

Akabare Chili Amplifies the Household Income of Farmers in the Mid-hills of Nepal

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Abstract

Akabare chili (*Capsicum* spp.) is becoming a popular spice cash crop for Nepalese farmers. However, its production and marketing have been challenged by various factors. A study of the cultivation, marketing and economic potential of Akabare chili is imperative. Information on the distribution and marketing of Akabare chili production and its economic value in farming households are collected from the desk review, field studies at seven locations in 2021 and a telephone interview with the chili growers in 2023. Akabare chili contributed 6.42% and 4.99% to the total national chili cultivated area and production, respectively, with 0.47 kg per capita consumption in 2021. Akabare chili with a value of 1,385 million Nepalese rupees was traded domestically in 2021. Insect pests (14.1%), diseases (13.1%) and drought stress (12.3%) are considered the main problems in cultivation. Despite the existing challenges, the area and production are increasing annually and Akabare chili is becoming a means of income generation. On average, Akabare chili farmers got 36% to 53% extra price for Akabare chili compared to common chili with a gross profit of 189%. From a ropani of land, an Akabare chili farming household earns a gross profit of NPR 80 – 218 thousand for 10 – 12 months. Crop variety improvement with the recommendation of standard agronomical practices and efficient market management strategy will further amplify the economic role of Akabare chili among households in hilly areas.

Keywords: agronomy, biotic and abiotic stress, economy, marketing, production

Introduction

Chili (*Capsicum* spp.) is a native of Latin America and is commonly grown for its spicy fruits around the world (Barboza *et al.*, 2022). Out of a total of 43 species of *Capsicum*, three species namely *C. annuum*, *C. baccatum* and *C. frutescens* and some chili collections on the border between the *C. annuum* and *C. frutescens-chinense* groups are reported under cultivation in Nepal (Nemoto *et al.*, 2016) covering approximately 23,000 hectares of land in all 77 districts, ranging from tropical to temperate agro-climatic conditions (MoALD, 2022). A total of 16 chili cultivars are released and registered for commercial use and some chili landraces, for example, Akabare chili, is also popular among growers. However, to date, no improved variety of Akabare chili is listed for commercial use (SQCC, 2021).

The area of chili cultivation also increases with the increase in vegetable cultivation in the country. In 2021, vegetables and nurseries occupied 9% of Nepal's total agricultural land and contributed to the National Gross Domestic Product (NGDP) by 5.9%, where a contribution of nearly 1.3% came from fruits and spices (MoALD, 2022). In the same year, the vegetable sector contributed to Agricultural Gross Domestic Product (AGDP) by 16.7% and chilies by 0.7%. Chili consumption in Nepal has increased over the years with a growing per capita total capsicum consumption that reached 9.5 kg in 2021. Similarly, the per capita of Akabare chili in 2021 was 0.47 kg, 34% higher than that in 2020 (Poudyal *et al.*, 2023). The coverage by the Akabare chili cultivation district was found to increase in the mid-hills of Nepal. In 2021, Akabare chili was commonly grown in 54 districts of Nepal, nearly 13% more districts than in 2018. Most of the major producing districts were in hilly areas. In 2021, a larger

area of more than 1,480 ha came under cultivation, producing nearly 9,233 MT. Akabare chili alone contributed 6.42% and 4.99% to the total chili cultivated area and production, respectively (Poudyal et al., 2023).

There may exist different sources of income for the farming household. In hilly areas, sources like agriculture, for instance, livestock rearing, fresh vegetable cultivation and grain production; wage/salary and remittances are common where agriculture dominates others with more than 50% shares in household income. Akabare chili serves mainly as a spice crop, with a significant proportion used for fresh consumption (green and ripe) and processed items, such as pickles. It is becoming popular as a cash crop and one of the main sources of household income. Akabare chili is mostly famous among ethnic groups, in particular, ethnic people of Kathmandu valley (Newars), Terai (Tharus, Rajbansis, Yadavs, etc.) and hills (Thakali, Gurung, Tamang, etc.). The ethnic group uses Akabare chili in their traditional food items of cultural value, however, despite ethnicity, many Nepalese consume chili regularly. With the belief in its medicinal value, consumption of this wonder spice is increasing (Chung & Campbell, 2016; Nemoto et al., 2016).

The demand for Akabare chili in the regional and domestic markets has increased over the years. The trend of using Akabare chili ingredients in food processing is also encouraging since Akabare chili provides a primary source of spicy condiments. In the pharmaceutical industry, chili has been used to extract oleoresin (Bhadragoudar & Patil, 2011). Some studies on the Akabare chili value chain have indicated the presence of a large market inside and outside the country (Chapagai et al., 2011). The potential roles and importance of this wonder spice in the household economy in hilly areas of Nepal should be explored and communicated among stakeholders. Understanding the role of various factors that challenge Akabare chili production and marketing will help to improve yield (Chaudhary et al., 2022; Lin et al., 2021) and adopt the crop largely in niches (Joshi, 2017) for continuous livelihood. This study aims to compile information on the Akabare chili distribution pattern in Nepal with major issues of production and marketing, the nature of the market that exists in the country and the profitability of the household economy.

Materials and Methods

As part of the desk review, information on Akabare chili production, distribution and trade was collected from Nepalese agriculture statistics published by the Ministry of Agriculture and Livestock Development in four different fiscal years (2018–2021). The desk review was complemented by field studies, telephone interviews and trials. Rapid Rural Appraisal (RRA) was carried out as a field study in seven districts, namely, Kathmandu, Bhaktapur, Makawanpur, Dailekh, Ilam, Tehrathum and Dhankuta (Figure 1) from December 2020 to January 2021. The districts were selected based on their classification in area coverage under Akabare chili production for the last three years 2018 to 2020. At the field level, an evaluation of production and marketing challenges was done by performing an RRA, as suggested by a field study tool (Mwongera et al., 2017). We collected first-hand information on production challenges, marketing-related problems, uses, cost of production and the economic importance of Akabare chili in the sites studied. We used a semi-structured checklist for focus group discussions and key informant interviews during RRA. The RRA was conducted in December 2020 and February 2021 and a total of 120 respondents participated in the field studies from seven sites out of them 54.2% were women.

During the RRA, additional information on seed sources, crop geometry, seedling mortality rate and fertilizer dose under current practices were also assessed. Information about the crop calendar, the estimated cost of production in a ropani land (508 sq. m), unskilled labor wages, fertilizer cost and associated taxes, if any, were also collected during the discussion. For any updates in the data obtained during the RRA, we conducted a telephone interview (9–12 February 2023) with six farmers from the respective RRA sites for up-to-date information on seasonal labor demand and unit price of Akabare chili products.

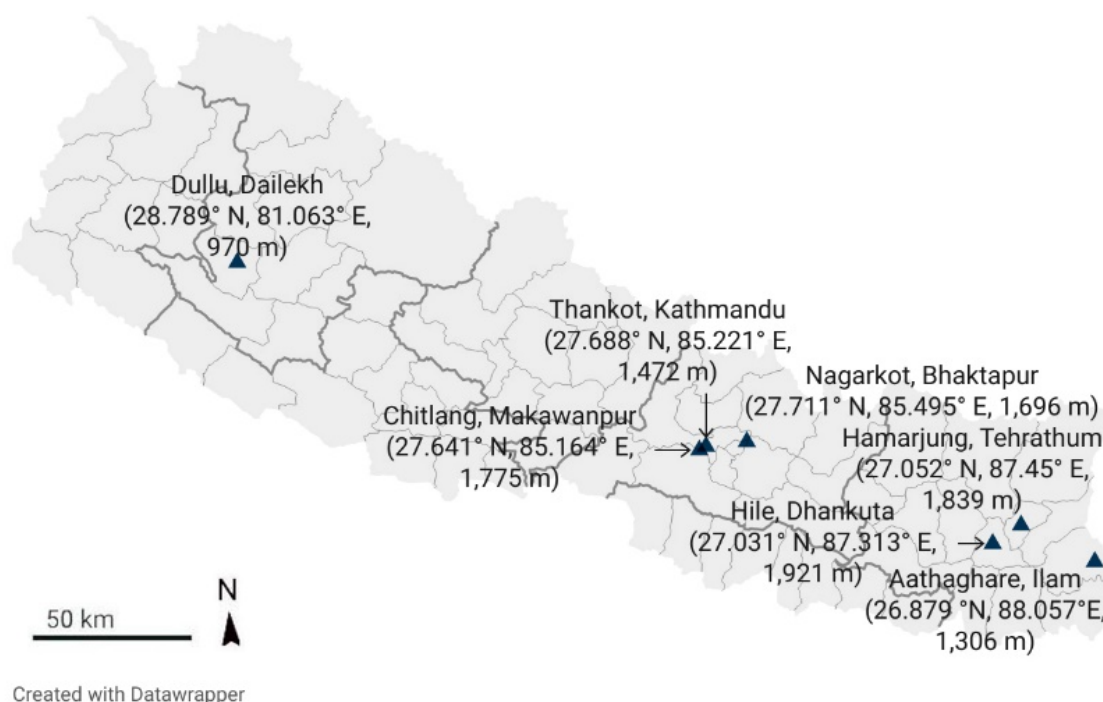


Figure 1. Nepal map indicating the Rapid Rural Appraisal (RRA) conducted locations in Akabare chili-producing districts during December 2020 and February 2021 (GPS coordinates and altitudes are shown in brackets). The map was created with Datawrapper, an online software developed by Datawrapper GmbH, Germany.

For a quick assessment of the production and trade of chili in the world, additional data on the respective fields were recovered from FAOSTAT, an updated dataset maintained by the Statistics Division of the Food and Agriculture Organization of the United Nations. Since some important information was missing from published sources and was also difficult to retrieve from the field study, assumptions were made when calculating and interpreting, for example, the per capita chili consumption, the amount of domestic seed production, the total value of Akabare chili traded, etc. People between the age of 15 and 64 years were considered chili consumers out of the total population of Nepal for the calculation of per capita chili consumption. Per capita use of Akabare chili was calculated as a fraction of the total Akabare chili production to the total chili consumers for the respective fiscal year. Experts in seed production and marketing were also consulted for their estimates of local seed production and trade. Similarly, the calculation of the overall seed requirement for chili in Nepal was estimated according to Alberta (2018). During the RRA, the average crop geometry for Akabare chili was noted as 0.45 m² per plant. The weight of Akabare chili seed was taken from the internal calculation done by SSSC (2022) as 7.142 ± 0.14 g (n = 24). The total amount of seed required for the total area under Akabare chili was estimated based on the calculated seeding rate per hectare as follows:

$$\text{Total seed required (kg)} = \text{Seeding rate} \left(\frac{\text{kg}}{\text{ha}} \right) \times \text{total Akabare chili acreage (ha)} \text{ -- I}$$

$$\text{Seeding rate, } \frac{\text{kg}}{\text{ha}} = \frac{\text{Desired plant population per sq.m} \times 1,000 \text{ seed weight (g)}}{\text{Seedling survival rate (decimal form)} \times 100} \text{ -- II}$$

$$\text{Seedling survival rate} = \text{Germination rate (\%)} - \text{seedling mortality (\%)} \text{ -- III}$$

For the calculation, the minimum seed germination was set to 65% as per Nepal's seed standard for common chili ((SQCC, 2021) and the average seedling mortality rate at 12% as discussed with farmers during the field study. The yield potential of Akabare chili observed during the RRA was compared with the field trial conducted at Thankot in 2022. In the field trial, we used five Akabare genotypes collected from the National Gene Bank and farmers' fields during the RRA. Six plants of each genotype were replicated three times and agronomical and morphological data were collected according to the capsicum descriptor (IPGRI et al., 1995).

Data collected during this study were analyzed using a simple spreadsheet and mean values were calculated and presented accordingly. For data visualization of the acreage distribution of Akabare chili, the Choropleth map of Nepal was developed by using the online software Datawrapper (Datawrapper GmbH, Germany) and the data from MoALD, 2022.

Results and Discussion

This article focuses on the distribution and production of Akabare chili in Nepal and discusses the main issues of production and marketing together with the possible contribution to farming households in hilly areas. Socioeconomic values are analyzed from the perspective of yield potential, employment creation, income generation and use of this wonder spice. In this section, we start with a quick overview of the world's chili economy followed by the current status of Nepal's chili business and finally present the Akabare chili production and trade of Akabare chilies in the country.

World's chili production and trade: a short overview

In the global chili business, India is the major exporter of dry chili, which is, in value terms, almost equal to the South American chili trade in 2020 (FAOSTAT, 2022). China leads behind India in the global chili trade (Table 1). In total, 1,852 million tons of chili (4.56% of the total global chili production) were traded for 4,187.6 million dollars in 2020 (FAOSTAT 2022). The green chili segment occupies 56.2% hectareage of the total chili area, contributing 89.7% to the total chili production whereas the dry chili segment covers 43.8% of the hectareage with a 10.3% contribution to the total global chili production in 2020 (FAOSTAT, 2022). Since India is a net exporter of chili, Akabare chili could satisfy the demand for chili in India.

Table 1. Global chili acreage and production in 2020 (data source FAOSTAT 2022)

Item	Country/region	Area harvested, '000 ha	Production, '000 MT
Chilies and peppers, green	Africa	407.11	3,622.04
	Americas	248.46	4,153.72
	Asia	1,309.79	21,710.31
	China	737.54	15,129.60
	Europe	102.43	3,250.04
	India	8.40	64.38
	Oceania	2.19	40.14
	World	2,069.99	32,776.26
Chilies and peppers, dry	Africa	370.69	892.06
	Americas	42.05	113.66
	Asia	1,196.95	2,734.51
	China	46.05	278.99
	Europe	5.45	30.36
	India	683.00	1,543.71
	Oceania	0.00	0.00
	World	1,615.14	3,770.58

Nepal's chili distribution and production

Akabare chili production in Nepal is increasing over the years. Table 2 shows the area, production and productivity of chili for the last four years in Nepal, indicating lower Akabare chili productivity in 2021 compared to national chili productivity.

Table 2. Area, production and productivity of common chili (hot pepper) and Akabare chili in Nepal for the last four years (data source: MoALD (2022))

Year	Area, ha		Production, MT	
	Akabare chili	Total chili	Akabare chili	Total chili
2021	1,481	23,083	9,233	184,885
2020	968	20,439	7,230	170,653
2019	1,186	21,565	6,976	174,374
2018	1,036	20,576	4,673	155,383

The distribution of chili production in the country is widely spread. In 2020, Nepal contributed to the total chili production by 6.9%, 0.6% and 0.4% in South Asia, Asia and the world, respectively (FAOSTAT, 2022). In Nepal, the area and chili production in the last four years (2018 to 2021) showed little ups and downs (Table 2). Overall, the total chili production trend is increasing. However, a reduction in the Akabare chili hectareage by 18% surfaced, with a slight change in production (+4%) in 2020. Again in 2021, both area and production of Akabare chili increased by 53% and 28%, respectively. Total chili hectareage and production increased by 13% and 8%, respectively, in 2021 compared to 2020.

The Choropleth map of the district-wise distribution of the Akabare chili hectareage in Nepal appears in Figure 2. However, almost all districts produce chili in the same year. Morang district ranked the highest for both hectareage and common chili, contributing 13.6% to national chili production, followed by Kailali and Pyuthan, contributing 7.8% and 6.3%, respectively (MoALD, 2022). In the case of Akabare chili, it is grown in 54 districts. Most of the districts are in the mid-hills region, representing a subtropical humid climate (Figure 2). Looking at the data for the fiscal year 2020/2021 (MoALD, 2022), Bhojpur ranked first for both hectareage and production, contributing 18.1% to the national Akabare chili production, followed by Panchthar, Dhankuta and Ilam, contributing 15.1%, 11.1% and 8.8%, respectively.



Figure 2. Choropleth map of Nepal showing the Akabare chili production area (ha) in districts for the year 2021, data source: MoALD (2022). Maps developed with Datawrapper, an online software developed by Datawrapper GmbH, Germany.

The top ten districts occupy 75.8% of the total area and 69.4% of the total production of Akabare chili in the country with a productivity of 5.5 MT/ha. Averaged over the last four years, Panchthar and Ilam districts were ranked first and second in terms of hectareage and production, respectively (Table 3). Out of ten, 70% of the districts are in the eastern mid-hills of Nepal, indicating the popularity of the crop in the region.

Table 3. Total area, production and ranking by area and production of Akabare chili in Nepal. The data averaged the area coverage and production of Akabare chili landraces for the last four years (2018 – 2021) (Data source: MoALD).

District	Area, ha	Production, MT	Ranking by area	Ranking by production
Panchthar	181.96	1,177.72	1	1
Ilam	165.45	762.74	2	2
Khotang	146.08	537.95	3	4
Bhojpur	124.52	486.10	4	5
Dhankuta	85.35	672.16	5	3
Mugu	48.25	417.50	6	6
Sindhuli	44.55	207.90	7	9
Sankhuwasabha	31.03	190.79	8	10
Morang	30.79	92.48	9	18
Tehrathum	27.78	334.78	10	7

Major challenges in the production and marketing of Akabare chili in Nepal

Akabare chili has been repeatedly reported to be one of the economically profitable chili landraces but is still neglected and underutilized (Joshi et al., 2020). The presence of cultivation challenges in the field of Akabare is well reflected in low productivity (for instance, 5.4 t/ha in 2021) (MoALD, 2022). The issues of Akabare chili production and marketing are well discussed by Poudyal et al. (2023) in their recent work. The field study has identified 12 major issues in the production and marketing of Akabare chili. Out of them, five problems were identified as biotic factors, five as abiotic strains and the rest were connected to management issues. Questions of Akabare chili production of biotic origin were dominated over other problems with a 52% share of the total problems followed by abiotic stresses (37%). Production and marketing-related issues due to poor management set-up received nearly 11% of responses from the respondents (Figure 3).

The insect pest problem was reported as the main culprit of biotic origin (14.1%), followed by diseases (13.1%). About 11.5% of the total respondents were concerned about the lack of suitable and high-yielding varieties under adverse environmental conditions. Drought stress was the third major problem (12.3%) indicating a lack of irrigation in Akabare chili farms in the hilly areas. Issues of water logging (5.7%), thermal stress (5%), windy weather conditions (3%) along with complaints about chili-eating avians (5.2%) and slugs (8.5%) were also observed during the field studies (Figure 3). Supply of agricultural inputs like fertilizer was one the major issues (10.7%) in the studied sites.

Almost all farmers from Ilam to Dailekh faced a similar level of abiotic strains, indicating that the impact of climate change has similar and negative effects on Akabare chili production at all locations. Our results on production issues are in agreement with the previous reports. Biotic factors (Barchenger et al., 2019; Parisi et al., 2020), as well as abiotic factors (Altaf et al., 2022; Reddy & Kakani, 2007), can influence the quality of Akabare chili production and it's quite challenging to manage and escape from abiotic factors (Abdelhakim et al., 2022; Zhou et al., 2022). The lack of modern cultivation practices could be one of the limiting factors for the low productivity of Akabare chili, as 9.3% of the respondents demanded training in the modern practices of Akabare chili cultivation. The timely application of nutrients and fertilizers should also be treated as a managerial factor due to their commercial nature. The lowest response (1.6%) accumulated for the inadequate market for Akabare chili indicates the presence of a good market for spice, but the development of a systematic and long-term chili market may still be lacking. Compared to the western hills, eastern hills farmers were found to be more connected to the Akabare chili market. Regarding the Akabare chili cultivation and seed production, farmers from eastern Nepal are found more advanced compared to their fellows in the western hills. This could be the reason why the eastern mid-hill districts are leading both in area coverage and production of Akabare chili in Nepal.

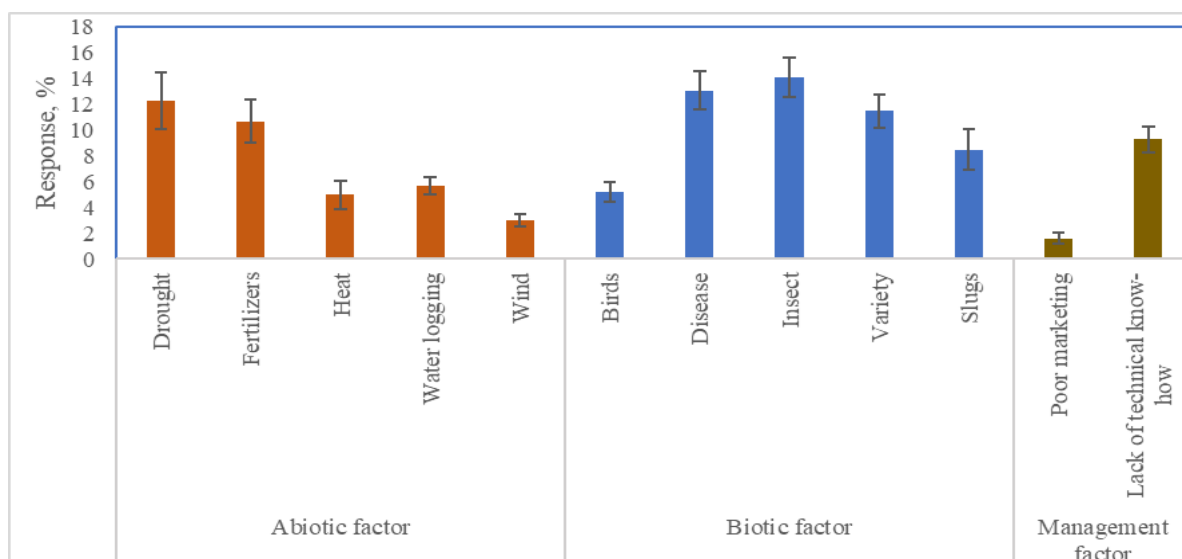


Figure 3. Proportion of issues related to the production of Akabare chilies in the field. Possible factors of abiotic, biotic origin and related to the management of chili production were discussed and 12 of them were listed as the major issues during the Rapid Rural Appraisal (RRA) 2020 and 2021 in the districts studied in Nepal.

Chili varieties, seed source and crop calendar

High-yielding cultivars can play a role in improving productivity and climate-smart varieties can stand well under adversity and produce better. A commercial variety of Akabare chili is not developed yet, however, farmers are using local landraces of Akabare chili and exchanging seeds among themselves for its cultivation. For common chili, there are listed a total of 16 commercial varieties are listed on the National Seed Board with different maturity and productivity.

The seed supply system of Akabare chili in Nepal is almost informal. This could be the reason the total amount of seed distributed in the country is unknown. Some seed companies have recently started to distribute Akabare chili seeds. Based on the results of the field study (RRA), we can say that more than 98.7% of the seeds are being supplied informally and a very little portion is left for the formal channel. Only four farmers out of 120 respondents approached seed companies for the Akabare chili seeds. The seed production of Akabare chili could be another lucrative business for household earnings. For example, approximately 445 kg of seeds is estimated to be required for 1,481 ha of land under Akabare chili. This quantity of seeds is almost equivalent to NPR 9.5 million at the current market price. The current average retail price for a kilogram of seeds is 21,350 (ranging from NPR 18,000 to 40,000) in the domestic seed market (BK Upadhyaya, personal communication, February 10, 2023). Though the seed production economics in this paper is not discussed, seed production in isolated areas can contribute to the better livelihoods of farmers through improved production.

Akabare chili growing season in the mid-hills generally starts in March. Seedling preparation and transplantation normally coincide with dryer months like April, May and June. Flowering and fruiting start in June/July/August and harvesting starts from the month of late August to September. Looking at the crop calendar, off-season Akabare chili production is not practiced yet. However, by adjusting the transplanting time by half or a month and growing Akabare chili in plastic tunnels, farmers can sell Akabare chili at a higher price, NPR 700 per kilogram of fresh fruits in the first week of February 2023 (Madan Rai, personal communication, February 12, 2023). This not only returns a higher profit but also ensures marketing.

Akabare chili can be annual, biannual, or can be grown for more than 2 years under good agronomical practices. Akabare chili cultivation is also observed under the plastic tunnel. However, tunnel cultivation may result in longer plant height due to an elongated internode, which could lead to a smaller number of branches and fruits per plant resulting in reduced yield. So, it is suggested to cultivate Akabare chili in open field conditions. However, seedlings can be transplanted to a plastic tunnel in July/August (Asar) to harvest Akabare chili in October/November (Kattik) as an off-season production. Figure 4 shows the main season for the planting and harvest of Akabare chili in the mid-hills of Nepal.

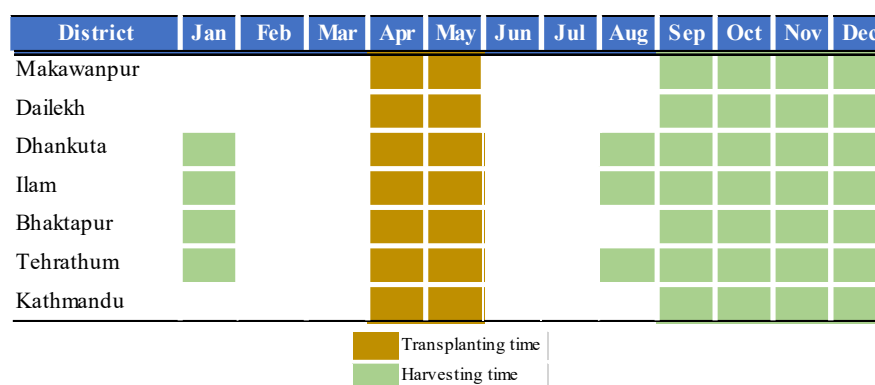


Figure 4. Seed sowing and fruit harvesting time of Akabare chili in Nepal. The timeline is standardized with the practice of farmers based on the field study (RRA). April and October are the main seed sowing and production month, respectively, in Nepal.

Chili marketing in Nepal and market potentials of Akabare chili

Nepal imports a considerable amount of chili (both hot and sweet pepper) and its products annually. In 2021, a total of 13,402 MT (equivalent to NPR 2,567 million) of chili import was recorded which was 29% lower than in 2020. Chili export from Nepal was very low compared to imports, but the chili export increased tremendously from 611 kg in 2020 to 2,360 kg in 2021 (equivalent to NPR 7 million) (MoALD, 2022). This indicates the existence of good market demand for Akabare and other chili production domestically and the opportunity for trade in substitute imports. The increase in per capita chili consumption in the country, 5.4% more in 2021 compared to 2020 (9.33 kg), further supports the local demand for chili. This scenario, in the case of Akabare chili, is even more encouraging with a 34% increase in per capita Akabare chili consumption in 2021 compared to the year 2020 (0.35 kg). Based on field results, depending on the size, about 200 - 500 Akabare chili fruits are required for a kilogram of fresh fruit. The field trial data indicated a 23.3 MT/ha yield potential of elite Akabare chili landraces for a 133-day long fruiting period (average yield of 1.05 kg per plant). The yield potential observed during the field study was a little higher, 33.3 MT/ha (1.5 kg per plant) for 210 days of fruiting period.

The average price for a kilo of fresh Akabare chili was estimated at NPR 150; however, it ranges from NPR 120 to NPR 400 on the domestic market. The higher price variation was due to variation in the fruit harvest season (higher price during the off-season) and was also location specific. A lower per-unit price of Akabare chili was reported in newer growing areas, especially in Palpa and Dailekh, compared to the eastern mid-hills. The organically grown Akabare chili could fetch even higher prices while exporting the certified products to foreign markets (B Lama, personal communication, January 17, 2023), indicating the market potential of this wonder spice. Based on the price per unit and total production, Nepal produced Akabare chili at a value of 1,385 million Nepalese rupees domestically in 2021.

There exists a domestic and foreign market for Nepali-produced Akabare chili. The domestic market indicates outlets outside the production districts, whereas market outlets within the same districts fall under the definition of the local market. The field study results on market segmentation showed the presence of considerable market demand for Akabare chili. Approximately 50% of Akabare chili products were sold in the domestic market, nearly 31% in local markets and about 11% in the Indian market. Almost 3% of Akabare chili was exported to the foreign market and 5% of the Akabare chili, especially from remote districts such as Dailekh, Tehrathum and Makawanpur, was found to be used for home consumption. The remaining 5% of the unsold or self-consumed quantity of Akabare chili could be due either to the small quantity or lack of proper marketing or unwillingness to sell for pickle preparation at the household level. An increasing trend of per capita consumption, expanding markets and growing interest in the food industry (noodles and fast food) are some positive indicators of the Akabare chili business in the country.

Almost 90% of Akabare chili produced from the eastern hills of Nepal goes to India (Madan Rai, personal communication, February 12, 2023). Traders from the adjoining border market of India visit the Akabare chili farm to collect produce at the prevailing market price. The Indian market prefers larger fruit with fewer seeds in it. Rest proportion of the total produce is being used in processed items like pickle and paste. This scenario indicates that

ease in the marketing of produce and price fixation based on the current market would help farmers get more gross margin, as discussed by Chapagai et al. (2011).

Chili economics: cost-benefit analysis at the household level

Akabare chili in the household is being used in several products. Processed pickles, chili powder and dry chili are some common by-products of fresh and ripe chili. The increasing consumption of Akabare chili and the possible reason behind this is well discussed in Poudyal et al. (2023). Here, we have tried to calculate the profit loss account of cultivating Akabare chili under open field conditions and analyze the cost-benefit ratio. This was done simply based on the information collected during the field study and over the telephone interview. Table 4 presents a summary of the cost and revenue of Akabare chili for three different locations. Cost estimation was carried out based on a ropani of land area (508 sq. m) and data obtained from Akabare chili-producing farmers.

Table 4. Summary of the cost-benefit analysis of the production and marketing of Akabare chilies from a ropani land area (508 sq. m) per household (HH) in three different locations (Ilam, Makawanpur and Palpa districts in the eastern, central and western mid-hills of Nepal, respectively).

Items	Ilam	Makawanpur	Palpa
Total production cost	82,285	93,180	73,875
Total income	300,789	266,700	154,093
Gross profit/loss (A)	218,504	173,520	80,218
<i>BC ratio</i>	<i>2.66</i>	<i>1.86</i>	<i>1.09</i>
Expenses can retain in the household (HH)			
Labor/employment	15,000	21,000	18,000
Compost/FYM expenses	6,000	9,000	10,000
Land lease rent	10,160	17,780	12,700
Potential return to HH (B)	31,160	47,780	40,700
Potential gross income per HH			
Potential return to HH (B)	<i>31,160</i>	<i>47,780</i>	<i>40,700</i>
Gross profit/loss (A)	218,504	173,520	80,218
Gross income to the HH (A+B)	249,664	221,300	120,918

Akabare chili has been considered well-adapted to marginal land (Joshi et al., 2020). However, under ideal growing conditions, Akabare chili can be grown as a perennial or biannual spice crop in mid-hill conditions. The study showed that about 30 persons could get a seasonal job from the cultivation of the Akabare chili crop in a ropani land annually. Considering all the production costs paid at the farmgate, Akabare chili production from a ropani land returns an average gross profit of NPR 157,414. However, the farmer can use household resources and save wages paid for intercultural operations, land lease, compost fertilizer/farm yard manure, etc. and these expenses can be considered as additional income. In such a case, each household could save approximately NPR 39,880 and the potential gross income to the household could be around NPR 197,294 per ropani land from the Akabare chili business (Table 4). This not only creates employment opportunities per unit area but also returns handsome profits to the household economy. Fresh Akabare chili could fetch a higher price (up to NPR 700 per kilogram) when produced in the off-season. Our result on potential returns from Akabare chili is in line with a result of the supply chain analysis of Akabare conducted in 2011. The supply chain study revealed that 58% of the total cost of cultivation was occupied by labor and the household claimed approximately 68% of the gross margin (Chapagai et al., 2011). Both cases have indicated a significant role for Akabare chili in employment generation opportunities and the domestic economy. The potential role of Akabare chili in the rural farming community sometimes surfaced in printed and electronic media, encouraging farmers to do this business (Chapagai et al., 2011; Chapagain, 2016; MyRepublica, 2019; NDTV, 2017).

Conclusions

Nepal has a broader distribution of Akabare chili-growing areas. Given the historical presence and cultural values of Akabare chili in the Nepalese kitchen, the fresh and processing market has increased over the years. There is a good

market for Akabare chili within the country with ample opportunities to expand the business. An improved marketing system with a buyback guarantee not only grows the chili economy but also creates employment opportunities on the farm and can attract young people. Additionally, there are two large chili markets in the neighborhood that Nepal has to explore. The import substitution and export promotion strategy of Nepal-produced Akabare chili could be the best alternative for the development of the Nepalese chili business. Issues in production and marketing should be addressed with the implementation of a short- and medium-term strategy plan and the shortage of fertilizers and the lack of technical know-how at different severity levels need solutions. Demand-led Akabare chili breeding and action research to dig out the solution for the problems are of utmost importance. Akabare chili production is a highly profitable venture and needs to expand in multiple domains with a properly established marketing system. Nepal's government should prioritize the Akabare chili production as a commercial venture and support the needy farmers at the policy level. In light of the findings of this work, more advanced studies should focus on maximizing the economic potential of this crop by solving existing hurdles in the production and marketing of Akabare chili in Nepal.

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Declaration of Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships that could appear to influence the work reported in this paper.

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