

# Role of Agroforestry and Traditional Crops in Livelihoods in the Hindu Kush Himalaya



# About ICIMOD

The International Centre for Integrated Mountain Development (ICIMOD) is a regional knowledge development and learning centre serving the eight regional member countries of the Hindu Kush Himalaya (HKH) – Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal, and Pakistan – based in Kathmandu, Nepal. Globalization and climate change have an increasing influence on the stability of fragile mountain ecosystems and the livelihoods of mountain people. ICIMOD aims to assist mountain people to understand these changes, adapt to them, and make the most of new opportunities, while addressing upstream and downstream issues. ICIMOD supports regional transboundary programmes through partnerships with regional partner institutions, facilitates the exchange of experiences, and serves as a regional knowledge hub. We strengthen networking among regional and global centres of excellence. Overall, we are working to develop economically and environmentally-sound mountain ecosystems to improve the living standards of mountain populations and to sustain vital ecosystem services for the billions of people living downstream – now and in the future.



ICIMOD gratefully acknowledges the support of its core donors:

The governments of Afghanistan, Australia, Austria, Bangladesh, Bhutan, China, India, Myanmar, Nepal, Norway, Pakistan, Sweden, and Switzerland.

ICIMOD Proceedings 2018/6

## **Role of Agroforestry and Traditional Crops in Livelihoods in the Hindu Kush Himalaya**

International Agroforestry Conference

**Promotion of Agroforestry for Rural Income Generation,  
Climate Change Mitigation and Adaptation**

27–29 April 2018, Kathmandu, Nepal

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**Published by**

International Centre for Integrated Mountain Development  
GPO Box 3226, Kathmandu, Nepal

**ISBN** 978 92 9115 632 0 (electronic)

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**Photos:** Anju Pandit – cover; Jitendra Bajracharya – pp 2, 3; International Agroforestry Conference (IAC) 2018 – pp 3, 4, 5, 6, 7, 8, 9

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This publication is available in electronic form at [www.icimod.org/himaldoc](http://www.icimod.org/himaldoc)

**Citation:** ICIMOD (2018) *Role of Agroforestry and Traditional Crops in Livelihoods in the Hindu Kush Himalaya*. ICIMOD Proceedings 2018/6. Kathmandu: ICIMOD

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# Background

The Hindu Kush Himalaya (HKH) is endowed with diverse cultures and ecosystems with abundant natural resources. However, due to the difficult and remote terrain, many communities in the HKH remain poor and deprived of basic services. Traditional agroforestry systems and traditional crops play an important role in sustaining mountain livelihoods and ensuring a supply of food and other economic benefits in the region. These systems and crops thus contribute in diversifying the income of mountain communities and conserving the local environment.

However, agroforestry systems and crops have largely been neglected amid changes in climate and socioeconomic dynamics. Innovative approaches are needed to manage mountain agroforestry systems and conserve traditional crops, because the subsistence livelihoods of mountain people are based on agriculture and forests.

The international agroforestry conference held in April 2018 included a special session “Agroforestry, Traditional Crops and Livelihoods in the Hindu Kush Himalaya.” The session focused on how to manage traditional mountain agroforestry systems while conserving traditional crops. It brought together researchers, academics and policy makers to discuss possible innovations for conserving and managing mountain agroforestry and traditional crops for sustainable agricultural production.

# Objective of the Session

Agroforestry has played an important role in reducing vulnerability and increasing the resilience of farming systems and people against climate related risks. It also provides different ecosystem services which support social, industrial and ecological needs. In this context, the International Agroforestry Conference (IAC) 2018 was organized from 27 to 29 April 2018 to provide a common platform for researchers, scholars, academics, policy makers and business entrepreneurs to address the main theme of the conference, "Promotion of Agroforestry for Rural Income Generation, Climate Change Mitigation and Adaptation". Over 100 participants from 11 countries participated in this event, which included five keynote speakers/presentations, three panel sessions involving 14 panelists/presenters, three special guest presentations, and 40 technical presentations in two parallel sessions.

As part of the conference, ICIMOD organized a panel discussion with distinguished experts in the field of mountain agroforestry and traditional crops from Bangladesh, China, India, Pakistan and Nepal.

The major objectives of the session were to:

- Understand the mountain agroforestry system and its role in mountain livelihoods
- Debate research-policy for conserving and managing mountain agroforestry and traditional crops
- Build a common consensus on managing mountain agroforestry system and conserving traditional crops



# Highlights

## Inaugural Session

Shakti Bahadur Basnet, Minister of Forests and Environment, Government of Nepal, inaugurated the conference. The minister highlighted the importance of agroforestry in mountains in general, and Nepal in particular. The minister also emphasized that an agroforestry system that is less labour intensive is necessary for the utilization of abandoned lands in a context where labour force is migrating out of the country. The Minister said that it was the right time to be sharing knowledge related to agroforestry.

Eklabya Sharma, Deputy Director General of the International Centre for Integrated Mountain Development (ICIMOD), shared the dais with Basnet. Sharma highlighted the importance of agroforestry in the present context of climate change.

In his keynote speech, Eklabya Sharma said that more than 50% of the world's population depends on goods and services from mountains but mountains have not received sufficient attention and investments. Presenting the different agroforestry systems promoted by ICIMOD in different countries of Hindu Kush Himalaya (HKH), he said that promoting agroforestry in the mountains will change the narrative of vulnerability to that of increasing adaptive capacity and resilience. In the context of mountains, the guiding framework should come with packages of solutions that combine contextual factors such as inclusive value chains, digital services, springshed restoration, livelihood diversification and participatory NRM planning. He concluded his presentation by discussing packages of solutions implemented at the local level such as Resilient Mountain Village and Community Forestry in Nepal.

The ICIMOD-supported session titled 'Agroforestry, Traditional Crops and Livelihoods in the Hindu Kush Himalaya' was organized on 28 April 2018 (Annex II). Participants included more than 100 delegates from 11 countries representing diverse sectors, institutions and agencies working in agroforestry, traditional crops, climate change, sustainable development, economy and livelihoods.

The session featured one keynote speech and five presentations. The discussions focused on conserving and managing mountain agroforestry and traditional crops. Yubak Dhoj GC, Secretary, Ministry of Agriculture and Development, chaired the session. Jyoti Prakash Tamang, a pioneer researcher in microbiology of "ethnic fermented





foods and beverages" and vice chancellor and dean of the School of Life Sciences at Sikkim Central University, Gangtok, India, delivered the keynote speech. The panelists included Jianwen Li, Kunming Institute of Botany, Chinese Academy of Sciences; Muhammad Ismail, ICIMOD; V.K. Singh, BAIF Development Research Foundation; Mohd. Abdul Quddus, Arannayk Foundation and Helen Wallace, University of the Sunshine Coast, Australia.

## Session

### 'Traditional knowledge of food fermentation of traditional agro-resources in the Himalayas'

- J.P. Tamang

In his keynote speech, J.P. Tamang, Vice Chancellor of Sikkim University, discussed traditional mountain crops and foods that are unique and linked to mountain culture. Tamang mentioned that the Himalaya are endowed with diverse bio resources, including domesticated plant and animal foods, wild edible plant foods, fermented foods and ethnic foods. Major foods in the Himalaya are obtained from agriculture and livestock. He further said that food is categorized into fermented foods and non-fermented foods. More than 1,000 varieties of major and minor fermented foods and alcoholic beverages are prepared and consumed in the Himalayan region. Microorganisms – culturable and non-culturable – naturally cause the fermentation of agro resources into fermented foods and beverages. Describing the process of fermentation of different foods, such as *gundruk*, *khalpi*, *churpi*, *mesu*, *kinema*, etc., he mentioned that fermentation adds nutritional value, harbors probiotic functions, and produces antioxidants and antimicrobial compounds in food and beverages. In the Himalaya, fermented foods are categorized into 10 major groups based on agro-resources and substrates. Although fermented foods have microbiological, nutritional and ethnic values, there is lack of scientific research and policy for promoting fermented foods.



## 'Principles and practices of agroforestry systems in Yunnan Province, south-west China'

- *Jianwen Le*

In his presentation, Jianwen Le, a researcher at the Kunming Institute of Botany, Chinese Academy of Sciences, talked about the unique biodiversity and traditional agroforestry system of Yunnan Province of China. He said that Yunnan Province is an important part of the Hindu Kush Himalayan region and has rich biological (17,000 spp. of plants) and cultural diversity (26 ethnic groups). People of this region directly depend on nature for medicines, timber and fuel wood, etc. It is hence necessary to ensure proper management of traditional crops and grow them on a commercial scale. The government of China has promoted agroforestry in national parks and farmers' lands, and provided support for standardized planting and nursery gardens. Mushrooms are important non-timber forest products in Yunnan; matsutake mushroom, in particular, is a high-value product found in the forests. But problems such as climate change, improper and over harvesting and chemical contamination have led to a decrease in the production of this mushroom. He pointed out that data gap, research methodology gap and policy gap have hindered the sustainable production and management of matsutake mushroom. He conducted his research in Shagri-la County in three types of forest – oak forest, pine-oak forest and pine forest. Based on his research, he said that there are five other ectomycorrhizal associated species of matsutake, and that geographical isolation restricts gene exchange among the species.



## 'Aga Khan Rural Support Programme's (AKRSP) experience in agroforestry in Chitral, Pakistan'

- *Muhammad Ismail*

Muhammad Ismail, ICIMOD, presented key lessons learned on mountain agroforestry from Chitral, north Pakistan. Chitral is a cold desert with unique biodiversity and agricultural models. Presenting the socio-economic and land use data of Chitral district, Ismail mentioned that forests are an integral part of the people's daily life in Chitral. Agri-silviculture (growing trees with crops) and silvopastoral (growing trees on pastures) are the two main agro forestry systems in Chitral, Pakistan. The agro forestry tradition in Chitral is very old; people have long been planting walnut, mulberry trees and pomegranate along their agricultural lands. However, the tradition became well developed after the forest department and other agencies like AKRSP launched social forestry initiatives in the 1990s. Ismail also mentioned other initiatives besides AKRSP that promote social forestry and agro forestry in Chitral, such as the Environmental Rehabilitation Project, Forestry Sector Project, UNCHR Forestry Sector Project and Billion Tree Afforestation Project. Some of the trees that farmers prefer in agro forestry are mulberry, walnut, pear, apricot, poplar and persimmon; these trees provide fuelwood, fodder, timber, soil and water conservation, etc. He concluded that the scope of agroforestry is high in Chitral. Since forest area in the district is limited, trees in agricultural land can help meet the demand for timber and fuelwood. Agroforestry can also help boost the livestock sector by providing extra fodder to farmers.



## 'Farming system based interventions for sustainable livelihoods of hill communities: Insights gained under BAIF's thematic centre for development in north western Himalayan hill areas in Uttarakhand, India'

- V.K. Singh

V.K. Singh, Thematic Programme Executive, BAIF Development Research Foundation, said that hill areas of India have low per capita land holding size i.e. 0.14 ha and around 82% of workers are engaged in agriculture. Agriculture in the hill areas is characterized by low productivity, shortage of inputs, and lack of marketing facility. The effects of climate change are more pronounced in the hills than in any other agro-ecological zone. Therefore, developing appropriate programmes for niche areas such as Himalayan foothills with strong science and technology tools is necessary. In this regard, BAIF Development Research Foundation, India tried to identify and pilot an innovative farming system based on livelihood development model combining different sectoral interventions in the hill areas of Uttarakhand.

Improved farming/crop production techniques in the hills, such as tree base farming, improved vegetable farming, cultivation under protected conditions, livestock improvement, poultry rearing, fodder promotion and silvipasture development have been piloted. The programme also promoted formation of farmer co-operatives that can carry out activities aimed at adding value to farm produce. Singh said it is important to plan cropping patterns based on altitude and to promote the integrated farming system combining livestock and crop.



## 'Agroforestry in the Chittagong Hill Tracts of Bangladesh: Traditional practices and improved alternatives'

- Mohd Abdul Quddus

Mohd Abdul Quddus, Senior Programme Officer, Arannayk Foundation, discussed traditional and improved agroforestry models prevalent in Chittagong Hill Tracts. Chittagong Hill Tracts, once a densely forested area, is severely degraded now. Every year ethnic hill communities carry out *jhum* cultivation, a traditional agroforestry practice, in at least 252,000 acres. Describing the slash and burn mechanism of *jhum* cultivation, Quddus said that due to increased population pressure, the fallow period has reduced from 15–20 years to 3–4 years, which has decreased soil fertility and crop yields. This practice is now seen as a major driver of deforestation in Chittagong Hill Tracts. Therefore, major agroforestry research and development (R&D) initiatives, such as Chittagong Hill Tracts Development Board, Bangladesh Agricultural

Research Institute and Arannayk Foundation have started to develop and promote improved agroforestry practices. Among these practices, homestead agroforestry and multi-strata fruit orchards models are well accepted by farmers while contour hedgerow intercropping technology is not accepted. He said that Arannayk's sustainable hill farming



model is more beneficial to farmers and the environment compared to other agroforestry models. Cooperative organizations with savings programmes are an effective way to enable poor farmers to adopt improved agroforestry practices and alternative income generating activities. To motivate farmers to adopt agroforestry systems, it is necessary to improve their access to the market and ensure that they get policy support from the government on land tenure security.

### 'Market-led approaches to agroforestry research'

- *Helen Wallace*

Helen Wallace, professor at the University of the Sunshine Coast Australia, said that approaches to agroforestry research consist of production/ processing, sellers/value adders and the market. She said starting with the market is a new way of doing business. Based on her experience, she said that a trans-disciplinary approach is best for ensuring the success of market-led initiatives. Such an approach consists of a diverse team including technical persons, market stakeholders and social researchers who work together to resolve problems and issues. Besides this, engaging with the private sector and working with smallholders can also lead to the success of market-led approaches. She also pointed out the challenges of market-led approaches, such as getting the right team members, creating a dynamic team that encourages different points of view and getting the right private sector partners.



### Discussion

The session chair opened the floor for discussion once the presentations were delivered. During the discussion, participants asked questions related to patent rights and branding of gundruk, and the nutritional value of fermented foods after drying. They also asked whether any additives or chemicals are used in fermented foods. Answering the above questions, J.P. Tamang said that not all fermented foods go through the process of drying. The purpose of drying is to increase cell life. The human body needs all types of nutrition and all foods do not provide all types of nutrition. Fermented food, besides having nutritional value, is part of the culture of people of Nepali origin. Gundruk is eaten all over the world by Nepalis and people of Nepali origin, so it is branded as Himalayan food. Only bio preservatives are used in fermented food.

Participants asked about communities who practice shifting cultivation and whether this should be promoted or not. Answering this question, Mohd Abdul Quddus said that 13 different communities practice shifting cultivation. They hold less than 0.2 ha of land. Shifting cultivation should not be promoted at all; that is why it is necessary to promote different agroforestry alternatives that ensure optimum sustainable use of limited land, he said.

Some participants asked whether matsutake mushrooms damage the host trees. In response, Jianwen Le said that the matsutake mushrooms rely on the host tree, and that research on the interaction between the host tree and the mushroom is ongoing.



This research might help identify new host trees in the future and increase the production of matsutake mushroom.

Participants also asked about the conflict between social scientists and market actors. In response, Hellen Wallace said that market actors want to work for large-scale agricultural production while social scientists want to work with small-holders. In order to resolve this conflict, there is the need to work with both in parallel.

## **Closing remarks from the chair**

Yubak Dhoj GC, Secretary, Ministry of Agriculture and Development, Land Management and Cooperatives, thanked all the presenters for their excellent presentations. He reiterated that Nepal is an agrarian country and that its economy is dependent on agriculture. Agriculture, livestock and forestry are inter-linked in Nepal's context, he said. So the government has consistently prioritized agroforestry through its policies, programmes and actions. The Agriculture Development Strategy 2015–2035 also gives much emphasis to agroforestry. Nepal is in the process of forming an agroforestry policy under the inter-ministerial committee. He also pointed out lack of research and lack of simple and adaptable policies as some of the challenges in adopting agroforestry practices.

# Technical Session: Agroforestry and Sustainable Development

The technical session on the theme “Agroforestry and Sustainable Development” was chaired by Golam Rasul, Chief Economist, ICIMOD. He started the session by stating that agroforestry is a model that produces food, ensures food security and livelihood security, and protects the environment and promotes sustainable development. He welcomed the presenters, who subsequently made three presentations on how agroforestry has opened opportunities for development.

Tanka Prasad Barakoti, former Sr. Scientist Nepal Agriculture Research Council (NARC) presented on the topic, 'Effect of fodder trees and forage on maize and finger millet grown on terrace risers of cropped land'. He said that improved fodder species can be grown successfully in terrace risers. Combining tree and ground fodder species in the terrace riser is an excellent method. Combinations of *Grewia oppositifolia*, *Ficus auriculata*, *Bauhinia purpurea*, *Ficus semicordata* trees with grown forage species have minimal effect on maize and millet. He recommended that new terrace riser farming technology should be scaled up throughout hill districts across the country and that other promising fodder trees and ground fodders should be tested in the terrace riser.

Samata Manandhar, ForestAction, Nepal, presented on the topic, 'Rural outmigration: An opportunity for agroforestry?'. She said that more than 70% of people in Dolakha district migrate internally, among which 70% are male. In the last five years, cropping patterns have decreased in all types of land, so fallow lands are increasing. This has raised prospects for agroforestry crops, such as kiwi and cardamom, which are high-value crops requiring less labour.

Engila Mishra, climate change specialist, Adaptation for Smallholders in Hilly Areas (ASHA) project, presented on the topic, 'Climate change adaptation planning: Integration of scientific information with local perception'. She mentioned that hilly regions are facing the consequences of climate change. Therefore, a participatory approach that integrates science should be adopted. In this regard, agroforestry practices could help people to improve their livelihood and adapt to the changing climate.



## Discussion

Golam Rasul noted that often it is only the tangible benefits of agroforestry, that are discussed. Other ecosystem services, such as regulating and supporting services provided by agroforestry, are ignored. Agroforestry is done for the sustainability of both agricultural and forestry systems. Agroforestry provides diverse benefits to local, regional and global communities. That is why assessment and valuation of all the tangible and intangible benefits from agroforestry is necessary.

S. Bhaskar said that in most fora people ask what ecosystem services are provided by agroforestry systems and whether there are any quantifiable indicators. International bodies like Adaptation for Smallholders in Hilly Areas (ASHA) and United Nations Framework Convention on Climate Change (UNFCCC) should develop indicators that can help convince farmers of the benefits of agroforestry.

Swoyambhu Man Amatya said agroforestry is not a panacea for existing problems. Climate change is a big problem and we need more data on it.

Javed Haider Rizvi said the conference had highlighted two important things. First, it is important to recognize the ecosystem services provided by agroforestry. Second is how to monetize such services. Monetizing agroforestry ecosystem services is challenging due to a lack of clarity regarding buyers and payment mechanisms and frequency of payment. To overcome these challenges we need systems that create awareness about the other ecosystem services provided by agroforestry as well as reliable data to convince investors and farmers to make upfront investments.

Concluding the session, Golam Rasul said that agroforestry is a diverse system and cannot compete with specialized systems such as green revolution agriculture. Agroforestry has some trade-offs and some symbiotic relations with other agricultural systems. However, there is a need for good data to convince policy makers of the importance of agroforestry.

# Key Recommendations and Suggestions

The keynote speech and presentations made during the special session and technical session highlighted diverse perspectives on agroforestry:

- Scientific evidence is necessary to ensure sustainability and better understanding of agroforestry system and the ecosystem services it provides.
- The importance of agroforestry system and conservation of traditional crops should be recognized and appreciated, as the subsistence livelihoods of local people depend on agriculture and forests.
- Policies and practices should be improved to promote innovative agroforestry practices and to sustain the flow of diverse ecosystem services.
- It is important to engage the private sector and smallholders for a successful market-led agroforestry approach.
- Agroforestry should be mainstreamed so that it may contribute to sustainable development.

# Annexes

## Annex I: Inaugural Session and Keynote Speech

### Inaugural Session

Time: 9:00-11:00

Chair of Inaugural Session: *Ramji Neupane*

Chief Guest: Hon. *Shakti Bahadur Basnet*, Minister of Forest and Environment

1. Welcome remarks: *Bishnu Hari Pandit*
2. Remarks by:
  - i. *Javed Razi*, Director of the South Asia Regional Programme, World Agroforestry Centre (ICRAF)
  - ii. *Somsak Pipoppinyo*, Food and Agriculture Organization, Nepal
  - iii. *Eklabya Sharma*, Deputy Director General, International Centre for Integrated Mountain Development (ICIMOD)
  - iv. *Krishna Raj Tiwari*, Dean, Institute of Forestry, Tribhuvan University
  - v. *Tony Bartlett*, Australian Centre for International Agricultural Research
  - vi. *Bimala Rai Poudyal*, Member, National Assembly
3. Remarks by the chief guest *Hon. Shakti Bahadur Basnet*, Minister of Forest and Environment
4. Remarks by chairperson *Ramji Neupane* and closing of the inaugural session

### Keynote Speech

Time: 11:30-1:00

1. Agroforestry and Sustainable Development: *Ian Nuberg*, Associate Professor, University of Adelaide, Australia
2. Policy, Impact and Way Forward: *Javed Rizvi*, Director of the South Asia Regional Programme, World Agroforestry Centre (ICRAF)
3. Special guest speaker: Agroforestry Experiences from the HKH Region: *Eklabya Sharma*, DDG, ICIMOD

## Annex II: Panel Session's Programme Agenda

Time	Details	Responsible
11:15–1:15	Panel Session: Agroforestry, Traditional Crops and Livelihoods in the Hindu Kush Himalayas	Moderator: <i>Laxmi Dutt Bhatta</i>
5 minutes	Session Chair	Chair: <i>Yubak Dhoj GC</i> , Secretary, Ministry of Agriculture and Development
20 minutes	Keynote speech: Traditional knowledge of ethnic food fermentation of indigenous agro-resource in the Himalayas	<i>J.P. Tamang</i>
12 minutes	Technical presentation 2: Principles and practices of agroforestry systems in Yunnan Province, southwest China	<i>Jianwen Le</i>
12 minutes	Technical presentation 3: Aga Khan Rural Support Programme's (AKRSP) experience in agroforestry in Chitral, Pakistan	<i>Muhammad Ismail</i>
12 minutes	Technical presentation 4: Farming system based interventions for sustainable livelihoods of hill communities: Insights gained under BAIF's thematic centre for development in north western Himalayan hill areas in Uttarakhand, India	<i>V.K. Singh</i>
12 minutes	Technical presentation 5: Agroforestry in the Chittagong hill tracts of Bangladesh: Traditional practices and improved alternatives	<i>Mohd Abdul Quddus</i>
12 minutes	Technical presentation 6: Market-led approaches to agroforestry research	<i>Helen Wallace</i>
30 minutes	Open discussion	Moderator: <i>Laxmi Dutt Bhatta</i>
5 minutes	Remarks and Conclusion by Chair	<i>Yubak Dhoj GC</i>

## Annex III: Technical Parallel Session's Programme Agenda

Time	Details	Responsible
2:15-3:45	Session A. I: Theme 1: Agroforestry and Sustainable Development	Chair: <i>Golam Rasul</i> , Chief Economist, ICIMOD
15 minutes	Effect of fodder trees and forage on maize and finger millet grown on terrace risers of cropped land	<i>Tanka Prasad Barakoti</i>
15 minutes	Rural outmigration: An opportunity for agroforestry?	<i>Samata Manadhar</i>
15 minutes	Climate change adaptation planning: Integration of scientific information with local perception	<i>Engila Mishra</i>
40 minutes	Discussion	
5 minutes	Closing remarks by chair	<i>Golam Rasul</i>



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