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Climate change adaptation strategy: Cardamom, Community and Community Based Forest users of Nepal

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Abstract

The paper intends to capture how communities are developing climate change adaptation strategies according to their own context. Climate change is a global issue. Communities are providing local solutions to tackle this challenge. This study was conducted in in Rolpa, Dang, Dolakha, and Ilam districts of Nepal. The household survey was conducted in three districts (Dolakha, Rolpa and Dang). The Focus Group Discussion, Key Informant Interview, and SWOT analysis was held in all four districts. The national level secondary information was reviewed. Based climate adaptation theory, a conceptual framework was developed where adaptation process contributes the livelihoods in achieving resilience in the community. Based on this model, findings are discussed. The cardamom is considered as one of the high value crops in Nepal. Switching to cardamom crops from conventional crops in community and its introduction in community-based forestry is one of the strategies to tackle adverse effects of climate change. Such strategies contribute to the livelihoods of the community and enhance resilience. Cardamom is produced in community land, private land and in community-based forests. The production of cardamom is in increasing trend in all three districts, Rolpa, Ilam and Dolakha. The cardamom farming is giving farmers almost three to five times benefit in comparison to traditional crops such as maize, and rice etc. The traditional trade route of cardamom involves

stakeholders including local level farmer as producer, district level aggregation and subsequently to central level. Cardamom is also exported to India from ground transportation, Kathmandu, and international market. Some associated challenges evolved in each stage. The international trade of cardamom depends on the level of exposure, capacity and quality.

Key words: Climate Change Adaptation, Cardamom, Resilience, Livelihoods

1. INTRODUCTION

Climate change adaptation has been a global issue (Kumar et al., 2023; Taylor, 2022; Kabir et al., 2021). Both the national and local level communities develop climate change adaptation strategies according to their context (Laukkonen et al., 2009; Cid et al., 2023). Climate variability and environmental change are some of the major aspects that govern such strategies (Cannon et al., 2010; Maru, 2014; IPCC, 2014). The practice of adaptation is not new to the local communities (Cabana et al., 2023; Rijal et al., 2022). Various forms of climate change adaptation strategies exist locally through conventional form. Among others, such local level strategies are conservation of water source, planting trees and grasses in the farmland, and crop diversification. Communities practice these choices both in their farmland as well as in communal land (Rijal et al., 2022; Car et al., 2022; Tiwari et al., 2014).

In responding climate change and concurrently addressing livelihoods, cardamom (Elettaria cardemomu) has been practiced as cash crop among small and medium level farmers in Nepal and some other countries of South Asia (Dhananjayan et al., 2023; Reyes et al., 2006; Parthasarathi et al., 2008). In Nepal, the cardamom production is increasing every year in Nepal (MoALD, 2022; MoALD, 2023; Shreshta et al., 2022). One of the eastern districts, *Ilam*, is a pioneer district to introduce cardamom in the country (Dhungana et al., 2010; Shrestha et al., 2022).

The record shows that cardamom was imported from Sikkim, India through eastern border of Nepal (TKP, 2018). During 1850s, people of eastern region began cardamom farming. It was first introduced in Ilam district being adjoined to eastern border of India (Paudyal & Rai, 2020). Gradually, the cardamom crop practice in Ilam district also motivated farmers to introduce cardamom in other districts of Nepal. Rolpa district is on the western side of Nepal and is reported to produce cardamom on 17 hectares of land in total (CBS, 2013). This production in Rolpa district is on household level. Dolakha district also adopted learning from Ilam. Farmers are producing cardamom

as preferred species. At the national level, cardamom farming has the strength to contribute to economy as one of the keystone spice species enhancing the economy of Nepalese people (Kandel, 2019; Kalauni & Joshi, 2019).

Principally both the Non-Timber Forest Product (NTFP) and agricultural cash crops are prioritized areas to address the livelihoods in rural Nepal. Cardamom is regarded as one of the high value crops. Switching to cardamom crop in community and its introduction in community-based forestry is one of the strategies to tackle adverse effect of climate change in Nepal (Aryal et al., 2023; Zakari et al., 2022). The paper intends to capture how the Cardamom is practiced in the community and switching earlier traditional crops to new species (Cardamom) is a climate change adaptation strategy in the study area.

TOWARDS THEORY AND CONCEPTUAL FRAMEWORK

Climate change adaptation practices contribute livelihoods (Clay, 2018; Nelson et al., 2007) of the community and enhance resilience (Nelson et al., 2007; Sargani, 2022; Kapruwan, 2024). Similarly, adaptation plans aim to decrease vulnerability to climate change and increase resilience (Folke, 2006). The adaptation has been defined as "the capacity of actors in a system to influence resilience (Folke et al., 2010). Adaptation acts as an element of pathways of interacting global changes and societal responses (IPCC, 2014; Wise et al., 2014). Resilience emphasizes the speed of recovery and is the buffer capacity or the ability of a system to absorb perturbations, or the magnitude of disturbance that can be absorbed before a system changes its structure by changing the variables and processes that control behavior (Holling et al., 1995; Adger, 2010). The adaptation, livelihoods and resiliency are closely connected (Marschke & Berkes, 2006; Rahut et al., 2014; Acharya et al., 2021; Atube et al., 2021).

Based on this theoretical understanding as shown in Figure 1 below, adaptation strategy contributes livelihoods. This process absorbs shock, maintaining or enhancing resilience. The integrated resilience process contributes to community livelihoods ultimately.

Conceptual Framework of Study

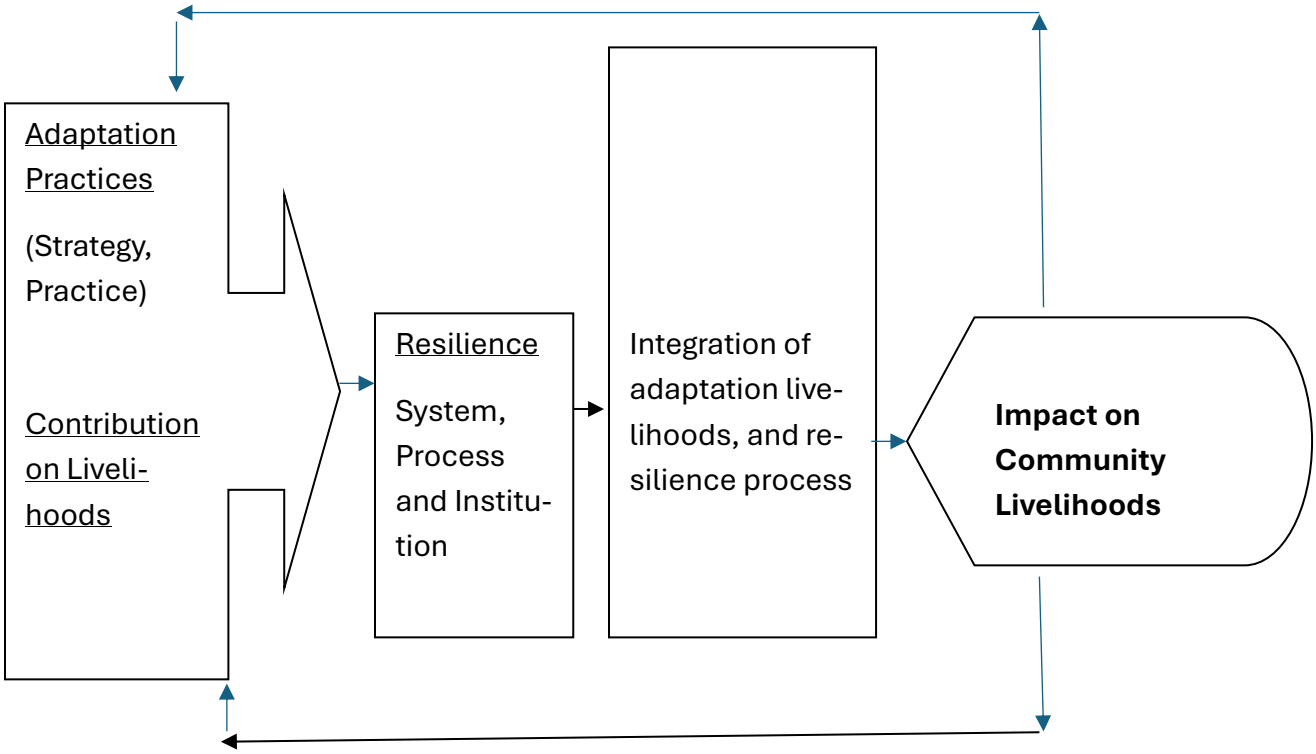


Figure 1: Theoretical Framework for Study

Source: Acharya (2021/22)

METHODOLOGY

Methods and study area

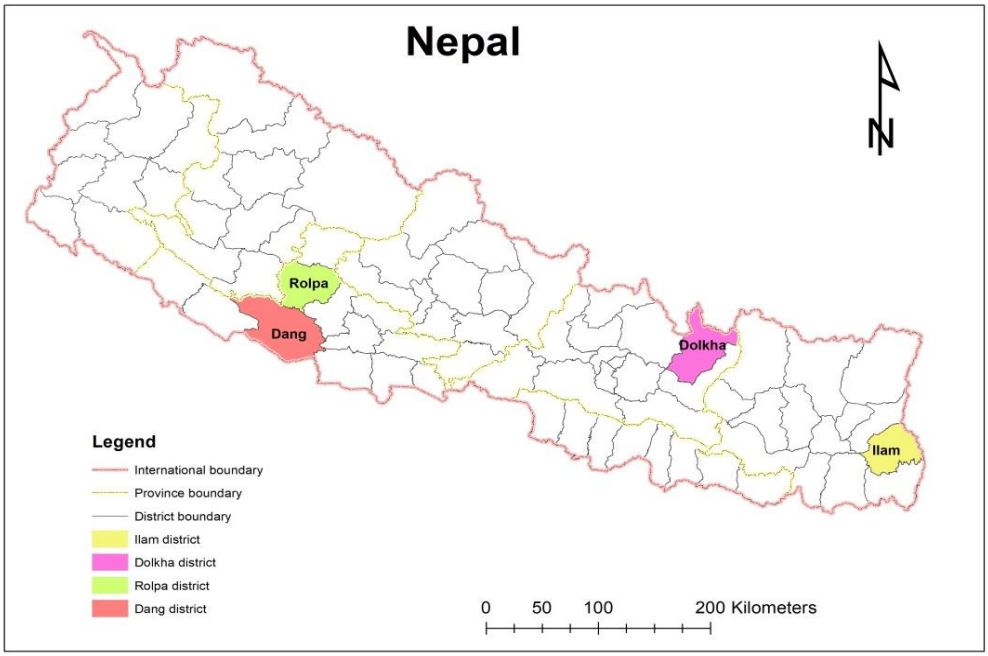
A mixed method was adapted for this study. The Household (HH) Survey, Focus Group Discussion (FGD), Key Informant Interview, and SWOT analysis were conducted to gather the information and data. The field visit was conducted in all four districts (Dolakha, Rolpa, Ilam and Dang). The household survey was conducted in three districts (Dolakha, Rolpa and Dang) and checklists were developed to conduct interviews. In Ilam district, FGD, KII and SWOT analysis was conducted to gather facts and understanding. The selection of district is based on the (i) proven production cardamom in national production system as reflected from MoAD (Ilam district), (ii)

recently producing district (Dolakha), (iii) production at household level but not yet acknowledged in national production system (Rolpa district), (iv) does not have production yet but can be prospective site for production (Dang district). The prospect of Cardamom production was explored in Dang district. Dang district is not yet a producer but farmers from hilly parts of Dang responded that the crop is feasible there.

In Dolakha, production was surveyed among 40 HHs. Since Rolpa still does not have mass production, some qualitative information about its production was assessed with 40 HHs.

The study sites were the community of Holeri and Jhenam area (Rolpa); Danabari area (Ilam); and Lapilang area (Dolakha). In Dang district, users of Community Forest User Group (CFUG) of Dudhras, Kuti Chaur, Dharna (Pandaweshwor CFUG, Khadgadevi CFUG, Kartikerani CFUG, Jharana CFUG, Bhulke CFUG, Kalika CFUG and Gadibara CFUG) were visited with 70 HHs. Altogether 6 KIIs were conducted in each district. The data was analyzed through descriptive statistics. Descriptive statistics provided information about production of cardamom and its trend for 6 years. National level information was received from the Ministry of Agriculture and Livestock and other government sources.

Similarly, the existing cardamom practice was reviewed in the papers. Literature review was carried out documents' adaptation aspect of cardamom and its value chain.



FINDINGS

Cardamom production as strategy of climate change adaptation

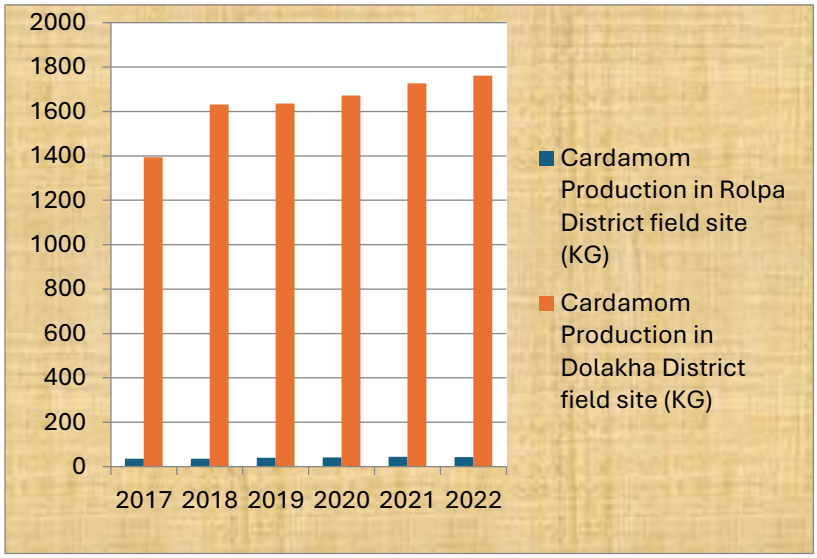


Figure 3 Cardamom production in Rolpa and Dolakha district study sites

Cardamom is produced in community land, private land and in community-based forests. Mostly community people prefer to produce cardamom on private land because they can easily sell it at their own interest and do not need to comply with other procedural complications. The cardamom species yields production from third year onwards of plantation. In some cases, good cardamom seedling production was reported in the first year as well. In both Dolakha and Rolpa districts cardamom production is increasing every year. Figure 3 shows the trend of production in the household surveyed area. The amount of production in Rolpa district is reported to be very low whereas that in Dolakha district is more. Production in Dang district has not yet started. Similarly, In Ilam district, KII and secondary data review was conducted. So, the above figure does not consist of the production of Ilam and Dang district. "Community people produce cardamom for its economic benefit and immediate return. The shift of weather pattern such as sudden rain fall does not adversely impact the cardamom, but it does to crop varieties such as wheat, maize. It is a strategy to address climate change effect," said Naresh BK, a producer from Dolakha district. The trend of cardamom production has been found to have increased in Dolakha district (trend

of 2017 to 2022 in the figure). The short rotation and income yielding crops have been considered for such intervention.

The production of cardamom depends on geography and climate. The geography, 500 to 1500 MSL and climate,15 to 35 Degree Centigrade is feasible for cardamom farming (Swar et al.2023). The northern belt of Dang district adjoining to Mahabharat hill range with moist area are found suitable for this species.

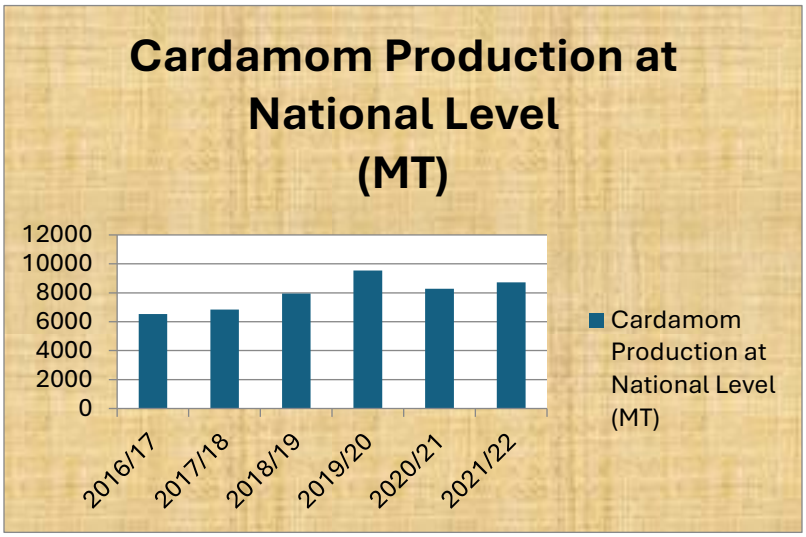


Figure 4: National level cardamom production

The production of cardamom has been found in an increasing trend in all three Rolpa, Ilam and Dolakha districts. In the northern part of Dang district, the practice of cardamom has been practiced very recently at the household level. Commercialization of this prouct has not been started yet in this district. The lesson learned from cardamom production from Ilam district has motivated other districts to expand it. The contribution of cardamom to the local economy is one of the reasons for its acceptance. The concern to upscale cardamom in different parts of the country including Rolpa, Dang and Dolakha reflects success in the Ilam district. Nationally more than 80% of the cardamom harvest comes from the eastern part of Nepal where Ilam district, the pioneering district of cardamom production has important share. The cardamom production in both Rolpa and Dolakha are recent initiatives where seeds and expertise were brought from Ilam district. The practice of cardamom has scope in the northern part of Dang district where the climate is suitable for its farming. During the interaction meeting in Dolakha, farmers shared that they are switching to these income generating crops from earlier conventional cereal crops. The cardamom farming is yielding them return of almost three to five times benefit in comparison to traditional crops such as maize, rice etc.

Cardamom price, like another commodity, fluctuates. The range of cardamom price is NRs 650 per KG to 2400 per KG based on demand. The traditional crop production in a piece of land and its income outweighs the price

of paddy and maize which is below 40 NRs/KG. The agricultural input price in cardamom is significantly lower than that in rice and paddy (Based on consultation from field).

Cropping pattern, risk, trade route and knowledge

The sustainability of cardamom production depends on cropping pattern, risks and trade. The stock needs to be replenished after harvesting. Ensuring the stock or the production aspect of cardamom only guarantees the benefit to the farmers. The cropping pattern, associated risks on this process and knowledge make the whole flow as an integrated process. Based on this rationale, the findings on cropping pattern, risk, trade route and knowledge were explored. The availability of irrigation is a prerequisite of cardamom cropping. It needs moist areas for success. The plant survival rate is about 70 to 75 percent (FGD in Ilam, Dolakha and Rolpa). Based on the FGD, KII and interaction with local people, cropping pattern of Cardamom crops practised has been explored as following:

Table 1: Cropping patter and risk

<table>
<tr><th>Activities</th><th>Jan</th><th>Feb</th><th>Mar</th><th>Apr</th><th>May</th><th>Jun</th><th>Jul</th><th>Aug</th><th>Sept</th><th>Oct</th><th>Nov</th><th>Dec</th></tr>
<tr><td rowspan="6">Cardamom practice cycle and associated Challenges</td><td colspan="4">Planation and germination (Jan-Mar)</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td colspan="3">Flowering period (Feb-Apr)</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td colspan="3">Fruit generation (Mar-Jun)</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td colspan="3">Fruit Maturation and Ripening (June-Aug)</td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td colspan="3">Harvest (Aug-Oct)</td><td colspan="2">Plantation begins</td></tr>
<tr><td colspan="5">Possibility of wildlife damage, rat, monkey, drought, aphid infection and fungal disease</td><td colspan="4">Possibility of wildlife damage, rat, monkey Hail, Water logging through excessive rain fall</td><td colspan="2"></td></tr>
</table>

Source: Source: Field visit (Ilam, Dolakha, Rolpa, Dang), 2021 and 2022

Animals damage the cardamom crop from its seedling stage to fruit ripening period as continuous threat. Cardamom is a vulnerable crop and monkeys; porcupines and other animals depredate it. "Monkeys also eat seedling stage of cardamom and its buds," says a local farmer. Similarly, the long-time storage of cardamom is also found detrimental to farmers. Farmers want to sell the cardamom as soon as they harvest it to avoid the risk in future. Once it is stored for a long time, its weight is gradually lost. "As the time of cardamom storage is increased, cardamom gets shrinked and weight gets lost. As a result, price becomes lesser," said Sarita Phago, a local farmer from Ilam district.

In the beginning, cardamom, plants were purchased in Nepali Rupees (NRs) 4 to 10 per seedling according to district and place. In Ilam district, it is cheaper and becoming more and more expensive in Dolakha and Rolpa districts gradually. The trade route of cardamom involves stakeholders including (i) local level farmer/producer, (ii) district level aggregation, (iii) export to India from ground transportation adjoining border area of Nepal such as Mahendra Nagar, Nepalgunj, Krishna Nagar etc., (iv) national actors in Kathmandu, and (v) international market. The growing knowledge about production is enabling farmers to produce it more. The technology of cardamom processing is still primitive in nature. The cardamom is graded based on color. The first point of contact for trading cardamom starts from the household themselves. Local trader approaches household also as their first point of contact. They visit individual household level at producer level and negotiate the price.

The proximity matters in trade. Producers, collectors and traders all intend to shorten the routes. The specific trade root of the study area is as following:

Table 2: Trade route

District	Domestic trade route	International trade route (India)	International trade route (Other countries)	Remarks
Ilam	Ilam (Jhapa, Madhesh province, Chitwan)	Eastern border to India (Kakarvitta, Pashupati Nagar)	Via Kathmandu	Most of the export route is adjoining India border and border of Jhapa district

Dolakha	Charikot (Major hub of the district)	Mostly, local traders aggregate and transport it to Kathmandu	Via Kathmandu	Ground transportation to Dhulikhel and Kathmandu. Transportation from Dhulikhel to Janakpur is also in practice
Rolpa	Dang (Nepalgunj, Krishna Nagar)	Local traders collect and trade to India through Nepalgunj, Krishna Nagar (Production is very low)	Via Kathmandu	Most of the export is to India from Nepalgunj and Krishna Nagar via Dang district
Dang	(Nepalgunj, Krishna Nagar)	Local traders collect and trade to India through Nepalgunj, Krishna Nagar	Via Kathmandu	The production scope is in the hilly area of Dang district

Source: Field visit (Ilam, Dolakha, Rolpa, Dang), 2021 and 2022

The cardamom farming is already institutionalized in Ilam district. The cardamom price fluctuates each year. However, the price 6 US $ (NRs 800) per KG for cardamom was a standard price found during field visit.

Cardamom, Climate Change Adaptation and Linkage in Value Chain

The study has explored that cardamom value chain is analyzed from adaptation perspectives as well (Sharma et al., 2017; Nelson et al., 2007). At the producer's stage of value chain, direct benefit from climate change adaptation strategy has been noted through direct sale of the production. In all other subsequent value chain aspects, use of local resources and economic benefit are the most important elements. Similarly, diversifying income from the same piece of land adapting bee keeping, mushroom and livestock, poultry etc. also contributes to the livelihood's enhancement and resilience.

The result below is a common finding and specific finding of the district from climate adaptation perspectives.

The SWOT analysis of cardamom value chain is as following:

Table 3: SWOT analysis of cardamom value chain and linkage to climate change adaptation

Aspect	Input supply	Production	Processing	Packaging	Marketing	Trading
Climate change perspectives	Focus on local situation (Local resource)	• Direct benefit from switching the crops (Climate Adaption process) • Economic benefit (livelihoods improvement) • Diversifying income from same piece of land by bee keeping, mushroom and livestock, poultry etc • Eco-friendly process Nature based solution	• Economic benefit (livelihoods improvement) • Contribution to resilience • Eco-friendly process	Economic benefit (livelihoods improvement)	Economic benefit (livelihoods improvement)	Economic benefit (livelihoods improvement)
Strength	• Land & availability (personal l&, community, CFs)	• Seedlings available at locally (Ilam, Dolakha)	• Lack of technology is still a critical issue (Traditional technology use)	• Packaging material support needed • Entrepreneur getting higher price of	• Community is aware about the local marketing process	• Cardamom Trading history is more than 3 decades in Ilam; Rolpa &

	• Wage worker availability & economic prices • Indigenous & local material use • Availability of supports from different organization & business support as well	• Household level production is recorded for last 15 years (Rolpa) • Prospect of production is available in hilly area of Dang district • Higher commercial collection (Ilam) • High potentiality growth at local village as well as community forest • Source of water is available • Locally available & no collection barrier • Collectors utilize their leisure time for additional income at community	• Well knowledge about processing method to the entrepreneurs through interaction meetings (Ilam, Dolakha) • Electricity (national grid/micro hydro) facility for making product at local level	packaging & its market is higher than non-packaging	• Supported needed to make them marketing beyond outside of Rolpa & Dolakha districts	Dolakha are recent with 10 years • Producer aware about price in the market

Weakness	• Inadequate inputs suppliers & chemicals (Cardamom) • Fertilizer is not available timely (Cardamom)	• Inadequate knowledge on modern technology • The irrigation channel from source of water to farm & is lacking (cardamom specific) • Motivation to the group members on processing at local level is lesser • Fertilizer availability	• Reliance on Fire-wood furnace (Rolpa, Dolakha) • High operational cost due to lack of technical know-how (Rolpa, Dolakha) • Poor quality due to use of traditional technology creating problem in external marketing • Training about product diversification needed • Excursion to eastern hilly zone to learn new ideas	The practice of aggregation of product does not exist. As a result, quality packing at producer level is not practiced	• Not fixed price, fluctuation • No proper & updated market information • The coordinated approach of dealing market does not exist	• High price fluctuation & not fixed price • Inadequate proper & updated market information
Opportunity	• Job creation prospect at the local level	• Hilly site of Dang district suitable for	• Knowledge on new processing technologies	Prospect of high return to the producers	• Potential market for products	Potential market for products

		cardamom production • Higher economic benefits • Possibility of establishing more cardamom nurseries employment opportunities to the rural poor people	Develop product diversified for better options		Possibility of linkage to Kathmandu, and other countries	
Threat	• The local entrepreneurs do not have skills and appropriate technology for product diversification at municipal and district level	• Crop damage by Monkey, Kala (an animal) • Pathogenic problem: Phurke disease and others • Drying of water sources	• Due to firewood furnace, pressure on forest area • Lack of modern technology for cardamom product making • In some places, there is only one	Adulteration of different quality of cardamom	• Entrepreneur themselves search market • Constraints on direct access of any trader in village/ external market constraint	Price fluctuation

		• Unavailability of appropriate technology for processing –applied traditional technology	furnace to dry cardamom • Threat for rotting of cardamom exists due to long storage		• Lesser marketing competition • Price fluctuation	

Source: Field visit (Ilam, Dolakha, Rolpa, Dang), 2022

The cardamom value chain was explored in four districts and the basic understanding about the value chain of cardamom follows following path. Mainly the following supply chains are used in marketing cardamom products. The whole supply chain of cardamom is attributed to the promotion of nature-based solutions.

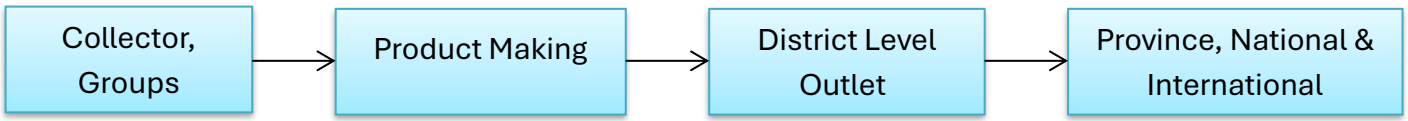


Figure 5: Supply chain of cardamo

Value addition and product diversification

As discussed in theoretical framework, the adaptation strategy has connection with livelihoods enhancement (Clay, 2018, Nelson et al.,2007). The value addition and diversification provide the opportunity to farmers towards sustaining livelihoods and resilience. This is also supported by studies and theory (Folke, 2010). Both value addition and product diversification are critical to it.

Value addition

The value addition consists of processing, grading and associated stages as an important part. The processing part is one of the challenging aspects in all crops. The processing part of cardamom is relatively better in Ilam district with the application of electric furnace. It has energy efficiency and lowers the carbon footprint avoiding firewood furnace. In other districts, firewood is used to process cardamom. The processing was explored poorer mostly from firewood furnace and that from sun burning. This type of process was recorded in Dolakha and Rolpa districts. Similarly, the community people do not grade it based on category. Conventional practice of subjective grading is in practice. Similarly, the process of tail cut among others is also in existence. The other forms of grading based on structure rot and not rot is also in practice. Similarly, some of the farmers of the community have received capacity development training.

Table 4: Value addition constituents

Value addition constituents	Actors	Barriers
The seed/seedling system	Farmers, seed researchers, seed bank	The seedling availability is informal, the availability of good seedling is lower and there is no choice for farmers (except Ilam district).
Production system (quality, variety, availability)	Farmers, including producers, farmer groups, cooperative farmers	Inadequate production (Dolakha), the availability of different types of seedlings is lower (Rolpa, Dang, Dolakha) and there is also a lack of production technology (Rolpa, Dang, Dolakha)

Processing and value addition	Farmers, processing etc.	Processing is labor intensive, and value addition is less than expected. The process is not women friendly.
Increasing market aspect (All types of formal and informal market)	Cooperatives, traders, etc.	Producers do have bargain capacity. Individual households sell it.
Policy approach	Farmers, traders, etc.	Inadequate research and infrastructure is poor

Source: Field visit (Ilam, Dolakha, Rolpa, Dang), 2022

Product diversification

Product diversification is one of the important aspects of farmers. "Farmers tend to diversify products for enhanced income and tackle climate change effects such as drought, crop failure," said Sarala Budha, a local farmer. In the value chain, such diverse products provide the opportunity of better income.

DISCUSSION

The production of cardamom in Ilam district is recorded for more than three decades (Magar et al., 2022). Similarly, the trend of cardamom production in Dolakha district is relatively new. The Rolpa district has been the cardamom producer (at least on household level) for a long-time though on a very small scale. However, still this product has not been accounted in MoALD national accounting system (CBS, 2013; MoALD, 2023). Despite the suitability of sites, temperature and other niche factors in Dang district, the production of cardamom has not started yet. At individual level, cardamom plantation exists but not in an entrepreneur level.

The introduction of cardamom is an adaptation strategy of community addressing the adverse effect of climate change. The key species have been game changers in the community (Kattel et al., 2020). For example, cardamom has been an important species for enhancing rural livelihoods (Hasan et al., 2023; Shreshtha et al., 2020). The acquired learning from Ilam, Dolakha districts are good examples for other prospective hilly areas (Dhungana et al., 2023).

Cardamom is considered one of the proven climate change adaptation strategies in hilly areas of South Asia (Possibia et al., 2022; Sharma et al., 2015). The reflection of this development in India has helped Nepal to adapt this crop. Cardamom has been perceived as viable income generating species for rural livelihoods (Dhungana et al., 2010). Cardamom crop is practiced in all provinces of Nepal (MoALD, 2023; KC et al., 2016).

The cardamom is a switching strategy from traditional crop to new crop to tackle adaptation challenges. The switching concurrently enhances income with increased resilience of farmers. This empirical finding from the field is substantiated with the studies. The finding explores the relation of adaptation, livelihoods and resilience as addressed in conceptual framework. The study finding from different study also suggests that crop switching for income generation and livelihoods is closely linked with the adaptation strategy to address the adverse impact of climate change (Cooper & Messina, 2023; Taylor, 2022). Similarly, different strategies are applied to climate change and crop switching being one of the prominent strategies (Nor Diana, 2022). Farmers have switched traditional crops to cardamom in other parts of South Asia (Bhutia et al., 2017).

Cardamom is also considered in agro-forestry model with *Alnus* and *Albizia* species (Paudel & Shrestha, 2022). Similar practices in different part of the country are also reported where cardamom is regarded as one of the climate change adaptation strategies and enhancing livelihoods in mid-hills of Nepal (Ranabhat et al., 2023; KC et al., 2016). Unfortunately, on some cases duplicate large cardamom has been found labelled as Nepal's production is also reported (GoN, 2017). It needs to be curbed timely.

It can be argued that switching towards crops such as cardamom from other conventional crops enhanced the resiliency and livelihoods of the farmers through increased income (Shrestha et al., 2018, Yazdanpanah, 2022; Carmen et al., 2022). This secondary review supports the claim that switching cardamom is an adaptation strategy that has potential for livelihoods enhancement and resilience. It further enabled the community to manage their bare land because of shortage of human resources for conventional farming practice (Pun, 2018).

CONCLUSION

The growing trends of cardamom production of national and sampled area indicate that farmers are enthusiastic about this cash crop innovation. The motivation of switching of the conventional crop to cardamom and insights of the farmers has revealed that cardamom cultivation continues to grow because the income with increased

adaptation, and its contribution on livelihood. The production aspect is linked to sustainability as stock. The processing part of cardamom is relatively with weaker focus area. Cardamom processing in some areas still rely on conventional firewood hearth for cardamom drying purpose. Use of conventional firewood contributes to deforestation. The high fluctuation of market price of cardamom year to year is making it indecisive to farmers to sell it. It makes them confusion about the sale, if they wait longer, the risk is there. If they do not wait, the price is lower.

Communities are reaping advantages from switching of the crop. Ilam and Dolakha are already in the cardamom scenario of Nepal, but Rolpa and Dang are progressing towards this. Despite the long tradition of trading history of cardamom, producers are not still linked with the major hub of marketing such as capital city Kathmandu adequately. The production Cardamom in Rolpa district and possibility of cardamom production hilly part of Dang district needs intervention. Similarly, the link to the international market is constrained. The farmers switch crops for adaptation purposes. The increased resilience and livelihoods through adaptation makes cardamom farming an innovative approach among rural farmers.

Acknowledgements

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Disclosure statement

The finding of this paper is original, and the first author has conducted field work in Dang, Rolpa, Dolakha and Ilam districts of Nepal.

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