Prospects and Challenges of Spice Seed Crops in Nepal

Mohan Bahadur Thapa[1*] and Sanjay Dhimal[1]
Nepal Horticulture Society, Khumaltar, Lalitpur
[*]Corresponding Author: mbthapa2009@gmail.com

Abstract

Spices are an integral part of Nepali cuisine and culture, used in various forms for pickling, preservation, coloring, flavor, pungency, and aroma. Major commercially grown spices in Nepal include large cardamom, ginger, garlic, turmeric, chilies, and onions, while tree spices like cinnamon and Timur (Zanthoxylum) are increasingly being cultivated beyond their natural habitats. Spices are marketed as whole seeds, barks, leaves, buds, stigmas, rhizomes, or in ground form. Nepalese households regularly use a mix of indigenous and imported spices in daily cooking. The country has 72,076 hectares under spice cultivation, yielding around 566,202 metric tons annually, with ginger occupying the largest area and production share. Large cardamom dominates spice exports, contributing 82% of the total export value, followed by ginger (11%) and other spices (7%). There is considerable potential to increase production of coriander, fennel, aniseed, onion, and specialty chilies such as 'Akabare Khursani.' Tree spices like cinnamon and Timur show strong promise in the mid-hills, while high-value saffron could be explored in mountain regions. Nepal's diverse agro-ecological zones offer significant opportunities for expanding spice cultivation. This overview highlights the current status, prospects, and challenges of the spice sector in Nepal.

Keywords: Cultivation, Export, High value, Market, Production.

Introduction

Nepal, roughly trapezoidal in shape, stretches 800 km in length and 200 km in width, covering an area of 147,181 sq. km. It is situated between latitudes 26° and 31°N, and longitudes 80° and 89°E. This unique physiographic position has given rise to diverse climatic conditions, contributing to the country's rich biodiversity (Pradhan et al., 2016). Among the agricultural crops cultivated in Nepal, spice crops stand out for their significant biodiversity. According to the International Standards Organization (ISO), spices are defined as “any of the aromatic vegetable products used in cooking, seasoning, and preserving foods." In simpler terms, spices are natural plant products primarily used to flavor, season, or add pungency to foods and beverages (Ferrel, 1985). Spices encompass various dry parts of aromatic plants, including roots (e.g. sweet flag), bark (e.g. cinnamon), rhizomes (e.g. ginger), leaves (e.g. bay leaf), shoots and leaves (e.g. coriander), flower buds (e.g. clove), stigmas (e.g. saffron), fruits (e.g. nutmeg), seeds (e.g. cumin), fruit pods (e.g. vanilla), and resinous exudates (e.g. asafoetida), which are traded globally as spices.

Spices, condiments, and herbs primarily contribute taste, flavor, and aroma to food. While most spices thrive in tropical to subtropical climates, certain varieties, such as saffron, black cumin, and Jimmu, grow in temperate regions. As a result, almost every country cultivates at least one type of spice or herb. Of the 109 spices listed by the ISO, India is known to grow 52, while Nepal produces around 30 species, either in their natural habitat or through cultivation (Ravindran, 2006; Sharma, 2013). Spices-both indigenous and imported - are commonly used by Nepalese people, either on a daily or weekly basis or during special social functions. Quality seeds play a vital role in successful spice cultivation. A quality seed meets all essential attributes, including genetic purity, physical purity, germination ability, vigor, seed health, moisture content, size, weight, and color.

Spices are used in various forms and ways, pickles (peppers, garlic, ginger and chilies), as preservatives (clove, black pepper and mustard seeds/powder), coloring (turmeric, chilies and saffron), spice oils (ginger oils) for the preparation of soft drinks and the oleoresins obtained from black pepper, ginger, capsicum, turmeric, fenugreek and cardamom are used for pungency, flavour and aroma in meat and food processing industries. The intrinsic quality of spices and herbs varies with variety, location, time and stages of harvest, processing methods, etc. Resinous part, which is the non-volatile portion, is made up of different polymers. The main flavoring effect in many spices is

pungency. Several valuable pigments are found in spices. These pigments are extracted and used as natural colorants in the food industry. Some of the spices, which yield colour pigments, are turmeric, paprika and saffron.

Spices are marketed as whole seeds, barks, leaves, buds, stigmas, and rhizomes or grounded of all these spices. Apart from these plant parts, majority of these spices are extracted for essential oils and oleoresins. Ginger oil and ginger oleoresin are the two main ginger products in the international markets (Bhatiya et al., 1999). In comparison to cereals and other food commodities spice trade is almost balanced due to the major role of cardamom and ginger. Cinnamon (*Dalchini*) is also contributing to some extent in trade balance. Nepal pepper (*Timur*) which has been exported in large volume and value usually does not come under Ministry of Agriculture and Livestock Development (MoALD) statistics, but it is the most exportable spice commodity. Spices contribute about 7.7% of the total national AGDP and 2.3% of national GDP (Sharma et al., 2019). Efforts made for the promotion of spices is quite inadequate to cope with the fulfillment of increasing demand. About thirty spices have been in use in Nepal (Table 1). Some of them are imported from India and overseas countries and most of them are cultivated or available under *in-situ* conditions of Nepal.

Table 1: List of spices commonly used in Nepal

S.N.	English name	Nepali name	Botanical name	Parts used
1	Turmeric	Besar/Haledo	*Curcuma longa* L.	Rhizome
2	Chili	Khursani	*Capsicum frutescence* L.	Fruit
3	Fenugreek	Methi	*Trogonella foenum graecum* L.	Seed
4	Garlic	Lasun	*Alliam sativum* L.	Leaf and bulb
5	Onion	Pyaj	*Allium cepa* L.	Leaf and bulb
6	Coriander	Dhaniya	*Coriandrum sativum* L.	Leaf and seed
7	Ginger	Aduwa	*Zingiber officinale* Rosc.	Rhizome
8	Cumin	Jeera	*Cuminum cyminum* L.	Seed
9	Black cumin	Himali jeera	*Bunium persicum* Bioss	Seed
10	Black pepper	Marich	*Piper nigrum* L.	Berry
11	Indian cassia	Tejpat	*Cinamomum tamala* Neesand Eberm	Leaf and bark
12	Cinnamon	Dalchini	*Cinnamomum zeylanicum* Blume.	Bark
13	Clove	Lwang	*Eugenia caryophyllus* Bullock and Harrison	Flower bud
14	Cardamom (Large)	Alainchi	*Amomum sabulatum* Roxb.	Fruit and seed
15	Cardamom (Small)	Sukmel	*Elettaria cardamomum* Maton.	Fruit and seed
16	Nutmeg	Jaiphal	*Myristica fragrans* Houttuyn	Kernel
17	Mace	Jaipatri	*Myristica fragrans* Houttuyn	Aril
18	Bishop's weed	Jwano	*Trachyspermum ammi* L.	Seed
19	Aniseed	Saunf (masino)	*Pimpinella anisum* L.	Seed
20	Black mustard	Katherayo	*Brassica nigra* (L.) Koch	Seed
21	Asafoetida	Hing	*Ferula asafoetida* L.	Resin from rhizome
22	Saffron	Kesar	*Crocus sativa* L.	Stigma
23	Mint	Pudina	*Mentha arvensis* L.	Leaf
24	Leek	Chhyapi	*Alliam ampeloprasum* var. *porrum*	Leaf and bulb
25	Nepal pepper	Timur	Z*anthoxylum armatum* DC	Fruit
26	Fennel	Sounf (moto)	*Foeniculum vulgare* Mill.	Seed
27	Dill	Nepali soof	*Peucedanum graveolens* (L.) CB Clarke.	Seed
28	Caraway	Himali soop	*Carum carvi* L.	Seed
29	Nigela	Mungrelo	*Nigella sativa* L.	Seed
30	Jimmu	Jimmu	*Allium hypsistum* L.	Leaves

Source: Sharma, 2013.

Involvement of Development Organization

In Nepal, there are two apex organizations for research and development of spices: (i) National Ginger Research Program, Kapurkot, Salyan under Nepal Agricultural Research Council (NARC) and (ii) National Center for Potato, Vegetables and Spice Crops Development, Kirtipur and its collaborating stations e.g. Spices Development Center, Panchkhal, Kavrepalanchok, under Bagmati Province and Cardamom Development Center, Fikkal, Ilam under Department of Agriculture. Apart from Government organization, Cooperatives, NGOs and INGOs are also involved in developing entrepreneurship on seed and seedlings production, edible parts production and processing of spices. Cooperatives in Palpa, Pyuthan and Ilam at community levels and Nepal Ginger Producers and Traders Association (NGPTA) at Dhulabari, Jhapa are also taking part in production and trading of ginger from eastern region. Federation of Large Cardamom Entrepreneurs of Nepal (FLCEN), Birtamod, Jhapa also taking part on promotion and trading of large cardamom in the country. It has already made the network on major cardamom producing districts.

All the spices defined and listed above have not been dealt with by MoALD and the mandated organization for spices. Cinnamon (*Dalchini*) and Nepal pepper (*Timur*) come under Ministry of Forest and Environment (MoFE). For the promotion of all these spices “A Separate Institution" needs to be formed and spices should get due priority for research and development in the country. Special courses should be taught in agricultural universities. All the Nepalese spices mentioned above need to be dealt with by one organization.

Cultivation Area and Production Status of Spice Crops

Most of the spices are shade-loving that can be grown in between the rows of orchard or inter cropped with other vegetable crops, which increases the cropping intensity as well reduces the risk of crop failure. According to the data available from MoALD in the FY 2021/22, total area under spice crops is 72,076 Ha with a production of 5,66,202 MT and ginger occupies highest area and production in Nepal (Table 2). Globally ginger is the single spice crop of Nepal showing fourth position in the world ranking during the year 2022 (FAOSTAT, 2022). Presently, five spices have attained a commercial production scale and some spices such as onion, coriander, fenugreek, saffron, vanilla, cinnamon, *Timur* etc. are coming up. Seed spices particularly cumin, black cumin, bishop's weed, aniseed, black mustard, fennel, dill, caraway, nigela, *Timur* and other spices cinnamon, saffron, are limited in backyard or *in-situ* conditions.

Table 2: Area, production and yield of spice crops in Nepal for the last three years.

S.N.	Crops	FY 2021/22			FY 2020/21			FY 2019/20		
		Area (Ha)	Prodⁿ (MT)	Yield (MT/Ha)	Area (Ha)	Prodⁿ (MT)	Yield (MT/Ha)	Area (Ha)	Prodⁿ (MT)	Yield (MT/Ha)
1.	Large Cardamom	15975	8714	0.55	15668	8289	0.53	16565	9545	0.58
2.	Ginger	22441	287813	12.83	21912	279206	12.74	23500	298945	12.72
3.	Garlic	9943	74763	7.52	9784	72490	7.41	10185	73859	7.25
4.	Turmeric	10847	111014	10.24	10340	105719	10.22	9795	99907	10.20
5.	Dry Chili	12870	83898	6.52	12525	87731	7.00	10276	68025	6.62
TOTAL		**72076**	**566202**	**7.86**	**70229**	**553435**	**7.88**	**70321**	**550281**	**7.83**

Source: SINA, MoALD (FY 2019/20 - 2021/22)

Trade Status of Commercial Spice Crops

More than 50% of total spices import is basically from India and obviously major market destination are also India. However, total spice trade would be more than that because of illegal entries from the open borders. Overall exports of spices are equivalent to the value of NRs 5851.2 million against the import value of NRs. 15362.1 million in 2021/22. Large Cardamom is the first spice commodity which shares 82% export value followed by ginger (11%) and the rest of the spices 7 percent. Regarding importing four spice commodities i.e. pepper, cumin, capsicum/chili and small cardamom shares 38% of import value while including onion import shares are 79% (Table 3).

Cardamom and ginger are among the top 10 trade commodities prioritized by the Industrial Policy 2010 and plans to provide additional incentives and facilities for the promotion of these spice crops (MoCS/GoN. 2010) and ADS 2015 has also given due priorities on these spices.

Spice crops should be promoted for commercial production that could help in minimizing the trade imbalance and increasing income and employment opportunities in the country. Spice export, especially large cardamom and ginger is always a significant part of the total agricultural export of the country (Table 4 and 5).

Table 3: Trade status of commercial spice crops in Nepal in the fiscal year 2021/22.

S.N.	Spices	Import Status		Export Status		Trade Balance (NRs. '000)
		Volume (Kg)	Value (NRs. '000)	Volume (Kg)	Value (NRs. '000)	
1.	Annise, Fennel	609,680	118,705	0	0	-118,705
2.	Capsicum	10,837,532	1,770,153	0	0	-1,770,153
3.	Cinnamon	434,967	108,019	2,529,835	230,495	122,476
4.	Cloves	166,169	86,061	0	0	-86,061
5.	Coriander	9,886,611	1,198,976	0	0	-1,198,976
6.	Cumin	8,462,717	2,078,051	0	0	-2,078,051
7.	Fenugreek	2,229,233	213,085	0	0	-213,085
8.	Garlic	1,355,184	187,245	0	0	-187,245
9.	Ginger	615,276	129,157	11,958,893	641,457	512,300
10.	Large Cardamom	175	304	5,367,443	4,813,465	4,813,161
11.	Nutmeg	76,793	38,727	0	0	-38,727
12.	Onion	173,829,390	6,446,509	155,513	21,563	-6,424,946
13.	Black Pepper	2,030,224	1,180,353	27,505	19,307	-1,161,046
14.	Saffron	74	7,744	0	0	-7,744
15.	Small Cardamom	467,349	724,656	0	0	-724,656
16.	Vanilla	1	21	0	0	-21
17.	Turmeric	2,847,071	418,383	10,525	5,406	-412,977
18.	Spice mixtures	2,363,784	656,012	1,124,815	119,541	-536,471
	Total	216,212,230	15,362,161	21,174,529	5,851,234	-9,510,927

Source: SINA, MoALD (2021/22)

Table 4: Export situation of major spice crops of Nepal for the last three years

S.N.	Crop	F.Y. 2021/22		F.Y. 2022/23		F.Y. 2023/24	
		Quantity (MT)	Value (Rs. '000)	Quantity (MT)	Value (Rs. '000)	Quantity (MT)	Value (Rs. '000)
1.	Large Cardamom	5367.4	4813465	9991.14	8276850	5018.34	7940964
2.	Ginger	11958.8	641456	23013.68	1222233	10779.49	1176169
3.	Turmeric	10.5	5407	14.88	6381	27.20	14006

Source: FTS, DoC/MoF (2021/22 - 2023/24)

Table 5: Import situation of major spice crops of Nepal for the last three years

S.N.	Crop	F.Y. 2021/22		F.Y. 2022/23		F.Y. 2023/24	
		Quantity (MT)	Value (Rs. '000)	Quantity (MT)	Value (Rs. '000)	Quantity (MT)	Value (Rs. '000)
1	Garlic	10496.06	1240801	10435.354	1246457	18605.24	2483050
2	Turmeric	2847	418383	1867.78	304372	1748.97	361765
3	Onion	168540.57	6170571	180190.24	6750923	51544.38	2153633

Source: FTS, DoC/MoF (2021/22 - 2023/24)

Prospects and Challenges of Spices in Nepal

1. Prospects

The global demand for organic products has significantly increased, creating new opportunities in the international

spice trade, particularly in Europe, which leads the market for organically produced spices. Nepal, with its diverse agro-climatic zones-from tropical lowlands to temperate highlands-is well positioned to capitalize on this trend by cultivating a wide variety of high-value spices. Compared to cereals and other staples, spices offer considerably higher returns per unit of land, time, and input. Major commercial spices include large cardamom, ginger, turmeric, garlic, onion, and chili. Additionally, seed spices such as coriander, cumin, fennel, fenugreek, bishop's weed, and black mustard grow well in the Terai and mid-hill regions. Tree spices like cinnamon and Timur (Zanthoxylum armatum) can be promoted through sustainable cultivation in community forests using silvi-horti systems, which not only reduce soil erosion but also enhance rural livelihoods. In the high mountain regions, favorable temperate conditions support the production of premium spices such as saffron, Jimmu, and Himali Jeera.

As culinary habits evolve globally and the use of spices expands, Nepal must respond by identifying high-yielding, export-oriented varieties and supporting the production of quality planting materials through the adoption of modern technologies. The widespread migration of youth has left many cultivable lands fallow; reclaiming these lands for scientific spice cultivation should be a national priority. There is also an urgent need to establish oil and oleoresin extraction facilities to process abundant raw materials like ginger, turmeric, chili, cardamom, cinnamon, and Timur (Thapa et al., 2016). This high-value, low-volume commodities are ideally suited for air freight, allowing Nepal to access premium markets in Europe and North America. The Agricultural Development Strategy (ADS, 2015) supports the development of competitive agricultural value chains, positioning spices as a strategic sector to enhance value addition and benefit smallholder farmers.

To realize this potential, targeted promotion is needed: cumin, coriander, and fennel in the Terai and valleys; cinnamon and Timur in the mid-hills; and saffron in high-altitude areas. Developing value-added spice products under a distinctive Nepalese brand could enhance market identity and international competitiveness. Among Nepal's unique offerings, *Akabare Khursani*—a highly pungent chili from the eastern hills—stands out for its exceptional capsaicin content and oleoresin with recognized medicinal properties. Its reputation as one of the finest varieties globally underscores Nepal's capacity to lead in niche spice markets. Strengthening the productivity, processing, and value addition of spice crops will be crucial for improving rural incomes and enhancing Nepal's agricultural trade balance in the years ahead.

2. Challenges

- Nepal does not have improved high yielding varieties and scientific cultivation practices.
- Nominal research and development work is being done in spices related farms with minimum human resources, despite having enormous suitable climates for spice crops production.
- Farmers have insufficient knowledge of modern seed production practices, including isolation distance, rouging, pest and disease management, and post-harvest handling. Extension services specific to spices are weak or non-existent in the country. Spice sector is not getting due priorities as per its importance in employment generation, earning foreign currency and potential in balancing international trade.
- Low access to market and its information for all the stakeholders concerned.
- Inherent nature of slow seed germination and initial growth pattern.
- High incidence of diseases like wilt, blight, powdery mildew and gummosis etc.
- The number of insect pests' attack spice crops like aphids, cutworms, borer, thrips, scales and nematodes etc.
- Low productivity in the spice sub-sector in comparison to other horticultural crops.
- There is limited government policy and institutional focus on promoting spice seed systems. Certification, subsidy programs, and incentives for private sector involvement in spice seed production are largely absent. Increase in the import of spices due to low production and changes in the standard of living of people and increasing demand.
- Unlike cereal crops, spice seed production has attracted little interest from the private sector due to low economies of scale, perishability, and lack of assured markets.

The prospects and challenges of some major specific commercial spice crops are dealt hereunder (Table 6).

Table 6: Prospects and Challenges to specific spice crops

Spice Crops	Prospects	Challenges
Large Cardamom	• Propagated by three methods i.e., seed, sucker and micro-propagation /tissue culture • Five varieties are registered	• Lack of high yielding disease resistant varieties • Cross pollinated crop/seed propagation do not give true to type variety • Mass production of improved tissue culture seedlings • Use of suckers from old plantation without knowing the disease incidence • Planting of available land races from unknown source without considering climate and altitudes is one of the major issues
Ginger	• Propagated by rhizome • Kapurkot Aduwa-1 and Kapurkot Aduwa-2 have been released for commercial production • Best suited in agro-forestry system	• No seed formation, • Danger of rhizome rots disease • Difficulty to identify disease free rhizome • High price of seed rhizome
Turmeric	• Propagated by rhizome • Kapurkot Haledo-1 and Kapurkot Haledo-2 have been released for commercial production • It is also a shade-loving crop and can be grown as intercropped with fruit orchard • Suitable for agro-forestry systems	• No seed formation • Quality disease free planting materials are lacking • Risk of rhizome rot disease, leaf spot diseases are the major problems of its cultivation
Onion	• Propagated by bulb • Utilized in every kitchen irrespective of economic status of the family • Propagated by seeds/seedlings • Red Creole is released, Nasik-53, Baitadi Local and five hybrid onions varieties are registered for cultivation	• Lack of improved seed • High cost of inputs • High post-harvest loss • Significant amount of onion is being imported from China, India and other countries • Very poor storage facilities to growers
Garlic	• Propagated by bulb • Cultivated from Terai to the high altitudes • Variety cultivated at high altitudes is called 'Bhote Lasun. • Terai Lasun' and 'Bhote Lasun' are common in use • White-skinned bulb or corm is sub divided into several cloves	• Lack of quality genotypes • Substance cultivation • Labour intensive farming
Black Pepper	• Propagated by three methods: seeds, runner and terminal shoots	• Seeds not planted within 20 days after harvest germination decline • Runner and terminal shoots-difficult for rooting
Chili	• Propagated by seeds • Single variety 'Jwala' released • 15 hybrid chili varieties registered for commercial production	• Thrips, mites, aphids and pod borers are the major insect pests • Fruit rot, die-back, bacterial wilt, powdery mildew and mosaic are the major diseases
Coriander	• Two open pollinated varieties Lotus and Suravi and three hybrid varieties have been registered after the adaptation trial • Intercropped with sugarcane as catch crop before the full growth of sugarcane	• Aphids and cutworms are the major insect pests • Fusarium wilt, stem galls and powdery mildews are the major diseases

Spice Crops	Prospects	Challenges
Cumin	• Propagated by seeds • Owing to low water requirements farmers can cultivate in drought affected areas where most of other crops cannot be grown	• Cross pollinated crop • Variety is not guaranteed • Powdery mildew is prevalent
Saffron	• Propagated through corms • Grown in dry temperate region altitude ranging from 2500 to 2800 masl • Temperate climate in the high mountain regions has provided special opportunities to grow saffron, *Jimmu* and *Himali Jeera*	• Farmers of Jumla and Humla have initiated growing this crop but have not yet have attained commercial production
Vanilla	• A member of orchid family • Perennial and climbing vine grown up to 20 meters long with Arial roots for support • A single vine can produce 100 to 150 pods • Second to saffron in price and can be grown in indoor at pots for home consumption	• Labour intensive crop because it needs hand pollination for pod formation • Lack of identified varieties and unavailability of planting materials • Lack of technical knowhow to technical manpower and farmers

Way Forward

1. Establish a dedicated institution for spice research and development

A specialized institution should be created with a focus on spice research and development, prioritizing the sector to unlock its potential and address the needs of spice farmers across Nepal.

2. Utilize agroforestry systems for spice cultivation

Most spice crops are shade-loving and can be successfully intercropped with fruit trees, making them ideal candidates for agroforestry systems. This approach can help improve land use efficiency and support sustainable farming practices.

3. Promote commercial production of spice crops

Spice crops should be actively promoted for commercial production, as they offer significant potential for enhancing agricultural trade balance, creating employment opportunities, and boosting rural incomes.

4. Establish oil and oleoresin extraction plants

The establishment of extraction plants for oils and oleoresins (from ginger, turmeric, chili, cardamom, timur, and cinnamon) should be prioritized, leveraging the ample raw materials available to add value to the spice sector.

5. Introduce specialized courses on spices in agricultural universities

Agricultural universities should offer specialized courses on spice cultivation and processing to create a pool of skilled professionals who can serve both government and private sectors.

6. Mass production of improved tissue culture seedlings for cardamom

Efforts should be focused on the mass production of high-quality, disease-free tissue culture seedlings of cardamom to ensure consistent, true-to-type varieties that command better market prices.

7. Increase the area and productivity of improved ginger varieties

The high-quality ginger varieties developed by the Nepal Agricultural Research Council (NARC) should be promoted both nationally and internationally. Expanding the area and improving productivity will help meet domestic and international demand.

8. Promote cumin cultivation in water-scarce areas

Cumin, with its low water requirements, can be an ideal crop for areas lacking irrigation infrastructure. Encouraging its cultivation will help diversify spice farming and boost production in water-scarce regions.

9. Cultivate cinnamon in tropical climates for commercial production

Cinnamon cultivation should be promoted in tropical climates, as it thrives in these environments and has significant potential for commercial-scale production.

10. Expand cinnamon cultivation for processed products

A targeted program should be launched to increase cinnamon cultivation, focusing on commercial production for processed products like cinnamon tea, cinnamon oil, and cinnamon powder.

11. Promote high-value spice crops in geographically suitable areas

High-value spice crops like saffron should be promoted in high-altitude hill regions, while vanilla should be cultivated in tropical areas, leveraging Nepal's diverse geographical conditions to maximize the potential of these crops.

References

ADS, 2015. Agriculture Development Strategy (ADS) 2015–2035. Government of Nepal, Ministry of Agricultural Development. Part 1.

Anonymous, 2003. Spice crops of India (P. S. Arya, Ed.). Kalyani Publishers.

Anonymous, 2011. A report on value chain analysis on Timur. Government of Nepal, Ministry of Agricultural Development, High Value Agriculture Project in Hill and Mountain Areas (HVAP).

Bhatiya, A. M., Hazarika, N., and Singh, R., 1999. Spices and fruits for micro-enterprises: A study of the potentials of ginger and pineapples in West Garo Hills, Meghalaya, India. International Centre for Integrated Mountain Development (ICIMOD).

Food and Agriculture Organization (FAO), 2022. FAOSTAT. http://faostat3.fao.org/download/Q/QC/E

Ferrel, K. T., 1985. Spices, condiments and seasonings. AVI Publishing Co.

The Spice Journal. (n.d.). About spice Nepal. http://thespicejournal.com/about-spice-nepal/

MoALD, 2021. Statistical information on Nepalese agriculture (2019–20). Planning and Development Cooperation Coordination Division, Statistics and Analysis Section, Ministry of Agriculture and Livestock Development Singhdurbar, Kathmandu, Nepal.

MoALD, 2022. Statistical information on Nepalese agriculture (2020–21). Planning and Development Cooperation Coordination Division, Statistics and Analysis Section, Ministry of Agriculture and Livestock Development Singhdurbar, Kathmandu, Nepal.

MoALD, 2023. Statistical information on Nepalese agriculture (2021–22). Planning and Development Cooperation Coordination Division, Statistics and Analysis Section, Ministry of Agriculture and Livestock Development Singhdurbar, Kathmandu, Nepal.

MoCS, 2010. Nepal trade integration strategy 2010: Executive summary and action matrix. Ministry of Commerce and Supplies, Kathmandu.

NGRP, 2008. Annual report. National Ginger Research Programme, Kapurkot, Salyan, Nepal.

Pradhan, S. B. N., Shrestha, P. P., and Thapa, P. K., 2016. Horticulture in Nepal: Journey in the last six decades. In Six decades of horticulture development in Nepal (Silver Jubilee Special–International Horticulture Conference, 2015) (pp. 1–16; 186–209). Nepal Horticulture Society.

Ravindran, P. N., 2006. Spices: Definition, classification, history, properties, uses and role in Indian life. In P. N. Ravindran, K. Nirmal Babu, K. N. Shiv, and J. A. Kallupurackal (Eds.), Advances in spices research (pp. 1–42). Agrobios (India).

Sharma, B. P., 2013. Spices. In P. K. Jha, F. P. Neupane, M. L. Shrestha, and I. P. Khanal (Eds.), Environment and natural resources (Vol. 1, pp. 453–464). Nepal Academy of Science and Technology.

Sharma, B. P., Adhikari, R., Adhikari, P. P., and Khan, S. A., 2019. Prospect and challenges of spice crops in Nepal. In Proceedings of the 10th National Horticulture Seminar, 2019 (pp. 87–96). Nepal Horticulture Society.

Thapa, M. B., Dhimal, S., and Adhikari, K., 2016. Trade flow analysis of large cardamom in eastern region. Ministry of Agricultural Development, Agribusiness Promotion and Statistics Division, International Trade Promotion Section, Singhdurbar, Kathmandu, Nepal.