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Case Study

Political Economic Analysis of Natural Climate Solutions (NCS) in India: Agroforestry in Sikkim

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Abstract

In 2022, we conducted a study under the Ashoka Trust for Research in Ecology and the Environment (ATREE) in Sikkim on "Trees in cropland" (Agroforestry), as an NCS pathway. The paper consists of the study and analysis of the existing policies and stakeholders for Agroforestry as an NCS pathway in Sikkim; identified key constraints and enablers for implementation of Agroforestry in Sikkim from political, social and economic perspectives; and recommendations made on major policy and/or legal changes that would help to overcome the identified constraints.

Keywords: Climate change, Natural Climate Solution, Agroforestry, Policy, Political, Economy.

Introduction

With the growing concerns of devastating consequences of climate change, the concepts like Nature-based Solutions (NbS) and Natural Climate Solutions (NCS) are gaining popularity among researchers, practitioners and policy makers[1].

NCS is closely linked with concepts like NbS, ecosystem based adaptation, and green infrastructure. NCS has been identified as a key tool to deliver on our existing national commitments like the Nationally Determined Contributions (NDCs). For this, India has been identified as one of the countries in the tropics with NCS potential based on governance and financial capacity, and geography[2].

A few examples of the NCS pathways are Avoided Deforestation, Reforestation, Restoration of Degraded Land, and Trees in Cropland (Agroforestry). This paper is based on the study of Agroforestry in Sikkim.

Methodology

In 2022, we conducted a study on Trees in cropland (Agroforestry), as an NCS pathway. The three objectives of the study were to study and analyse the existing policies and stakeholders for Agroforestry as an NCS pathway in Sikkim; to identify the key constraints and enablers for implementation of Agroforestry in Sikkim from political, social and economic perspectives; and to make recommendations on major policy and/or legal changes that would help to overcome the identified constraints.

Literature review of peer reviewed journals, reports, policy documents and government schemes and plans were also conducted. Key informant interviews were done with the Department of Forest, State Biodiversity Board, Department of Science and Technology, Rural Development Department, Sikkim University and NGOs like WWF, and ECOSS who work in the relevant sectors.

Yuksom-Dubdi Panchayat was selected as the field site because of the presence of two major models of agroforestry practiced in Sikkim. Interviews were conducted with farmers, members of GPU, NGOs like Kanchendzonga Conservation Committee, JFMC, EDC and SHG Federation, and Community Organizers who was appointed under the JICA assisted SBFP under the Forest and Environment Department. FGDs, transect walk and resource mapping were used for information collection related to land use, resources, gender roles, infrastructure and social structure of the village and demography.

Field site: Yuksom lies in the district of West Sikkim at an altitude of around 1700m. It is 146 kms from Gangtok, capital of Sikkim. It lies within the KBR and surrounded by KNP, a UNESCO 'mixed' (cultural and natural) world heritage site[3].

The site level observation was done in a Lepcha hamlet known as Barfungdara in Norganag village under Yuksom-Ramgaythang ward. There were only six households in the hamlet with a total population of 26 including adults and children. Their main source of income is agriculture, mainly large cardamom (*alaichi)* which is cultivated with the sole purpose of selling it.

Key Findings: Like in other mountain areas the agroforestry systems found in the region are traditional, with deliberate management of trees, crops and livelihood as an integrated system[4]. The agroforestry practices in Sikkim are examples of locally managed small areas of agricultural ecosystems with potential of large landscape level management. It has contributed to household economy, food security and even unemployment to a large proportion of the population in the landscape[5]. Traditionally, the local communities in Sikkim have practiced agroforestry without any intervention from the government as a means to provide for an income safety net and NTFPs. It also helps in conserving soil and water, and maintenance of soil fertility[6]. Additionally these traditional agroforestry systems are reported to have the potential to function as adaptation strategies within agricultural systems, contributing to climate change mitigation[7].

Three major categories of agroforestry can be found in Sikkim, namely, Farm Based Agroforestry, Farm Forest Based Agroforestry, and High Value Crop Based Traditional Agroforestry[6]. Out of which the last two types are practiced in Yuksam-Dubdi GPU.

Under the Farm Forest Based Agroforestry, the species of the trees are consciously selected based on their provisioning services like fodder, fuelwood (for drying cardamom),timber and shade trees to protect the crops from frost; supporting services like enhancing soil stability to prevent soil erosion; and regulating services like to check erosion and landslide[8]. This knowledge has been passed down through generations from their elders. Table-1 consists of names of such species of trees along with their purpose in accordance with the community[9].

Under the High Value Crop Based Agroforestry, large cardamom is one of the principal cash crops. The quantity of the trees planted is directly proportional to livestock and the size of cardamom plantations. Shade trees play a significant role in protecting those plantations from frost. *Alnus nepalensis* or Alder is the most commonly used species of shade tree[10]. Various studies have found that Alnus-cardamom system has significant positive impact on soil fertility through its nitrogen fixing properties[6,11,12]. From a climate change perspective, this system had 3.5 times more atmospheric carbon fixed compared to rainfed agriculture thus showing a higher carbon stock compared to other systems[12]. Despite the benefits for the carbon sequestration, this monoculture mode of *Alnus nepalensis* increased susceptibility of cardamom to viral diseases- "*Chhirkey* and *Foorkey"*[13,14]. According to the farmers, the production quantity has drastically reduced (quantity not specified). Some other drivers for such decrease in the yield include water scarcity and damage by wild animals and pests. The farmers showed discontentment with the amount that they earn from cardamom plantation as compared to the amount of hard work, care, time and money invested on it. They also expressed gradual loss in their interest in this model of agroforestry.

Table-1: Trees planted for the purpose of Agroforestry in Yuksom, according to the farmers.

Local Name	Scientific name	Purpose
Uttis	*Alnus nepalensis*	Fuelwood
Nebhara	*Ficus auriculata*	Fodder, shade
Asare	*Woodfordia floribunda*	To check erosion and landslide (since their roots do not spread too much like bamboos and also have soil binding property)
Mauwa	*Engelhardtia spicata*	Fuelwood
Chaap	*Michelia champaca*	Timber, shade
Kharane	*Symplocos theifolia*	To check erosion and landslide (since their roots do not spread too much like bamboos and also have soil binding property)
Dhuppi	*Cryptomeria japonica*	Timber
Titepati (shrub)	*Artemisia vulgaris*	Medicinal, religious and cultural

Reduction of large cardamom productivity has impacted household income especially as large cardamom was one of the economic pillars. This has led to the farmers to gradually give up on cardamom cultivation, hence High Value Based Agroforestry. Some farmers have shifted their interest to other farm related activities. The Department of Agriculture at regional level had undertaken the cultivation of Quinoa and Saffron on an experimental basis as an alternate cash crop to compensate for large cardamom.

Key enablers, constraints and recommendations for implementation of Agroforestry as NCS pathway in Sikkim: Agroforestry is not a new land use practice in Sikkim. These models are integrated into farming, community-based and traditionally passed down by their elders. Agroforestry provides all types of ecosystem services (regulating, supporting, provisioning and cultural). One of the key respondents mentioned that it has both tangible and intangible benefits to the local communities and ecosystem as a whole. Despite low productivity and high demand of labour, farmers are still involved in agroforestry. They will potentially support any government initiative that will address the challenges of agroforestry.

Despite Agroforestry being a popular practice, there are major constraints to it. The National Agroforestry Policy (NAP) provides a broad guideline however, it does not specify on how agroforestry can be used as an NCS pathway. Since the state is responsible for implementation, a state specific comprehensive agroforestry policy is lacking.

Furthermore, there is lack of specific institutions responsible for implementation and supporting agroforestry in Sikkim. Economic incentives are mandatory and desirable for developing sustainable agroforestry system.

States like Sikkim have a very restricting regulatory system in harvesting trees and getting economic benefits from these renewable resources. This has been evident from the experience of trade in medicinal plants grown in private land. Policy guidelines for exemption of agroforestry tree species from restrictive regulatory regimes are required under the tree and land tenure legal framework of the state. This would require coordination and convergence among multiple stakeholders especially between government sectors and the flagship schemes implemented by them.

Limited market option is also a major constraint. Crops and vegetables grown under the agroforestry systems, other than High Value Based Agroforestry system, are mostly subsistence crops. They are however, sold at small scale at local level to local shops and people who come to buy directly from the farmers. There is no support for subsistence-based farming and crops because it does not pay and does not achieve the market-oriented scaling process being rolled out by the Sikkim Government[14].

In order to adopt agroforestry for commercial purpose, they may be initial upfront costs. There is a need for financial support for agroforestry to transform to scales where it can be an NCS pathway. Carbon credit may be one of the best options to the farmers to reward on promoting agroforestry, however, there is no definite policy and standards to access the carbon market, awareness among the farmers on it, and method to fulfil the international requirements[4].

Various studies have focused primarily on one of the agroforestry models-Cardamon-Alder based agroforestry system while the two other important models have not been a subject of research and thus there seems to be a lack of knowledge and information on the more diverse ecosystems practiced in Sikkim. The farmers in Sikkim have been relying on traditional techniques to adapt to the consequences of climate change on agroforestry at temporal and spatial scales. There is a deficit of information and knowledge on modern and scientific methods and technologies among the farmers to adapt to these changes.

Agroforestry systems in Sikkim are both dynamic and vulnerable to climate change and the erratic rainfall patterns experienced in the current times. For instance, lack of water can impair the agroforestry system particularly in dry seasons[16]. It could result in the burden of work to fetch water for farming, particularly of the women. The farmers somehow manage to water their crops in farm-based agroforestry and farm forest-based agroforestry because these are usually located near their houses. But it is not desirable when it comes to cardamom based agroforestry that is mostly practiced in private forests which are located farther from their houses. Availability of water at appropriate quantity and season is crucial, particularly to cardamom based agroforestry.

In terms of recommendations, Sikkim specific comprehensive agroforestry policy needs to be developed through consultative processes involving all relevant stakeholders and based on sound ground realities of the existing conditions. Financial incentives, equitable benefits and inclusion of all groups should be ensured by this policy. A comprehensive policy would be able to take care of many of the constraints listed in the previous section of the document. Additionally, there is also a need for a unified regulatory regime for agroforestry[17].

Currently there are restrictions on harvesting, transportation and marketing of agroforestry produce (timber and even medicinal plants). There will be many species which are present in the agroforestry and the government owned forests (*Michelia champaca, Tectona grandis, Shorea robusta* etc.) which have high demand and commercial value. There is an urgent need for validation/certification and relaxing regulatory restrictions for these certified species. Some form of relaxation in transit, tree felling permission etc. is essential to encourage active participation in this NCS pathway[18]. This may be the most challenging legal barrier to overcome to achieve policy convergence with other sectors.

Financial support (loans, credits, insurance) exist through various central schemes and plans. These are mainly for growing food and commercial crops and do not include growing trees. For agroforestry as a NCS pathway this needs to change and also include promoting agroforestry. Linking this activity to carbon credits is perhaps one of the ways to take this forward, however capacity and expertise to fulfil the requirements of carbon trading is required. These farmers shoulder the burden of climate change and also burdened with the responsibility to tackle it. Perhaps, a definite arrangement needs to be put in place to pay them for their contribution to mitigate climate change and its consequences.

There is also a need for a paradigm shift in the way agroforestry is practiced in Sikkim from subsistence and meeting basic provisioning services to one which is a solution for building resilience to climate change impact for people as well as the environment. There is a need for acknowledgment of their impact and vigorous promotion of their practices, mostly traditional.

Conclusion

Despite Agroforestry being an age old traditional practice that is practiced across Sikkim, above mentioned constraints have posed challenges in effective implementation of Agroforestry as an NCS pathway. According to G. Sharma & Dhakal, there has been a decline in the area of cardamom based agroforestry almost by 50%[12].

Hence, there is a growing necessity for a state specific policy that includes participatory governance, incentivising mechanisms, markets, access to finances, inclusion (landless, marginal land holders, women, economically marginalized), flexible regulatory mechanisms, technical capacity (management), monitoring and evaluating performance and robust institutional set up that could provide a way forward for effective and impactful implementation. At the ground level community perspectives resonate with the findings in the peer reviewed knowledge base. Primary barriers to community adoption of agroforestry included the non-participation of Village Development Committees in planning and monitoring of agroforestry programmes, lack of assessments on the priority of communities on the species of trees, poor quality of seedlings and saplings leading to low survival rates, lack technical knowledge of farmers on managing such complex ecosystems.

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