CASE STUDIES

CLIMATE ADAPTIVE PRACTICES GRASSROOTS INITIATIVES

Development Alternatives

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Population	As per 2011 census, Sikkim has a population of 610,577, and Ranks 29th in India in terms of population.[1]
Climate	The state has five seasons: winter, summer, spring, autumn, and a monsoon season between June and September. Sikkim's climate ranges from sub-tropical in the south to tundra in the north.season (June to September) and north east monsoon season (October-December).
Climate Vulnerabilities	Changing weather patterns and rising temperatures, water scarcity, spatial variation in rain fall, increase intensity of extreme rain fall.
Average Annual Rainfall	2756.3 millimetre[2]
Economy	Sikkim's economy is largely agrarian, based on the terraced farming of rice and the cultivation of crops such as maize, millet, wheat, barley, oranges, tea andcardamom.[3,4]

[1] *2011 Census of India.*

[2] *District-wise monthly rainfall data from 2004-2010 for the whole of India by Indian Meteorological department from www.indiaportal.org*

[3] *Dutt, Ashok K.; Baleshwar Thakur (2007). City, Society and Planning: Society. Concept Publishing. p. 501. ISBN 81-8069-460-7.*

[4] *Bareh 2001, pp. 20–21.*

Sikkim is a northeastern state of India landlocked in the Himalayan range. It is home to one of the world's highest peaks, Kanchenjunga. Like most of the Himalayan region, Sikkim is rich in beautiful springs, lakes, mountains, deep valleys and biodiversity; making it a sought after tourist destination. Water is one of the most important sectors on which climate change (increase in temperatures, evapo-transpiration, spatial variation in rain fall, increase intensity of extreme rain fall and drought events) can have a profound impact, which in turn can have cascading impacts on other sectors. The agricultural sector is highly dependent on the climate, and given the low productivity increase of the last few years compared to population growth, climate change is likely to have serious consequences for Sikkim's agriculture[1].

[1] *http://www.moef.nic.in/sites/default/files/sapcc/Sikkim.pdf*

Sowing Resilience

Key Messages

- Traditional adaptive management system combined with new scientific approaches have potential for improved ecological health, and socio-economic well-being of vulnerable communities.
- Convergence of different departments facilitated improvement of livelihoods of climate vulnerable societies.

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1. Context

1.1. Need:

Around 57% of the total cultivated land in Sikkim is covered by horticulture crops and about 70 % of the horticulture farmers are marginal and small. With the temperatures rising at around 0.2°C[1] per year, the monsoon rains have become sporadic, winters have become warmer and the winter rains have become scanty. This has affected the year-long availability of water for agriculture and horticulture. The impact has been worse in the drought prone areas of South and West Sikkim. Unseasonal climate occurrences have caused serious depletion in ground water and this has affected the flow of water from the basic sources, i.e., springs, streams, etc. Furthermore, rapid spread of various fungal and bacterial diseases affecting cash crops has become more prominent since the onset of climate change.

Large-scale production of paddy crops has seen a reduction in production, due to water scarcity in the region coupled with increasing climatic changes. The lack of constant flow of water has affected the sowing period of rice; thereby, taking a toll on the yield period of the crop. Similarly, the production of water intensive crops like maize and wheat has witnessed a reduction in production, due to increasing water scarcity[2]. Large cardamom locally called *alainchii* is believed to be one of the oldest spices known[3]. A large section of farmers in North Sikkim and most parts of Sikkim are engaged in large cardamom cultivation. This traditional adaptive

[1] *http://sikkimforest.gov.in/climate-change-in-sikkim/1-chapter-Climate%20Change%20Synthetic%20Scenario%20over%20Gangtok.pdf*
[2] *http://www.fao.org/fileadmin/templates/giahs/PDF/Himalayan_System_india.pdf*
[3] *http://nopr.niscair.res.in/bitstream/123456789/2967/1/IJTK%208(1)%2017-22.pdf*

management system has been a potential livelihood support to the farmers; a means to conserve biodiversity, environmental services and ecological health, and social and economic well-being of the people. For years cardamom has been the single most crucial cash crop in Sikkim. Cardamom is a shade-loving plant and the hills of Sikkim provide an ideal environment. Frost and hail-storms are injurious to plants during flowering. Cardamom thrives in moist soil.

"Traditional, adaptive, management system combined with new scientific approaches have potential for improved ecological health, and socio-economic well-being of vulnerable communities"

Over the years, there has been a decline in the large cardamom production due to various factors such as diseases incidence, methods of agricultural practices, lack of quality planting material, socio-economic conditions; absence of proper shade management, lack of irrigation facilities and lack of scientific methods of cultivation. It is probably one of the few crops which is perennial, low-volume, high-value, non-perishable.

The cardamom plantation area in Sikkim has reduced to 12,000 hectares from 24,000 hectares in the last five years due to climate change. Maneybong Sophaka Gram Panchayat in the Dentam Block of West District used to once be a large cardamom growing village. All seven wards under the Gram Panchayat used to cultivate large cardamom as the primary cash crop, which was the main source of livelihood for the rural households. The changing climate with it brought a rapid spread of fungal diseases like colletotrycum that destroyed the entire belt of the cash crop, especially in the Maneybong Sophaka Gram Panchayat in Dentam Block of West Sikkim. The rapid spread of fungal and bacterial diseases destroyed the large cardamom crop in the entire belt and its revival did not succeed for several years. Cardamom though, a less water intensive crop, thrives in moist soil. The ground water, in West Sikkim has reduced over the years, due to lesser rainfall; thus, the soil moisture levels have declined.

The change in the weather is also affecting the production of mandarin oranges and banana; especially, the plantations in South Sikkim between 2000-3000 feet altitude, primarily due to increasing cases of water scarcity.

1.2. Response

Unlike the traditional practice of growing cardamom as an agro-forestry crop under the shade of trees, the villager adopted the new practice of growing cardamom in dry fields, which were more accessible for tending, applying manure and winter irrigation. In order to promote growth of orange and banana cultivation in south Sikkim, seedlings were distributed to the farmers along with providing them access to water storage tanks.

2. Objectives

- Revive and enhance horticulture in South and West Sikkim through adoption of low

water intensive form of cultivation.

- Empower and protect the livelihoods of small and marginal farmers.

3. Approach

Given that more than half of the rural population depends on horticulture for their livelihood security, the Government of Sikkim along with other departments envisaged to help the marginalised and small farmers cope better with the changing climate and simultaneously, adapt to it. A convergence between Department of Horticulture and MGNREGA was formed, where the Department of Horticulture distributed seedlings/saplings of mandarin orange, banana, and cardamom to the local farmers.

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Cardomom field, Dentam

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Pipeline for irrigation

While MGNREGA provided funding and labour to carry out the task.

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Water storage tank

4. Key Stakeholders

- Rural Management and Development Department: Facilitated and guided the initiative.
- MGNREGA: Supported with the funding and labour to work on the initiative.
- Department of Horticulture: Provided the seedlings of orange, banana, and cardamom, along with organic manure.
- Local Farmers: The lands of the local farmers were used.

5. Key Components

- Cardamom plantation

The replantation of cardamom across various lands of the farmers was taken up by MGNREGA in convergence with the Department of Horticulture. In 2011, the Gram Sabha passed a resolution to take up large cardamom plantations in all seven Gram Panchayat Wards of Maneybong Sophaka, with funding support from MGNREGA. Accordingly in June 2011, large cardamom

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Orange field, Melli-Dara

© DA

Banana field, Melli-Dara

plantation was taken up in all the 7 villages, covering 77 hectare on an investment of about Rs. 24 lakh.

Unlike the traditional practice of growing cardamom as an agro-forest crop, the villagers adopted the practice in dry fields that were more accessible to tending, applying manure and winter irrigation. The cultivation of this crop is less labour intensive and involves ploughing (June-July) and plucking (October-November). Essentially, this requires around 120 labour days, per annum per hectare of land. While it is a less water intensive crop, access to water still remains a problem. Water is accessed through springs or streams and via personal pipes. Organic manure is used to strengthen the seedlings, within 2-3 months of planting them.

- Mandarin Orange and Banana

In order to protect and promote livelihood security amongst the farmers in Melli-Dara Gram of South Sikkim, MGNREGA and Department of Horticulture distributed seedlings/saplings of orange and banana to the local farmers. Each household in this gram was provided with a water storage tank, through which the farmers had access to water for irrigation and domestic purposes. The water tanker were refilled through water trucks and it essentially lasted for a week. The bio-manure was also provided by the Department of Horticulture.

6. Outcomes and Impacts

Cardamom plantation all over Sikkim:

- Covered 77 hectare of land with an investment of about Rs. 24 Lakh in 2010.
- Planted 3.50 lakh cardamom seedlings
- Covered 120 farmers.
- The cardamom plants started bearing suckers after two years of plantation, with maximum yield after 3 years.
- By 2013, on an average; a household sold 40kgs of large cardamom at the average market price of Rs. 1100/kg.
- Provided an additional income of Rs. 44,000, per annum per household of the 120 families in the Maneybong Sophaka Gram Panchayat.

Mandarin orange was cultivated in an area of about 6,300 hectares, with a total average annual production of about 17,190 tonnes. While exact data for the Melli-dara gram isn't available, as mandarin orange produce will come only after 4-5 years, the local farmers

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Mr. Buddhiman Limboo

I planted 10,000 cardamom plants in the 2-hectare of land in 2011. The harvest produced about 50 kg of dry cardamom, sold at Rs. 1500/kg helping me earn a profit of Rs. 50,000 this year. I also sold around 14,000 cardamom seedlings at Rs.4/sapling and earned Rs. 56,000.

are motivated and confident about the move from rice paddy to less water intensive farming. One of the banana farmer mentioned that he has made a profit of Rs. 10,000 on the 1 hectare of banana field he owns.

7. Lessons Learnt

- Impact of climate change forced farmers to rethink their livelihood strategy and enabled them to move towards climate resilient agricultural practices. The farmers, who earlier practiced farming of water intensive crops like maize, millet and vegetables; have now changed their cropping pattern over the last two years to cardamom, orange etc.
- Changing to less water intensive cropping has helped communities cope with the problem of water scarcity.
- Introduction to horticultural crops has also helped to increase the production outcomes of the farmers enhancing their economic security.