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Farmers' perception, knowledge and practices towards decline in production of large cardamom in Sankhuwasabha district of Nepal

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Abstract

Large cardamom (*Amomum subulatum* Roxb.) is a vital crop and a symbol of national identity in Nepal, particularly serving as a primary source of livelihood for farmers in the eastern hill regions. In recent years, cardamom production has declined markedly presenting serious challenges to major growing districts. This study aims to assess farmers' perceptions, knowledge, and management practices related to large cardamom decline in Sankhuwasabha district. A total of 84 cardamom farmers were selected using a simple random sampling technique for an in-person household survey. The results indicate that 72.6% of respondents are experiencing severe crop decline, with many plantations in critical condition. The issue has persisted for over five years. Most farmers attributed the decline primarily to pest and diseases. Alarmingly, 89.3% of growers anticipated complete orchard collapse within the next 2–3 years if the situation remains unaddressed. While farmers expressed frustration over the ineffectiveness of past interventions, 70.2% remained hopeful that improved management practices could reverse the trend. The decline has significantly affected 67.9% of orchards, though some have shown slower rates of deterioration. Notably, 76% of farmers lacked adequate awareness regarding the causes and control measures for the decline. Approximately 60% continue to follow traditional cultivation practices, with most relying on mechanical and cultural methods for disease and pest management. Limited technical knowledge and poor access to agricultural inputs were identified as major constraints to the adoption of effective management practices.

Keywords: Large cardamom, decline, orchard, perception

Introduction

Large cardamom (*Amomum subulatum* Roxb.), commonly known as hill cardamom, Bengal cardamom, greater cardamom, Nepal cardamom, or black/brown cardamom, is a major high-value cash crop predominantly cultivated in the eastern Himalayan region of Nepal (Sharma *et al.*, 2000; Tangjang & Sharma, 2018). It plays a critical role in the livelihoods of hill farmers and contributes significantly to Nepal's agricultural exports (Shrestha, 2018). The favorable agro-climatic conditions of eastern Nepal, particularly in districts such as Taplejung, Panchthar, Ilam, Sankhuwasabha, and Terhathum, support

large-scale cardamom cultivation. These regions collectively contribute over 80% of the nation's total production (Kattel *et al.*, 2020), with Sankhuwasabha alone producing 917 metric tons across 2,871 hectares (MoALD, 2021). Approximately 67,000 households are directly involved in large cardamom farming, and the crop is cultivated across a range of land types from fertile valleys to marginal sloping terrains due to its relatively low labor requirement and consistent market demand (George *et al.*, 2007; ICIMOD, 2016). Nepal exports nearly 95% of its cardamom production to India, positioning itself as the world's leading producer and exporter (Shrestha, 2018). Despite its economic importance, the large cardamom sector is facing a series of critical challenges. Production and productivity have shown significant fluctuations over the past decade, with a consistent decline in yield since 2010. Factors contributing to this downturn include disease outbreaks, climatic variability, orchard degradation, and inadequate farm management practices (Pun, 2019; MoALD, 2021). This decline has had adverse socio-economic implications, such as reduced household income and increased food insecurity in affected regions (Klasen *et al.*, 2013).

The sector is further hindered by widespread reliance on traditional cultivation techniques, insufficient investment in research and development, limited farmer awareness, and weak market infrastructure. As a result, despite its commercial potential, cardamom farming in many areas remains at a subsistence level (Yadav *et al.*, 2015; Acharya, 2019). A considerable proportion of growers lack technical knowledge of orchard management and are unaware of the factors contributing to yield loss (Khatiwada & Piya, 2009). Biotic and abiotic stresses, coupled with the adoption of unscientific agricultural practices, have significantly compromised productivity (Chaudhary *et al.*, 2015; Tangjang & Sharma, 2018). These challenges highlight the urgent need for targeted interventions focused on improving farmer knowledge, correcting misconceptions, and promoting sustainable cultivation practices. A comprehensive understanding of farmers' knowledge, perceptions, and practices (KPP) is essential to diagnose the root causes of cardamom decline and design effective mitigation strategies. Strengthening farmer capacity and promoting evidence-based agricultural practices will be crucial in revitalizing Nepal's large cardamom industry and ensuring its long-term sustainability.

Methodology

Study site

The study was conducted in two major cardamom producing wards of Sabhapokhari rural municipality in Sankhuwasabha district (27° 27′ 0.07″ N and 87° 18′ 0″ E).

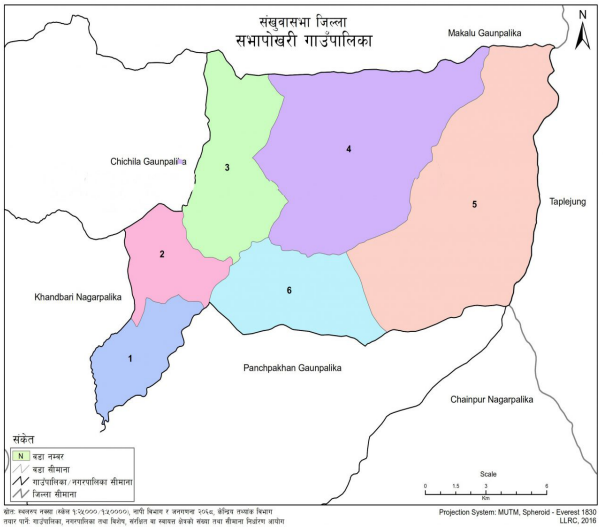

Fig 1. Map showing research district and sites (Tiwari, 2020)

Data collection methods

A total of 84 households were selected using a simple random sampling technique. Data collection was carried out through focus group discussions (FGDs) and key informant interviews (KIIs) to assess farmers' knowledge, perceptions and practices related to large cardamom cultivation as well as to examine production trends in the study area. The fieldwork was conducted between May and June 2022.

Data analysis

The collected data were compiled and analyzed using IBM SPSS Statistics version 25.0 and Microsoft Excel. Analytical procedures were applied based on the type and nature of the data to ensure accurate interpretation and presentation of results.

Results and discussion

Demographic status of large cardamom farmers of Sankhuwasabha, Nepal

Among the respondents, 69% were male, with male members predominantly serving as the heads of households. The average age of the respondents was 43.95 years. An overwhelming majority (94%) belonged to the Janajati ethnic group. Regarding family composition, 52% of the respondents lived in nuclear families, whereas 48% resided in joint families. Agriculture was the principal occupation for 96% of the participants, with large cardamom being the primary crop cultivated. These demographic details are summarized in Table 1.

Table 1. Demographic status of respondents

Variable	Mean	S.D.	S.E.M.
Gender	0.69	0.465	0.051
Gender of household head	0.80	0.404	0.044
Age	43.95	13.51	1.475
Ethnic group	0.94	0.238	0.026
Education status	0.68	0.470	0.051
Family size	0.52	0.502	0.055
Occupation	0.96	0.187	0.020

Farm size and farming status of large cardamom growers

Table 2 presents data on the farming experience and landholding size of large cardamom farmers in the study area. In Sankhuwasabha district, large cardamom serves as a primary source of income for many farmers. The survey revealed that while the overall area under cardamom cultivation remained relatively stable, many orchards were experiencing a decline in productivity. The largest group of farmers (32.1%) owned more than 15 ropani of land, followed by 21.4% who had farms ranging from 6 to 10 ropani. Meanwhile, 19% of the farmers cultivated cardamom on plots smaller than 5 ropani. Large cardamom cultivation is believed to have a long historical presence in the region. In terms of farming experience, 39.1% of farmers had been cultivating cardamom for over 20 years, 32.3% had between 11 to 20 years of experience, 17.3% had been growing it for 6 to 10 years, and 11.3% were relatively new growers with less than 5 years of experience.

Table 2. Farm size and farming experience in cardamom production

Farm size (ropani)	% distribution	Farming experience (yrs)	% distribution
< 5	19	<5	11.3
6-10	27.4	6-10	17.3
11-15	21.4	11-20	32.3
>15	32.1	>20	39.1

Decline status of large cardamom

In the study area, most farmers have been experiencing a significant decline in large cardamom production over the past several years. Among the respondents, 72.6% reported facing a severe problem, while 14.3% experienced a slight decline, and 13.1% reported a moderate decline. These findings align with those of Manger *et al.* (2017), who noted a downward trend in both the cultivation area and production volume of large cardamom in recent years. Figure 2 illustrates the timeline of the emergence of this decline.

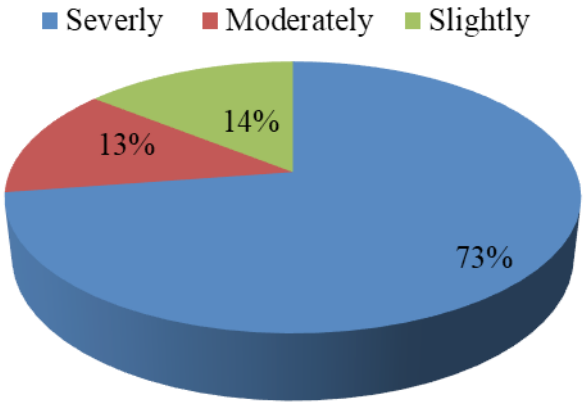

Fig. 2. Time period of emergence of decline of large cardamom

According to the survey, 42.9% of farmers reported that the decline began more than five years ago. Another 22.6% stated they had been facing the issue for exactly five years, while 29.8% indicated the problem started within the last two to three years. Only 4.8% said it had become noticeable just in the past year. This suggests that the majority of farms have been severely affected for more than five years. These results are consistent with Pun (2019), who observed that the decline in large cardamom became particularly severe after 2010. Figure 3 illustrates the severity of the issue in the study area.

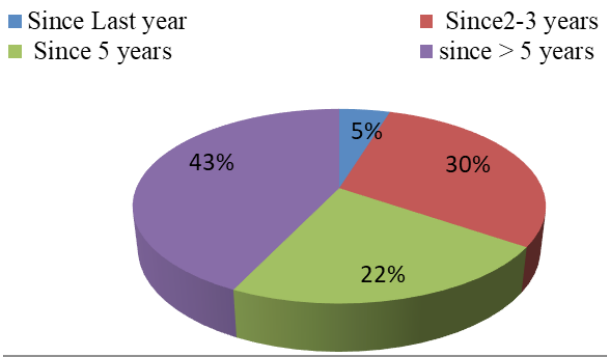

Fig. 3. Severity of decline in large cardamom

Farmers' perception on cause, effect and management of large cardamom decline

The study revealed that farmers held varied perceptions regarding the causes, consequences, and management practices related to the decline of large cardamom cultivation. A significant proportion of respondents (91.7%) identified plant diseases particularly blight, rhizome rot, *chirkey*, and *foorkey* as the primary causes of decline, a finding consistent with earlier research by Dhakal and Shrestha (2004). Likewise, 85.7% of farmers attributed the decline to pest infestations, with the hairy caterpillar being the most commonly cited. Farmers noted that pests feeding on cardamom leaves caused visible damage to vegetative parts, while disease-affected plants typically exhibited symptoms such as yellowing, reduced vigor, and rhizome decay. Furthermore, 60.75% of respondents believed that the widespread use of transplanted suckers as planting material contributed to the decline. Although these planting materials initially produced satisfactory yields, productivity diminished after one to two years. Climatic variability was also perceived as a key contributing factor by 57.1% of farmers. Among the climatic concerns, drought (referred to locally as *sukkha lagne*) and erratic rainfall patterns were most frequently mentioned. Soil degradation was identified by 53.6% of farmers as a major issue, with many attributing it to prolonged monoculture practices that depleted soil fertility. Additionally, 51.2% considered shade trees especially dense and aging *Alnus* species to be detrimental in certain areas. However, some farmers countered this claim, noting that orchards without shade also experienced severe decline. Only 27.4% of respondents believed that nutrient deficiency due to insufficient manure application was a significant factor. Among those who agreed, it was noted that prolonged use of the same land had led to nutrient exhaustion, warranting soil amendments. Nevertheless, many farmers viewed the use of manure and fertilizers as unnecessary or impractical, arguing that in earlier years, cardamom yielded well without their application, relying instead on natural forest litter. A smaller proportion (27.4%) associated the use of sprinkler irrigation with the decline, citing instances of leaf yellowing as a possible consequence. Weed infestation was regarded as a minor issue, with only 21.4% of respondents identifying it as a cause.

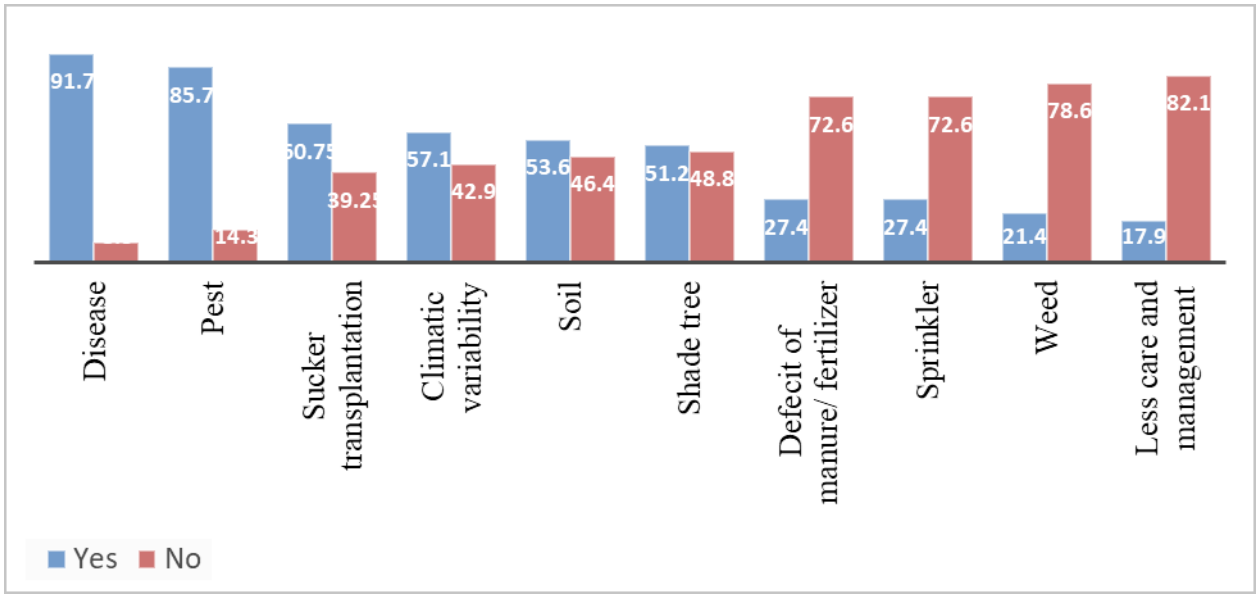

Fig. 4. Farmers perception of causes of decline of large cardamom

They noted that minimal weeding sufficed in the past. Similarly, only 17.9% believed that inadequate care and management practices were responsible for the observed decline.

These findings support the conclusions of Sony and Upreti (2017), who reported that farmers primarily attributed the decline in large cardamom cultivation to disease, while also recognizing the potential roles of improper fertilizer use, climatic changes and outdated agricultural practices. Figure 4 presents a detailed breakdown of farmers' perceptions regarding the causes of the decline.

The decline of large cardamom cultivation has reached a critical stage, with projections indicating that most orchards may be severely damaged within a few years. The livelihoods of farmers have already been significantly affected. An overwhelming 89.3% of respondents predicted that, if the current trend continues, their orchards would collapse within the next two to three years. The issue is reportedly spreading rapidly in the orchards of 67.9% of farmers, while the remainder reported a more gradual spread of the problem. In recent years, many farmers had shifted from cultivating traditional crops such as rice and maize to large cardamom, seeking better economic returns. However, with the ongoing decline, 77.4% of respondents acknowledged a noticeable negative impact on their livelihoods. An additional 11.8% reported minimal impact so far, but anticipated being affected in the near future.

Most farmers lacked formal knowledge of effective management techniques and relied instead on their own practical experience. Nonetheless, 70.2% expressed optimism that the problem could be addressed if appropriate management strategies were made available. They agreed that effective management practices had the potential to mitigate the decline. In contrast, 54.8% of respondents were discouraged by the failure of their past efforts and believed that no intervention could resolve the issue. Furthermore, 45.2% considered management strategies to be impractical or unfeasible in their context, while a small portion (4.8%) stated that leaving the orchards unmanaged was preferable to applying ineffective measures. Farmers' perceptions regarding the effects of large cardamom decline and the feasibility of its management are summarized in Table 3.

Table 3. Farmers perception on effect and management of decline in large cardamom

Statements on effect	Yes (%)	No (%)
Orchard will be completely destroyed within few years	84.3	15.7
Largely spreading problem over the orchard	87.9	13.1
Largely affected livelihood	81.4	18.6
Not significant effect seen	11.8	88.2
Statements on management	Yes (%)	No (%)
Good management practices can mitigate the problems	70.2	29.8
It is not feasible to adopt management practices	45.2	54.8
No measures can mitigate the problem	54.8	45.2
Leaving as it is would better than management	4.8	96.2

Farmer's knowledge on large cardamom decline

Farmers in the study area were able to recognize the decline in large cardamom cultivation primarily through observable symptoms and a noticeable reduction in yield. Approximately 50% of the respondents identified the issue using both visual cues and declining production levels. Additionally, 27.4% recognized the problem solely through visual symptoms, while 22.6% became aware of it based exclusively on reduced harvests. In terms of knowledge regarding the management of the decline, 81% of farmers reported having some level of understanding, primarily derived from their personal experiences. A smaller proportion (11.9%) acquired knowledge through informal sources such as friends or media, while only 7.1% received information through formal training programmes. The methods by which farmers identified the decline and the sources of their knowledge are summarized in Table 4.

The survey revealed a low level of awareness among farmers regarding the causes and management of large cardamom decline. A significant majority (76.2%) of respondents reported having no knowledge about the issue or its mitigation strategies. Approximately 19% indicated limited awareness, while 4.8% were aware of the problem but had not taken any corrective actions. These findings align with those of Dhakal and Shrestha (2004), who also reported a lack of awareness as a key factor contributing to the inability of farmers to protect their orchards.

Farmers practices on large cardamom decline

Large cardamom has been cultivated for many years in eastern Nepal, with traditional methods still widely practiced across various regions. Over generations, farming practices have evolved to some extent. Among the surveyed farmers, 59.5% continue to follow traditional cultivation methods, while 27.4%

Table 4. Methods of identification and source knowledge of large cardamom decline problem

Methods of identification of problem	% distribution	Sources of knowledge about decline in large cardamom	% distribution
Based on visual symptoms	27.4	Own experience	81
Based on declining production	22.6	Informal sources	11.9
Using both	50	Training programs	7.1

have made moderate adjustments and 13.1% have implemented significant changes in their farming practices. These findings are consistent with Chapagain (2011), who observed that most farmers rely on indigenous knowledge and experience, with limited adoption of structured preventive or adaptive strategies to manage emerging threats. Historically, cardamom cultivation involved minimal monitoring, no use of agrochemicals and was largely based on conventional practices. Although the overall approach to farming has not changed drastically in recent years, some farmers have begun integrating improved practices. These include the use of micro-propagated planting materials, disease and pest management strategies, routine weeding and irrigation, adoption of modern drying units (*bhattis*), and greater attention to timely farm operations. Regarding orchard monitoring, 59.5% of farmers reported conducting regular checks, while 29.8% monitored their orchards during critical periods such as weeding, irrigation, and harvesting. A smaller group (10.7%) monitored their fields infrequently. Details on the extent of changes in farming systems and orchard monitoring priorities in Sankhuwasabha district are presented in Table 5.

Farmers in the study area employed various management practices to address the decline in large cardamom production. As illustrated in Figure 5, the most commonly adopted methods were cultural and mechanical in nature. A majority (71.4%) of respondents reported removal of affected plant parts, though often without following proper disposal procedures. Additionally, 38.1% of farmers responded by changing crop varieties or shifting cultivation to different fields. A notable portion (35.7%) used commercially available chemical treatments, typically without adequate safety precautions or technical guidance. Furthermore, 28.6% resorted to burning the damaged plant materials as a control measure, while 17.9% of farmers didn't implement any mitigation practices.

Table 5. Changes in management practices in Sankhuwasabha district

Changes in farming system	% distribution	Orchard monitoring frequency	% distribution
Highly changed	13.1	Regular monitoring	59.5
Moderately changed	27.4	Monitoring at critical stages only	29.8
Very little changes	59.5	Rarely monitored	10.7

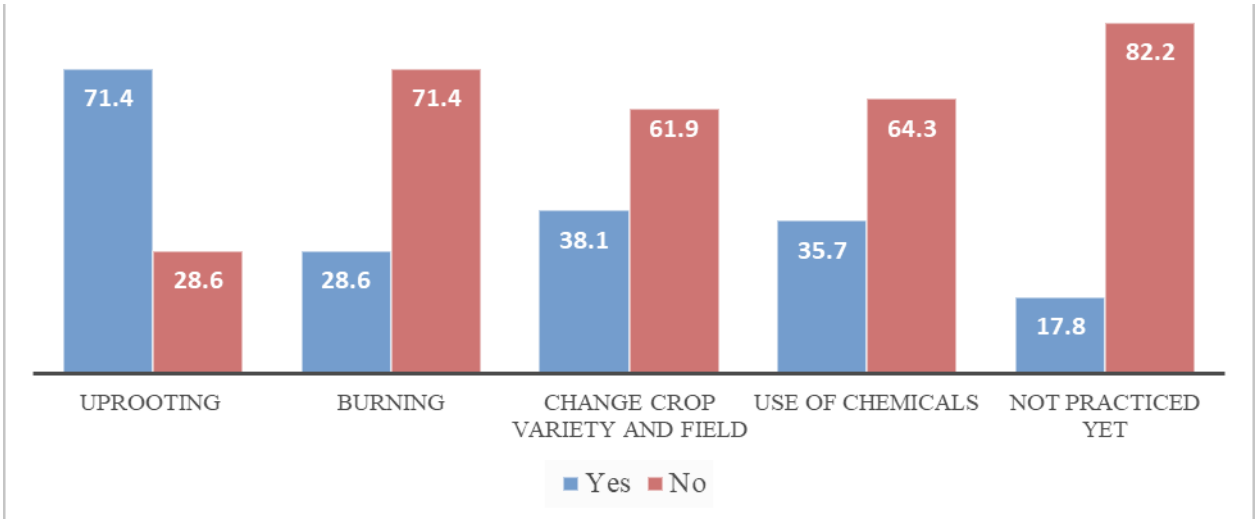

Fig. 5. Methods of management practices for addressing decline of large cardamom

Table 6. Determinants of adoption of large cardamom decline mitigation measures

S.N.	Determinants	Index value	Rank
1	Lack of knowledge	0.73	I
2	Lack of inputs	0.71	II
3	Difficulty in management	0.41	III
4	Lack of interest	0.25	IV

Factors affecting adoption of mitigation measures in Sankhuwasabha district

Table 6 highlights the key factors influencing the adoption of mitigation strategies among cardamom growers. These determinants were ranked based on their scale value as reported by the respondents. The primary barrier identified was a lack of knowledge, which limited many farmers' ability to implement effective management practices. More than half of the participants reported facing challenges in managing the problem effectively.

Conclusion

The decline in large cardamom cultivation has emerged as a significant threat to the eastern hills of Nepal. Situational analysis indicates that farming of this crop has been severely impacted, posing potential risks to the livelihoods of farmers and affecting both national and international trade. Farmers primarily perceive pests and diseases as the main problems, although the exact causes have yet to be scientifically identified. In response, farmers have been using traditional knowledge and experience to manage these issues. However, these indigenous methods have not proven sufficient. If current conditions persist, large cardamom cultivation may be abandoned in the near future. This could jeopardize Nepal's unique identity in the global spice industry. To address this crisis, all relevant stakeholders must prioritize the development and implementation of farmer-focused programs. Identifying the root causes, understanding the crop's biology, and developing effective management strategies are essential first steps. Moreover, it is crucial to promote the widespread dissemination of scientifically backed coping mechanisms among farming communities.

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