressed and water consumption will increase. There will be an increase in body temperature. Milk production and reproduction will be decreased.</td>
</tr>
<tr>
<td>75-80</td>
<td>Severe</td>
<td>Cows will become very uncomfortable due to high body temperature, rapid respiration (panting) and excessive saliva production. Milk production and reproduction will be markedly decreased.</td>
</tr>
<tr>
<td>Above 80</td>
<td>Danger</td>
<td>Potential cow deaths can occur.</td>
</tr>
</tbody>
</table>

Figure 1: Humindex values and corresponding degrees of discomfort

Figure 2: Spatial Patterns of Animal Stress levels (Temperature and Humidity Index) in Uttarakhand in June
(The maps depicting heat stress levels in all key months between March and September can be found in the consolidated VRA document)
The VRA study for Uttarakhand specifically projects changes in the extent and duration of THI as a result of climate variability and change. The impact areas are

Increase in heat stress
- Changes in dairy production
- Feed and fodder quality and availability

The impact assessments in the VRA while focusing on projected changes in THI offer insights on heat stress but do not offer specific projections on the exact impacts on dairy production or fodder availability and quality as a consequence; details on the latter are generic in nature and extrapolated from other existing research.

Increase in Heat Stress
In the current situation THI values are already high and more pervasive in the months of June, July, and August, this is expected to become worse in the future. Under the two climate change scenarios (RCP4.5 and RCP8.5), THI values – both frequency and duration – are projected to increase in the months of June, July, and August both in the mid and end-centuries. This is expected to have a significant impact on dairy animals in Nainital, Pauri Garhwal, and Almora and a severe impact on animals in Haridwar and Nainital which are further south.

Under both scenarios (RCP 4.5 and RCP 8.5), the number of days having a THI value between 71 and 74 are projected to increase in the months between May and September in the mid and end-centuries. This will likely impact feed intake and also result in a reduction in milk production as well as animal reproduction. THI Values and heat stress impacts are projected to worsen by end-century compared to the mid-century. Under the more extreme scenario (RCP8.5), THI is projected to rise between 75 and 80 in June during the end-century leading to a marked decrease in milk production and reproduction (See Figure 2).

Impact on Dairy Production
India already loses an estimated 2% of its milk production due to animal heat stress, amounting to losses to the tune of 2.5 Crore Rupees. India-wide studies have projected a decrease in milk production by another 1% by 2020 and 10% by 2050 due to a further increase in heat stress. This is also expected to put pressure on availability of water for livestock.

Impact on Feed and Fodder and its availability
Rising temperatures are expected to adversely impact fodder yield and also make plant tissues tougher or more lignified thereby reducing their digestibility to livestock. This can affect the health of an animal and also impact livestock production which in turn has an impact on food security and incomes of small livestock keepers. In Uttarakhand there is an existing 36% deficit in fodder availability. Villagers increasingly depend on fodder from forest areas. Climate-linked impacts could increase the pressure on forests and lead to further drudgery – particularly for women – in having to venture farther into the forests for the collection of fodder.

3. LIMITATIONS OF THE VRA
As noted earlier, while the VRA focuses on projected changes in THI levels and heat stress as a consequence, it does not detail specific impacts on dairy production or feed and fodder quality and availability as a consequence of rising THI. Additional research on these impact areas, specific to Uttarakhand, needs to be initiated to guide policy action.

4. ON-GROUND VULNERABILITY AND COPING STRATEGIES
Participatory Rural Appraisals (PRAs) conducted in five sample villages in Uttarakhand indicate a number of factors impacting the vulnerability of the livestock sector and people's livelihoods as a consequence (See Box1). In the last 30 years (between 1985 and 2015), villagers have felt that average temperatures have been rising. Livestock, therefore, are already being exposed to rising heat levels. While in the hill village of Chameli (Tehri Garhwal) cattle rearing is a subsistence activity, in Bikampur (Haridwar) which is in the plains, dairy production is a major occupation and a major income generating activity. This is consistent with the analysis of the VRA. In most of the villages sampled, villagers seem to be venturing further into the forests to collect fodder to feed livestock. Villagers, specifically women, can spend two to six hours every day collecting fodder and firewood. This community-level issue is consistent with government concerns of a fodder deficit acting as a significant challenge to improving livestock production. On the positive side, villagers in Kantari (Uttarkashi) and Chameli (Tehri Garhwal) use manure for their agricultural cultivation. Historically, many hill districts in the Himalayan states have had little or no access to subsidised fertilisers under the Green Revolution. As a result, most of the horticultural cultivation has been carried out with locally available inputs. This indicates a potential for villagers to improve their income through organic

1 Representative Concentration Pathways (RCP) scenarios are greenhouse gas concentration trajectories adopted by the Intergovernmental Panel on Climate Change (IPCC) to describe four possible climate futures, depending on how much greenhouse gases are emitted in the years to come. In RCP 4.5 emissions peak around 2040, then decline. In RCP 8.5, emissions continue to rise throughout the 21st century.
farming (which typically offers better margins) – an approach that has been successfully carried out in the State of Sikkim.” Although strengthening market linkages and assistance on third party certification would be important prerequisites.

5. CLIMATE CHANGE AND LIVESTOCK SECTOR POLICY LANDSCAPE.

The key document considering climate change and the livestock sector in Uttarakhand is the Uttarakhand Action Plan on Climate Change (UAPCC). The key objective in the UAPCC, linked to the sector, is “increasing animal productivity; protecting and creating livelihoods; enhancing income generation and providing employment.”

Nationally, the most pertinent initiative is the National Livestock Mission (NLM). NLM is a centrally-sponsored scheme initiated in 2014-15, designed to “cover all activities required to ensure quantitative and qualitative improvement in livestock production systems and capacity building of all stakeholders.”

In addition, there are a number of national projects and schemes that have a direct and indirect bearing on activities in the state linked to livestock, dairy, and animal husbandry such as the Dairy Entrepreneurship Development Scheme, National Project for Cattle and Buffalo Breeding, National Initiative on Climate Resilient Agriculture (NICRA), Rashtriya Krishi Vikas Yojana, and National Agroforestry Policy (NAP).

India’s Nationally Determined Contribution (NDC) to the United National Framework Convention on Climate Change (UNFCCC) highlights India’s large buffalo and cattle population and points to the “mega project” NICRA under which livestock and fisheries are key focus areas.” One of the intended outcomes of NICRA, for instance, is identifying livestock breeds with greater tolerance to climatic stress. Another policy highlighted in the NDC is India’s National Agroforestry Policy (NAP). One of the focus areas of NAP is to supplement available agroforestry products, such as fodder collected by rural and tribal populations, to reduce the pressure on existing forests.

At the state-level, the Department of Animal Husbandry focuses on livestock breeding. A number of linked activities are handled by Uttarakhand Livestock Development Board (UDLB). The State also has an Uttarakhand Sheep and Wool Development Board (USWDB) to focus on improved breeding policies of sheep, goat and rabbit, and facilitate improved livelihoods of the farmers through skill development.”

It is worth noting that while intensifying and modernising livestock production is an important end-goal in improving income and livelihoods of communities in Uttarakhand, climate change could impact water and feed availability as well as livestock production undermining these efforts. The sector therefore requires an integrated approach. At present, there is no up-to-date overarching livestock policy document specific to Uttarakhand. The lack of such a document can hinder efforts at climate compatible livestock development in the State. A cross-section of existing livestock policies and schemes at the national and state-level that need to be reviewed and potentially aggregated in light of the VRA are:

- Livestock Insurance Scheme
- Fodder Development Project
- Centre Of Excellence for Fodder Development
- Ahilyabai Holkar Sheep and Goat Development Scheme
- Sheep and wool improvement scheme
- Integrated livelihood support programme
- Social security scheme
- State initiatives under
  - Dairy Entrepreneurship Development Scheme
  - National Project for Cattle and Buffalo Breeding
  - National Initiative on Climate Resilient Agriculture (NICRA)
  - National Agroforestry Policy (NAP)

Finally, a top-down vulnerability and risk assessment as well as a bottom-up study focusing on specific impacts of heat stress on dairy production, animal husbandry, and feedstock in Uttarakhand needs to be undertaken.

6. AGENDA FOR CLIMATE ACTION

The following table suggests areas of action to be undertaken in the livestock and animal husbandry sector over the next five years based on findings of the top-down VRA, a bottom-up review of community trends, and a review of existing State and national priorities.
<table>
<thead>
<tr>
<th>Impact Area</th>
<th>Action</th>
<th>Type of intervention</th>
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<tbody>
<tr>
<td><strong>Increase in Heat stress: increased temperature and humidity levels are projected to impact reproduction and make livestock prone to disease outbreaks</strong></td>
<td>• Review and strengthen vaccination measures to control common diseases in light of the VRA findings&lt;br&gt;• Conduct further research on expected disease outbreaks and develop and adopt a standard operating procedure (SOP) to deal with such outbreaks&lt;br&gt;• Strengthen disease surveillance and monitoring guided by the VRA&lt;br&gt;• Develop mobile veterinary and diagnostic services with a focus on hill districts as the terrain makes it difficult for animals to be brought to a hospital for treatment, vaccination, and artificial insemination. Increase the state plan outlay for setting up such mobile veterinary units.&lt;br&gt;• Focus on hill-centric livestock research – which is still a nascent endeavour – guided by the VRA findings&lt;br&gt;• Align State initiatives on livestock and animal husbandry with the more recently developed National Livestock Mission.</td>
<td>Strengthening existing initiatives&lt;br&gt;Information and research&lt;br&gt;Strengthening existing initiatives&lt;br&gt;Strengthening existing initiatives&lt;br&gt;Information and research&lt;br&gt;Policy review and mainstreaming</td>
</tr>
<tr>
<td><strong>Impact on dairy and other livestock production</strong></td>
<td>• Conduct further research on exact impacts of heat stress on dairy and other animal production in Uttarakhand, guided by the VRA&lt;br&gt;• Focus on decreasing the number of low-production cattle – which is already a priority agenda of the State government – through selective breeding of local animal varieties, with the objective of increasing milk production and keeping mind existing fodder deficit.&lt;br&gt;• Strengthen on-ground research on production trends of milk, meat, egg, and wool, guided by the VRA</td>
<td>Information and research&lt;br&gt;Strengthening existing initiatives&lt;br&gt;Strengthening existing initiatives</td>
</tr>
<tr>
<td><strong>Impact on fodder quality and availability</strong></td>
<td>• Conduct further research on exact impacts of temperature and precipitation on fodder quality and availability in Uttarakhand, guided by the VRA.&lt;br&gt;• Assess the Fodder Development Programme in light of the VRA findings. Create more fodder banks such as the one piloted in Rishikesh&lt;br&gt;• Research on alternate feed resources, planting fodder trees and increasing Van Panchayat lands under fodder crops guided by the VRA&lt;br&gt;• Initiate co-ordination with the Forest Department to plan for fodder availability.&lt;br&gt;• Initiate co-ordination with water department on water availability for livestock drinking and bathing&lt;br&gt;• Increase purchase rate of wheat straw for the animal husbandry department as it is currently purchased at a higher cost by paper mills</td>
<td>Information and research&lt;br&gt;Policy review and mainstreaming&lt;br&gt;Information and research&lt;br&gt;Cross sectoral planning&lt;br&gt;Cross sectoral planning&lt;br&gt;Policy review and mainstreaming</td>
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<td>Impact Area</td>
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| Impact on livelihoods Since livestock farming is predominantly the endeavour of small land holders, climate change can further worsen existing vulnerabilities | • Assess and strengthen existing livestock credit and insurance schemes guided by VRA findings  
• Focus on equal assets for women such as land titles, livestock ownership, lease on forest land etc.  
• Training of farmers and livestock entrepreneurs under ULDB  
• Assess and strengthen the pilot programme on privatization of farm advisory and production support services including training of adequately educated, unemployed local youth (men and women) to act as barefoot workers and provide breeding services, primary veterinary first-aid etc.  
• Assess the viability of improving livestock production for commercial use in light of the VRA findings and focus on strengthening market linkages.  
• Assess viability of using manure as an input in organic farming and biogas production | Strengthening existing initiatives  
Policy review and mainstreaming  
Capacity Building  
Strengthening existing initiatives | Cross sectoral planning |

7. DEVELOPMENT CO-BENEFITS

The suggested areas of climate action would lead to the following development co-benefits:

• Improve smallholder livelihoods in the State
• Strengthen efforts to reduce the current fodder deficit
• Improve the quality of livestock production
• Enable access to central funds under National Initiative on Climate Resilient Agriculture (NICRA), National Agroforestry Policy (NAP) and specifically, the National Livestock Mission
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