

# DEVELOPMENT AND PROSPECTS OF SPICES IN NEPAL

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## ***ABSTRACT***

*Turmeric and chillies are the foremost important spices and about 30 spices are in Nepalese culinary use. Major spices commercially grown in Nepal are large cardamom, ginger, garlic, turmeric, chillies and onions. Tree spices Cinnamon and Timur (Xanthoxylem) grown in-situ and now their cultivation has been initiated. Nepal is the world's third highest ginger producer [235,033MT], area wise 5th (19,376 ha) and productivity wise 8th (13.45 t/ha) in position. Large cardamom is the number one export commodity with the highest share value [79%] of the total spice export. All together 76,335ha is under spice cultivation with a total production of 672,384 MT annually. Despite of poor technical knowhow and poor infrastructures international trade on spice is almost balanced, there is just deficit of Rs 559 million (10%) in export as compared to import value R.S.5443.8 million. Coriander, fennel, Aniseed, onion, chillies specially 'Akabare kbursani' have the ample scope of increasing production. Among the tree spices Cinnamon and Timur is also important to promote in mid hills. Saffron is extremely high value spice for the mountain regions. Spices have tremendous scope of production in the existing multi environmental conditions of Nepal. This paper briefly gives an introduction to the major spices that are grown, their present status and prospects in Nepal.*

## **INTRODUCTION**

International Standard Organizations (ISO) has defined spices as “Any of the aromatic vegetable products used in cooking, seasoning and preserving the foods”. In a simple definition “Spices are natural products of plant origin, used primarily for flavoring, seasoning or adding pungency and flavor to foods and beverages[Ferrel, 1985]. Dry parts of aromatic plants such as root (sweet flag), bark (cinnamon), rhizome (ginger), leaf (bay leaf), shoot and leaves (coriander), flower bud (clove), stigma

(saffron), fruit (Nutmeg), seed (cumin) and resinous exudates (asafetida) have been considered as spices in the international spice trade. Various spices, condiments and herbs mainly contribute taste, flavor and aroma in foods. Majority of spices are grown in tropical to sub-tropical but some spices (saffron, black cumin and Jimmu) are grown in temperate climates. Hence almost all countries produce one or more spices and herbs. Of the 109 spices listed by the ISO, India grows 52 spices [Ravindran, 2006] and Nepal about 30 spices either in-situ or in cultivated conditions [Sharma, 2013]. Nepalese people use many indigenous and imported spices on daily basis or at week intervals or at special social functions.

Spices are used in various forms and ways, pickles (peppers, garlic, ginger, chillies), as preservatives (clove, black pepper, mustard seeds/powder), coloring (turmeric, chillies, 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, flavor 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 color pigments, are turmeric, paprika and saffron.

Cardamom contains 2.7 to 3.6 % volatile oil and oleoresin 6 to 7 %. Essential oil possesses medicinal properties like carminative, stomachache, diuretic and cardiac stimulant, etc. Dried ginger contents 2-4% oil and 6-9% oleoresin and many antibiotic and antifungal properties. It is the main constituent in most of the Aurvedik medicines [Sharma and Shrestha 2002]. 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**

SN	English name	Nepali name	Botanical name	Parts used
1	Turmeric	Besar/Haledo	<i>Curcuma longa</i> L.	Rhizome
2	Chilli	Khursani	<i>Capsicum frutescence</i> L.	Fruit
3	Fenugreek	Methi	<i>Trogonella foenum graecum</i> L.	Seed
4	Garlic	Lasun	<i>Alliam sativum</i> L.	Leaf and bulb
5	Onion	Pyaj	<i>Allium cepa</i> L.	Leaf and bulb
6	Coriander	Dhaniya	<i>Coriandrum sativum</i> L.	Leaf and seed
7	Ginger	Aduwa	<i>Zingiber officinale</i> Rosc.	Rhizome
8	Cumin	Jeera	<i>Cuminum cyminum</i> L.	Seed
9	Black cumin	Himali jeera	<i>Bunium persicum</i> Bioss	Seed
10	Black pepper	Marich	<i>Piper nigrum</i> L.	Berry
11	Indian cassia	Tejpat	<i>Cinamomum tamala</i> Neesand Eberm	Leaf and bark
12	Cinnamon	Dalchini	<i>Cinnamomum zeylanicum</i> Blume.	Bark
13	Clove	Lwang	<i>Eugenia caryophyllus</i> Bullock and Harrison	Flower bud
14	Cardamom (Large)	Alainchi	<i>Amomum sabulatum</i> Roxb.	Fruit and seed
15	Cardamom (Small)	Sukmel	<i>Elettaria cardamomum</i> Maton.	Fruit and seed
16	Nutmeg	Jaiphal	<i>Myristica fragrans</i> Houttuyn	Kernel
17	Mace	Jaipatri	<i>Myristica fragrans</i> Houttuyn	Aril
18	Bishop's weed	Jwano	<i>Trachyspermum ammi</i> L.	Seed
19	Aniseed	Saunf (masino)	<i>Pimpinella anisum</i> L.	Seed
20	Black mustard	Katherayo	<i>Brassica nigra</i> (L.) Koch	Seed
21	Asafoetida	Hing	<i>Ferula asafoetida</i> L.	Resin from rhizome
22	Saffron	Kesar	<i>Crocus sativa</i> L.	Stigma
23	Mint	Pudina	<i>Mentha arvensis</i> L.	Leaf
24	Leek	Chhyapi	<i>Alliam ampeloprasum</i> var. porrum	Leaf and bulb
25	Nepal pepper	Timur	<i>Zn্থoxylum armatum</i> DC	Fruit
26	Fennel	Sounf (moto)	<i>Foeniculum vulgare</i> Mill.	Seed
27	Dill	Nepali soof	<i>Peucedanum graveolens</i> (L.) CB Clarke.	Seed
28	Caraway	Himali soop	<i>Carum carvi</i> L.	Seed
29	Nigela	Mungrelo	<i>Nigella sativa</i> L.	Seed
30	Jimmu	Jimmu	<i>Allium hypsistum</i> 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 Programme, Kapurkot, Salyan under Nepal Agricultural Research Council (NARC) and (ii) National Spice Crop Development Programme, Khumaltar and its collaborating stations e.g. Spices Development Center, Panchkhal, Kabhrepalchok and Cardamom Development Center, Fikkal, Ilam under Department of Agriculture. National Spice Crop Development Programme, Khumaltar/DoA run Cardamom disease management and nursery establishment programme since five years to minimize the disease and increase production of cardamom, likewise Ginger promotion programme to increase the production and add the value of the product. Projects run in collaboration with Ministry of Agriculture Development; High Value Agriculture Project [HVAP], out of 7 selected value chain commodities three are spices [Ginger, Turmeric and Timur], have been included for 7 Districts, Raising Income of Small and Medium Farmers Project [RISMFP] at 10 districts of mid and far western regions for the promotion of ginger and turmeric. Commercial Agriculture Development Project (CADP) has supported for the promotion of ginger and cardamom in the eastern region. UNNATI Project also has some programme for the promotion of ginger and cardamom at eastern hill districts. Ginger is one of the most important export commodities under National Trade Integration Strategy [MoCS/GoN, 2010] under the Ministry of Trade and Industries since 2010. A part from Government organization, Cooperatives, NGOs and INGOs are also involved for developing entrepreneurship on production and processing of spices. Mercy Corps, GTZ, Samarth-NMDP [Nepal Market Development Programme], High Mountain Agri-business and Livelihood Improvement (HIMALI) has also given due priorities on cardamom in most of the project districts and saffron in Jumla. 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 in eastern region. Federation of Large Cardamom Entrepreneurs of Nepal (FLCEN), Birtamod, Jhapa has also been taking part on promotion and trading of large cardamom in

country. It has already made the network on major cardamom producing districts. The Enhanced Integrated Framework (EIF) and World Trade Organization Standards and Trade Development Facility (WTO-STDF) have funded 11 million U.S. dollars to enhance the capacity of ginger producers in Jhapa, Panchthar, Ilam and Morang districts. Under this project, there was planned programme of installing a rhizome washing facility with 100 MT daily cleaning capacity at Dhulabari of Jhapa. Micro Enterprise Development Programme [MEDEP] with the financial support of UNDP had a significant contribution on processing and value addition of ginger in several mid hill districts. Project for Agriculture Commercialization and Trade [PACT] and USAID funded project Nepal Economic Agriculture and Trade [NEAT] have also supported promotion of ginger and cardamom to some extent.

All the spices defined and listed above have not been dealt by the Ministry of Agricultural Development and the mandated organization for spices. Dalchini [Cinnamon] and Timur [Xanthoxylum] come under Ministry of Forest and Soil Conservation [MFSC]. Cardamom, Ginger, Turmeric, Onion, Garlic and Chili are under the Vegetable Development Directorate, Khumaltar. Two organizations deal on single commodity i.e. fresh ginger is dealt by MoAD whereas, dried ginger [Sutho] is being traded as Judibuti by MFSC.

## **CULTIVATION AREA AND PRODUCTION STATUS**

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. Total area under spices is 76,335 ha with a production of 6,72,384 MT and ginger occupies highest area and production followed by onion and cardamom. Presently, five spices have attained a commercial production scale (Table 2) and some spices such as onion, coriander, fenugreek, saffron, cinnamon and timur are coming up. Seed spices particularly cumin, black cumin, bishop's weed, aniseed, black mustard, fennel, dill, caraway, nigela, Xanthoxylum and other spices cinnamon, saffron, are limited in backyard or in-situ conditions. All these spices should be promoted for commercial production that could help in minimizing the

trade imbalance and increase income and employment opportunities in the country.

**Table 2: Area, production and productivity of commercial spices in Nepal**

Spices	Productive Area (ha)	Production (MT)	Productivity (t/ha)
Cardamom	11501	5225	0.45
Ginger	24224	276150	11.40
Garlic	6569	45035	6.86
Turmeric	7310	67631	9.25
Chili	8033	35668	4.44
Onion*	18698	242675	13.0
Total	76335	672384	

\*Source: Vegetable Development Directorate, Khumaltar

Ginger is the single spice commodity showing third position in the global ranking, fifth position in area and eighth position in productivity [FAO 2015]. India is first in area as well as in production but productivity far below than Nepal. Highest productivity of ginger [32.55 t/ha] has been recorded in Fiji [Table 3].

## PROCESSING AND VALUE ADDITION

There is almost lacking of appropriate technologies on post-harvest handling, drying and packaging of spices. In traditional manner, large cardamom is smoke dried and packed in gunny bags without doing other value addition. Likewise ginger is peeled without washing and dried over the muddy place in open air for 15-20 days or dried under hot smoke to make gola sutho [round black dry ginger]. Little technological intervention has been made on cardamom and ginger for better processing and disseminating to farmers and entrepreneurs, although through proper technological interventions quality of dried cardamom capsule can be improved and marketed with increased value. Likewise in ginger, a series of value added processed products are prepared- i.e. solar dried ginger [sutho], ginger powder, ginger candy, ginger squash, ginger tea, ginger shampoo and several other items by farmers groups and entrepreneurs.

**Table 3: Top ten countries in the world with respect to cultivation area, production and productivity in 2013**

Cultivation Area		Production		Productivity	
Country	ha	Country	MT	Country	t/ha
1. India	136000	1. India	683000	1. Fiji	32.55
2. Indonesia	51700	2. China, mainland	390000	2. USA	29.77
3. Nigeria	50000	3. Nepal	235033	3. China [Taiwan]	29.17
4. China [mainland]	37000	4. Indonesia	232669	4. Japan	27.67
5. Nepal	19376	5. Nigeria	160000	5. Mauritius	16.80
6. Thailand	9000	6. Thailand	140000	6. Thailand	15.56
7. Bangladesh	8400	7. Bangladesh	69000	7. Kenya	13.20
8. Cameroon	5381	8. Japan	57835	8. Nepal	12.13
9. Philippines	3914	9. Cameroon	46350	9. Costa Rica	11.13
10. Ethiopia	3500	10. China [Taiwan]	35000	10. China mainland]	10.54

Source: FAO-STAT updated up to 2013, recovered Sep 2015

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 used for extraction of essential oils and oleoresins. Ginger oil and ginger oleoresins are the two main ginger products in the international markets [Bhatiya et al 1999]. In case of ginger, 80% of produce is exported as fresh rhizomes and 10-20% processed for dry ginger [NGRP, 2008] and negligible amount is used for making value added ginger products like dry slices, candy, squash, powder and ginger pickles which are consumed locally. Essential oils are the fragrant products obtained from natural raw materials by hydro-distillation or steam distillation or by Supercritical Fluid Extraction [Anonymous. 2003]. Small scale cottage industries (Masala Udyog) prepare value added spice products utilizing raw spices, produce as single or mixed masala powder packets of cumin, coriander, turmeric, chilly, black pepper etc. Processing techniques to ensure uniform color, attractive appearance,

increased quality along with healthy and attractive packaging is another emerging area of value addition.

## **NATIONAL AND INTERNATIONAL TRADE**

More than 50% of total spice import is basically from India and obviously major market destination is also India. However, total spice trade would be more than that because of illegal entries from the open borders. Overall export of spices is equivalent the value of NRs 4883.9 million against the import value of 5443.8 million Rupees in 2013/14 (Table 4). Large Cardamom is the first spice commodity which shares 87% of export value followed by ginger [9%] and rest of the spices 4 percent. Regarding import four commodities pepper, cumin, capsicum/chilly and small cardamom shares 79 % of import value.

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]. ADS 2015 has also given due priorities on these spices. Cumulative efforts and impact of all stakeholder producers, entrepreneurs, traders, NGOs and Government Organizations reflects on the export and import scenario of spices [Table 4]. In comparison to cereals and other food commodities spice trade is almost balanced due to the major role of cardamom and ginger. Cinnamon is also contributing to some extent in trade balance. Timur [*Xanthoxylum*] which is exported in large volume and value usually does not come under MoAD statistics but it is the most exportable spice commodity. Timur is found naturally in 30 districts of Nepal out of which Achham, Dailekh, Jajarkot, Kalikot, Salyan, and Surkhet are the major potential districts exporting about 220 MT annually [Anonymous, 2011]. It indicates that Nepal's agricultural trade policy should led emphasis on the promotion of this important spice. Turmeric, coriander, fenugreek, cumin, garlic, onion and saffron are the future priority spices crops which could be grown extensively and the government should have appropriate promotional policy. Thus, there is high scope to increase productivity, availability and distillation in the country with ample possibility of value addition[<http://thespicejournal.com/about-spice-Nepal/>]. Overall there is significant trade deficit of



Rs. 559 million (10%) per year [Table 4].

**Table 4: Import and export of spices in 2013/14**

SN	Commodities	<u>Import quantity and value</u>		<u>Export quantity and value</u>		Trade balance NRs[1000]
		[Kg]	NRs [000]	[kg]	NRs [000]	
1	Annise, Fennel	447599	54849	735	21	-54828
2	Capsicum	6075477	925809	0	0	-925809
3	Cinnamon	474160	59594	925394	67437	7843
4	Cloves	215834	92442	250	72	-92370
5	Coriander	3917448	383612	60	1	-383611
6	Cumin	6497147	1182585	60	36	-1182550
7	Fenugreek	1531231	118090	7725	1581	-116509
8	Garlic	740118	66857	8017	2472	-64385
9	Ginger	2299983	188861	20415666	449901	261040
10	Large cardamom	1414	584	4913890	4270372	4269788
11	Nutmeg	27496	10347	0	0	-10347
12	Onion	154583	11152	19000	11212	61
13	Pepper	2428676	1459023	13410	1812	-1457210
14	Saffron	1651	6769	0	0	-6769
15	Small Cardamom	1814522	726733	0	0	-726733
16	Spices	1075609	136262	1206148	74452	-61810
17	Turmeric	166945	20206	20572	4617	-15589
18	Vanilla	1211	114	0	0	-114
Total		27871104	5443888	27530927	4883986	-559903

Source: MoAD, Year Book, 2014

## SPICES UNDER CULTIVATION

### Cardamom

Large cardamom is the world's third-most expensive commodity after saffron and vanilla. This is mainly grown in the sub-Himalayan region of India and Nepal between an elevation of 600 to 2000 msl where annual

rainfall is between 1,500 to 2,500 mm and the temperature varies from 8° C to 20° C (Dhital and KC, 2069 BS). It was introduced from Sikkim in 1865. After the establishment of Cardamom Development Centre at Fikkal in 1975 its cultivation extended to 42 hill districts. However, 73% of total national production still comes from four eastern districts (Taplejung, Panchthar, Ilam and Sankhuwasabha [Anonymous, 2015]. Out of 16 cultivars grown in the world, the most popular varieties of Large Cardamom in Nepal are Ramsai (1500-2000 meter msl) and Golsai (1200-1600 meter msl). However Saunae (700-2000 meter), Ramla, Chibae, Dammarsai, Varlangae (1500-2000 meter msl), Jirmalae (600-1200 meter msl) are found sparsely cultivated. Farmers from remote districts follow traditional methods of large cardamom cultivation which are eco-friendly and less costly due to utilization of local resources, family labor and traditional wisdom (Gaudae et al., 2013). Recently at Ilam, 'Salakpure' a new cultivar is being tested in farmer's field since three years [Anonymous 2015].

Propagation is done through seeds and suckers. The major problem to this crop is the widespread occurrence of the viral diseases such as streak mosaic (Chhirke) and stunt mosaic (Furke) caused by 'Mosaic streak virus' and 'Bushy dwarf virus' respectively [Subba and Ghimire, 2009]. Vectors of these two viruses are two species of aphid *Myzus persicae* Sulzer and *Micromyzus kalingpongensis* Basu [Pun, 2007] respectively. Recently, another devastating fungal disease known as *Colletotrichum* blight is becoming serious threat and lack of phytosanitary measures causing much serious threat to the whole cardamom industry of Nepal. Farmers are unwilling to replace the diseased Large Cardamom-orchard. Vegetative propagation is still under practice. Even though farmers want to replant seedling, they are unable to buy at reasonable rate as well as in sufficient quantity. Indiscriminate planting of available land races from unknown source without considering climate and altitudes is another major issue. So far disease resistant variety is not available to Nepalese farmers. Apart from the diseases, post-harvest handling and processing are the major problems in cardamom. Conventional drying using firewood makes the cardamom of inferior quality because of smoky appearance and reduced oil content. Dried capsules are packed into gunny bags and

marketed to India. There is high possibility of doubling the price of cardamom through value addition in drying, cleaning and marketing by attractive packaging. Double drum dryer of cardamom is being practiced for many years for no smoky appearances but in small scale.

## **Ginger**

Ginger is herbaceous perennial spice crop which has been in use for more than 5000 years ago by the ancient Chinese and Indians. India is a leading producer of ginger in the world. It grows well in warm and humid climate and is cultivated from sea level to an altitude of 1500 m above sea level. It also can be grown both under rain fed and irrigated conditions. In Nepal, ginger is cultivated in 24224 ha and total production 276150 MT with the average productivity of 11.44 t/ha [MoAD, 2014]. Productivity is very low as compared to other countries. The major cause of low productivity is rhizome rot disease, unavailability of quality disease-free planting material. Ilam, Nawalparasi, Palpa, Salyan are the lead ginger producing districts. Rhizome rot caused by *Pythium aphanidermatum* and *Fusarium* spp. is the main bottleneck of production causing substantial yield loss of 30 percent [Sharma and Shrestha, 2002], however it has the capacity of crop damage up to 100%. It is the third most important exportable commodities after lentil, and large cardamom. Of the total produce 60% is exported particularly to India, 30 % is domestic consumption and 10% is used for seed purpose [Anonymous, 2013]. In 2002, a variety 'Kapurkot Aduwa-1' has been released for commercial production and it has high yielding and processing properties. Despite of many constraints, Nepal ranks 5th in area and 3rd in production and 8th in productivity in the world [FAO, 2015].

## **Turmeric**

It has underground modified stem (rhizome) like in ginger. The name turmeric is believed to be originated from the Latin word terra merita meaning merit of the earth. Turmeric rhizomes contain curcuminoids 2 to 6% [Pruthi, 2006], which is responsible for yellow pigments and comprises three types of curcumins. It is also a shade-loving crop and can be grown as intercropped with orchard and suitable

for agro-forestry systems. Rhizome rot and leaf spot diseases are the major problems of its cultivation. Dried rhizomes and their powder are the commercial forms. Its cultivation could be scaled up in all the terai and mid hills regions. Turmeric is a mild digestive, stimulant, carminative and beneficial in reducing blood cholesterol, ulcers, dysentery, diarrhea, sore throat, indigestion, cancer and also has antiseptic properties. In 2014, for the first time in Nepal, Kapurkot Haledo-1 a turmeric variety was released for commercial production with high yielding and high curcumin content. Package of practices for this crop was also recommended by National Ginger Research Programme, Nepal Agricultural research Council [NARC].

### **Chilli**

It is an annual herb, which is also called hot pepper, red pepper, cayenne pepper, capsicum, etc. Chilli imparts pungency and color to the dishes. Biting pungency is attributed by ‘capsaicin’ whereas; ‘capsanthin’ attributes red pigment [Zibokere, 1994]. It is also a rich source of vitamin A, C and E, and assists in digestion and also prevents heart diseases by dilating blood vessels.

The chilli is propagated by seeds. Chilli requires warm and humid climates for best growth and dry weather during the maturation of fruits and can be grown throughout the year from sea level to 2100m msl. Thrips, mites, aphids and pod borers are the major insect pests and fruit rot, die- back, bacterial wilt, powdery mildew and mosaic are the major diseases of this crop. A single variety ‘Jwala’ has been released, whereas 15 hybrid chilli varieties are registered for commercial production. Almost all districts grow chilies but commercial producers are Morang, Jhapa, Sunsari, Rautahat, Kathmandu, Banke, Bardiya, Kailali and Kanchanpur districts cultivating chilies in more than 200 ha in each district, with the productivity of 4.44 t/ha. Chillies are grown in 8033 ha in the country.

### **Coriander**

Coriander requires cool climate during the growth stage and warm dry climate at maturity. Two open pollinated varieties [Lotus and Suravi] and three hybrid varieties have been registered after the adaptation

testing. Pant Haritama, an Indian variety is under testing at Kapurkot and Dailekh. Aphids, cutworms, fusarium wilt, stem galls and powdery mildews are the major biotic constraints. This crop matures on 110 to 140 days. Terai and Inner Terai are the best-suited areas for its cultivation. It can be intercropped with sugarcane as catch crop before the full growth of sugarcane.

## **Onion**

It is one of the most important and popular vegetables grown successfully in Nepal. It is most popularly used vegetable and spice, which is utilized in every kitchen irrespective of economic status of the family. It contains vitamins 'B' and 'C' and traces of iron and calcium and has manifold medicinal value. A significant amount of onion is being imported from China, India and Thailand. Government of Nepal has launched 'Onion mission' for its promotion and increased production and to substitute import. Variety Red Creol, Agri-found red, Nasik-53 and five hybrid onions are registered for cultivation.

## **Garlic**

In Nepal it is cultivated from Terai to the high altitudes. The variety of garlic cultivated at high altitudes is generally called 'Bhote Lasun'. It has tall plants and large leaves, corms resembles with Chinese garlic. Research has been initiated with local germplasm collection and being evaluated at the agriculture research stations. 'Terai lasun' and 'Bhote lasun' are common in Nepal. These two types may be different species of *Allium*. The white-skinned bulb or corm is subdivided into several 'cloves'. Garlic contains a wealth of sulphur compounds; most important for taste is allicin (diallyldisulphide oxide). Its biological function is to repel herbivorous animals. Garlic is used as a flavoring agent, vegetable and medicinal herb that has accumulated superstitions over the centuries.

## **Saffron**

Saffron is the highly expensive spice and is basically grown in dry temperate region at altitude ranging from 2500 to 2800m msl. It is perennial crop propagated through corms. Dried flower stigmas of

saffron are of commercial value. Approximately 150000 flowers are needed for one kilogram of dried saffron. The intensive color of saffron is caused by pigments of carotenoids. The most abundant constituent is 'safranal'. There is high potential of saffron production in the high altitudes of Nepal. Some farmers of Jumla and Humla have initiated growing this crop but have not yet attained commercial production. However HIMALI project has implemented a sub-project on Saffron in Jumla for its production in farmer's field.

## **CONSTRAINTS OF PRODUCTION, PROCESSING AND TRADE**

- Despite of having enormous suitable climates for spices production, suitable policy is lacking to exploit the opportunities.
- Nepal does not have improved high yielding varieties, scientific cultivation practices and appropriate processing technologies. Whatever technologies we have that has long way to reach to the growers and processors.
- Considering its importance in employment generation, earning foreign currency and potential in balancing international trade the commodity is not getting due priorities.
- Few spices research and development farms working on many spices but with minimum human resources
- Since Nepal became a member of WTO, without SPS quality certificate Nepal's processed spice products cannot enter into international spice markets.
- Unwashed [dirty] fresh ginger without SPS certificate gets quarantine problem and Nepali traders are compelled to pay unofficial money to Indian custom office personnel.
- Large cardamom fetches good price but it has to compete with Sikkim and Darjiling products. Because of smoky appearance and low oil content its price is affected.
- Nepalese spice products are unable to meet the minimum standard of American Spice Trade Association [ASTA] and European Spice Association [ESA], to enter into Western countries due to quality issues.

- Lack of proper knowledge on harvesting, grading and local value addition and inadequate capacity of farmers to prepare required technical and business plan.
- Low access to market and its information.
- Inability of farmers, traders, and processors to provide adequate storage facilities for the spices.

## **PROSPECTS OF SPICES IN NEPAL**

The growing demands for organic crop products have led to the development of international trade for organic spices. Europe is the world leading market for organically produced spices. Spice export is always a significant part of total agricultural export of the country. Nepal has diversified climate from tropical to temperate where almost all spices can be grown successfully. Growers will get more returns from spice crops per unit area than cereals and other crops with comparatively less investments and in less time. In addition to cardamom, ginger, turmeric, garlic, onion, chili, other seed spices like coriander, fenugreek, cumin, fennel, Bishop's weed, black mustard can be grown commercially in Terai and mid hills. Cinnamon and Timur can be promoted through adopting improved package of practices in the community forests that will help to reduce soil erosion and increases income of the community through Silvi-horti system [Anonymous. 2003]. Temperate climate in the high mountain regions has provided special opportunities to grow saffron, Jimmu and Himali Jeera. For the promotion of all these spices, a 'Spice Board' needs to be formed and spices should get due priority for research and development in the country. Special courses should be taught in the agricultural universities. All the Nepalese spices mentioned above need to be dealt by one organization.

In the recent years all over the world, there is a growing trend in the use of various spices in culinary preparations due to changing lifestyle and food habits of the present generation. Spice varieties which have high production potential and better export demand have to be identified for promotion with quality planting materials in large scale and adoption of latest technologies. The present problem of young farmers' migration to foreign job has kept potential cultivable land as fallow. Rejuvenation

of unproductive fallow land for the scientific cultivation of suitable spice crops should be given high priority. There is urgent need of establishing oils and oleoresin extraction plants in the country. Ample raw materials [ginger, turmeric, chilli, cardamom, timur and cinnamon] are now available for the oil and oleoresin extraction. Spice as low volume commodity and with qualitative production and processing, Nepal can directly penetrate into European and American spice trade by air. A prioritized group value chains leading to national program to develop competitive agricultural value chains that increase value added and benefits to smallholder farmers [ADS, 2015] needs to be included in the programme.

Among seed spices cumin, coriander, fennel in terai and valleys, tree spices Xanthoxylem [timur] and Cinnamon [Dalchini] in mid hills and Saffron in high hills should be promoted for commercial production. There is need of exploring value added spice products in the international market under our own Nepalese trade mark. Chilli, particularly Akabare Khursani; one of the most pungent spices grown in eastern hilly region is of best quality in containing 'Capsasin' and has great market value. Its oleoresin content has special medicinal value that is the best of its kind in the world. We need further sincere efforts to explore, promote and increase productivity and value addition. Spice has the ample scope to balance the agricultural international trade deficit of Nepal.

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