

SUBJECT I
INSTITUTIONS FOR AGRICULTURAL DEVELOPMENT: FARMERS'
COLLECTIVES/PRODUCERS' ORGANISATIONS INCLUDING
EFFICIENT SUPPLY-CHAIN MANAGEMENT

**Production of Turmeric in North East Hill Region of India: A
Value Chain Analysis**

Ram Singh*, **S.M. Feroze[†]** and **Shiv Kumar****

ABSTRACT

The paper demonstrates the economics of turmeric in the North Eastern Hill region by focusing on the states, viz., Mizoram, Meghalaya, Manipur and Sikkim through value chain analysis approach. The cost of cultivation analysis has shown that the turmeric crop is economically beneficial across the states and it has been more beneficial in the state of Sikkim as the product in Sikkim has been certified as organic. The factor share as well as cost and returns analysis both have attracted the scientists; policy makers for both pre- and post-harvest interventions. The pre-harvest arrangements include rhizome storage, developing small machinery to reduce drudgery as most of the work has been performed manually in turmeric farms in the region. The mapping of value chain actors and value addition analysis has shown that the processed (powder) and semi-processed (slice/flakes) of turmeric earned good returns, although the powder turmeric was made and sold by a few number of turmeric growers across the states. Making powder as well as slices was not possible for all the turmeric growers as it needs slicer, dryers, grinders and packaging machine and all these are not affordable by the turmeric growers of the region. Therefore, establishment of slice/flakes maker, dryers, grinder, storage for rhizome and packing machines are the need of the hour in the region to enhance their due share in the consumers' price of turmeric and its by-products.

Keywords: Value, Chain, Actor, NEHR, Turmeric and Price Spread.

JEL.: J54, P32, Q02, Q13

I

INTRODUCTION

Turmeric (*Cucurma longa*) is a highly commercial spice of India. The rhizome of turmeric spice contains yellow pigments called *curcumin* which is the main active compound as well as the main colouring agent which also has certain therapeutic properties. Turmeric is part of Indian's culture: it is an important ingredient in curry dishes; it is also used in many religious observances, as a cosmetic, a dye, and it enters in the composition of many traditional remedies. As a dried rhizome of an herbaceous plant, turmeric is closely related to ginger (Dahal and Idris, 1999). This spice is also sometimes called "Indian saffron" because of its yellow colour. This

*Professor, CPGS-AS, CAU, Umiam-793 103, Meghalaya; [†]Associate Professor, CoA, CAU, Imphal and **Principal Scientist, ICAR-NIAP, Pusa, New Delhi.

The authors are grateful to ICAR-NIAP for collaboration of this research project with Central Agricultural University, Imphal from which this research article has been prepared. The authors are also thankful to anonymous reviewer for giving the constructive suggestions to improve this article.

golden spice contains the highest diversity comprising 40 species (Ashraf *et al.*, 2017) and some are important varieties exported outside (Table 1). Turmeric is mostly traded as a whole rhizome, which is then processed into powder or oleoresin by flavour houses and the industrial sector (ASTA, 2002) rhizomes come as fingers, bulbs and splits. Since *curcuminoids* (the colour constituents of turmeric) deteriorate with light and to a lesser extent, under heat and oxidative conditions (Buescher and Yang, 2000), it is important that ground turmeric be packed with protective packaging and appropriately stored.

TABLE 1. MAJOR TURMERIC CULTIVARS GROWN IN INDIA

State (1)	Cultivars/varieties (2)
Kerala	Alleppey Finger
Maharashtra	Rajapore, Karhadi, Waigon
Andhra Pradesh	Nizamabad, Armoor, Vontimitta
Tamil Nadu	Erode local, BSR-1, PTS-10
West Bengal and Assam	Pattant
Meghalaya	Lakadong, Lashein, Ladaw, Lakashain and Megh-I
Mizoram	Lakadong and RT-1
Manipur	Lakadong and local variety
Sikkim	Lakadong and local variety

Source: APEDA, 2018.

Turmeric Production in India

In India, turmeric crop occupies about 6.05 per cent of the total area under spices and condiments grown (Government of India, 2017). Turmeric ranks fourth in production in the country with a total production of 1056.10 thousand MT under a total area of 193.4 thousand ha in the year 2016-17 (Government of India, 2017). The country is not only the largest producer and consumer but is also the largest exporter of turmeric in the world. India dominates the world production scenario contributing 78 per cent followed by China (8 per cent), Myanmar (4 per cent), Nigeria and Bangladesh together contributing to 6 per cent of the global production (Viraja *et al.*, 2018). Telangana state is the leading state under turmeric cultivation (51 thousand ha) and in terms of production (294 thousand MT) contributing about 27.84 per cent to the total country's production in 2016-17. The others major states in turmeric production in the country are Maharashtra (177.85 thousand MT), Tamil Nadu (112.59 thousand MT) and Andhra Pradesh (79.73 thousand MT) (Table 2).

Turmeric Production in NEH Region

Spices are low volume and high export-oriented commodities that has great economic significance in India (Sugasini *et al.*, 2018). The NEHR, green belt of India which comprises states, namely, Assam, Arunachal Pradesh, Meghalaya, Manipur, Mizoram, Nagaland, Tripura and Sikkim harbours a rich flora on account of its varied topography, climate and altitudes and has great potential for the development of

TABLE 2. TOP TEN STATES IN AREA AND PRODUCTION OF TURMERIC IN INDIA (2016-17)

State/ UT (1)	Area ('000 ha) (2)	Per cent (3)	Production ('000 MT) (4)	Per cent (5)
Telangana	51.00	23.00	294.00	27.84
Maharashtra	10.71	4.83	177.85	16.84
Tamil Nadu	29.31	13.22	112.59	10.66
Andhra Pradesh	19.18	8.65	79.73	7.55
Karnataka	14.99	6.76	76.49	7.24
Gujarat	4.10	1.85	65.50	6.20
Odisha	27.86	12.56	54.50	5.16
West Bengal	18	8.12	45.50	4.31
Mizoram	7.2	3.25	27.82	2.63
Haryana	1.5	0.68	22.00	2.08
Overall total in India	221.78		1056.10	

Source: Government of India, 2018.

horticultural crops including spices. It is the hub of major spices like large cardamom, ginger, turmeric, black pepper, chilli, bay leaf, etc. which are in great demand and has tremendous potential (Hnamte *et al.*, 2012). NEH Region is home to some niche spice crops like *Lakadong* turmeric, *Bird's eye* chilli, *King* chilli and *Nadia* ginger which has high market demand for their unique features (Momin *et al.*, 2018). Turmeric is an important cash crop in the NEH region and shares about 8.30 per cent of the total production in the country. Mizoram, with a total production of 27.82 thousand MT is the leading state in the region followed by Meghalaya (16.63 thousand MT) and Manipur (15.40 thousand MT). The agro-climatic conditions of the region characterised by warm and humid summers with abundant rainfall and cool winters are favourable for turmeric cultivation (SFAC, 2012). Like other food crops grown in the NE region, turmeric is cultivated using the traditional knowledge of the inhabitants which are generally eco-friendly, less expensive and organic inputs.

Turmeric spice has a great market potential domestically and abroad which brings forth the need for a value chain analysis. The analysis will help to understand the flow of the produce from the turmeric producers level to the end consumers and the value added to the commodity along the flow. Moreover, turmeric commodity can be sold-off in the raw or in the processed form (dry flake/powdered), hence a value chain analysis will help to identify the stakeholders and marketing along the chain. Therefore, keeping this fact in view the present paper attempts to study the value chain in pre- and post-harvest of turmeric in North Eastern Hill Region of India.

II

MATERIAL AND METHODS

The study was conducted under ICAR funded project in North East region of India comprising the eight sisters, Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura. On the basis of highest area of cultivation of turmeric, four states namely; Mizoram, Meghalaya, Manipur and Sikkim state in

North Eastern Hill region were selected (Table 3). In each selected state, two districts having the highest area under the cultivation of turmeric were selected. From each selected district, 2-4 major collection centres or blocks were selected. Further, a list of all the villages in the chosen collection centres/block was prepared along with the total number of households and the producer of turmeric. A total of 334 number of turmeric producers were selected from the highest turmeric cultivation areas in NEH region (Table 4) by selecting at least 10 per cent of the total farmers from each of the selected villages. A sample of 53 value chain actors were identified in the value chain of turmeric in all the selected states (Table 5). The economics of turmeric cultivation, producers' plus, its disposal and different value chain actors in each selected state were mapped.

TABLE 3. TURMERIC GROWING STATES IN NEH INDIA (2016-17)

State (1)	Area ('000 ha) (2)	Production ('000 MT) (3)
Meghalaya	2.61 (16.35)	16.60 (18.94)
Mizoram	7.20 (45.11)	27.82 (31.74)
Manipur	1.40 (8.77)	16.40 (18.71)
Nagaland	0.70 (4.39)	10.72 (12.23)
Arunachal	0.80 (5.01)	3.84 (4.38)
Tripura	1.30 (8.15)	6.59 (7.52)
Sikkim	1.95 (12.22)	5.68 (6.48)
Total (NEH)	15.96 (100)	87.65 (100)
Total (India)	221.78	1056.10
Per cent Share of NEH	7.20	8.30

Source: Government of India, 2018

Note: Figures in parentheses are percentages to the total of NEH region.

TABLE 4. SAMPLING OF TURMERIC RESPONDENTS (NUMBER)

States (1)	Districts selected (2)	Villages selected (3)	Turmeric respondents	
			Total turmeric producers (4)	Selected turmeric growers (5)
Mizoram	2	7	950	95
Meghalaya	2	9	862	86
Manipur	2	8	746	75
Sikkim	2	9	783	78
Total	8	33	3341	334

Source: Household survey, 2017-20.

TABLE 5. SAMPLING OF TURMERIC VALUE CHAIN ACTORS (NUMBER)

State (1)	Market/collection centre (2)	Value chain Actors of turmeric					Total (8)
		VT (3)	TP (4)	PWR/ PW (5)	R (6)	FPO (7)	
Mizoram	3	5	5	5	3	1	19
Meghalaya	4	4	1	4	4	-	13
Manipur	4	2	-	3	4	-	9
Sikkim	4	-	-	3	7	2	12
Total	15	11	6	15	18	3	53

Note: VT- Village Traders; PWR- Processor-cum-Wholesalers-cum-Retailer; PW- Processor-cum- Wholesaler; TP- Trader-cum-Processor; FPO- Farmer Producer Organisation; R- Retailers.

III

DATA

Three year primary data were collected for the year 2017-2020. Data were collected through personal interview approach. The interview schedule was pre-tested against ambiguity and redundancy and necessary modifications were made in the interview schedule on the basis of the result of pilot study and thereafter final format was obtained for data collection. The interview schedule was prepared differently for the different respondents – producers, value chain actors (traders, wholesalers/retailers/processors, etc.) and consumers.

Analysis of Data

Cost and Return Analysis

The cost concepts namely; Cost A₁, Cost A₂, Cost B₁, Cost B₂, Cost C₁ and Cost C₂ proposed by Special Expert Committee on 1979, 30th January (Government of India, 1979) were used.

Factor Share Analysis

The physical quantity of each factor input when multiplied by its price and then divided by the value of the total product, will yield factor share input (Dhondyal, 1977).

$$\Pi (X_1)= P_1X_1/P_y, \Pi (X_2)= P_2X_2/P_y, \Pi (X_3)= P_3X_3/P_y, \Pi (X_4)= P_4X_4/P_y, \Pi (X_5)= P_5X_5/P_y, \Pi (X_6)= P_6X_6/P_y, \Pi (X_7)= P_7X_7/P_y, \Pi (X_8)= P_8X_8/P_y, \Pi (X_9)= P_9X_9/P_y$$

where,

$\Pi (X_1)$ = Share of seed	P_1 =Cost of seed
$\Pi (X_2)$ = Share of hired labour	P_2 = Cost of hired labour
$\Pi (X_3)$ = Share of imputed value of family labour	P_3 = Cost of imputed value of family labour
$\Pi (X_4)$ = Share of total human labour	P_4 =Cost of total human labour
$\Pi (X_5)$ = Share of manure	P_5 = Cost of manure
$\Pi (X_6)$ = Share of depreciation	P_6 = Cost of depreciation
$\Pi (X_7)$ = Share of interest on working capital	P_7 = Cost of interest on working capital
$\Pi (X_8)$ = Share of rent paid for lease in land	P_8 = Cost of rent paid for lease in land
$\Pi (X_9)$ = Share of interest on owned fixed asset	P_9 = Cost of interest on owned fixed asset
	P_y = Price of the output

Mapping of the Value Chain Actors and their Activities/Function

Value Chain Analysis study helps to map the value chain of a specific product involving various value chain actors, which may use qualitative or quantitative

approach. While the produce moves from one chain actor to another chain actor, it gains value in the form of price mark-up. The chain actors, who actually transact a particular product as it moves through the value chain, includes input dealers (e.g., seed suppliers), farmers, traders, processors, transporters, wholesalers, retailers and ultimately the final consumer. Using snowball sampling, the actors involved in the value chain of the selected spices were identified and mapped according to the flow of the commodity. Various value chain stakeholders starting from the supply of raw materials to marketing of processed products were identified. The flow of the produce within the chain and the relationship between various actors are presented with the help of value chain maps. The following actors/stakeholders across the value chain will be targeted in the identified clusters:

- Input supplier
- Producers (farmers or organisation)
- Intermediaries/functionaries (such as commission agent/ village merchant/ wholesalers/retailers etc.)
- Processors (or may be farmers/ Commission agent/ village merchant/ wholesalers/ retailer, etc., act as processors)
- Service providers (Logistics, storage, packages, etc.)
- Government officials (Horticulture department, KVKs, APMCs, etc.)
- Enlisting appropriate number of agency (Organic certification agencies, if any)
- Enlisting FPO (for spices in particular, if any).

IV

RESULTS AND DISCUSSION

Costs and Returns of Turmeric Production in NEH Region

The production of turmeric in NEH region shows that the cost of production in the state of Manipur was the lowest followed by the states of Meghalaya, Sikkim and Mizoram. The sale price of the produce was observed to be more in the state of Sikkim (₹ 34.45/kg) than to Mizoram (₹ 32.77/kg), Meghalaya (₹ 26.92/kg) and Manipur (₹ 21.38/kg). Higher price of turmeric in the state of Sikkim might be due to the preference of consumers for organic produce. Consequently, the producer of state of Sikkim earned comparatively more (₹ 17.07/kg) net return than the state of Mizoram (₹ 9.07/kg), Meghalaya (₹ 10.48/kg) and Manipur (₹ 8.18/kg). Hence, it can be concluded that organic adopter state of Sikkim tend to attract the consumers as the turmeric was organically produced (Table 6).

The cost and returns of by-products of turmeric varies spatially as well as per cultivar of the crop. The conversion of raw turmeric into dry-flakes has been presented in Table 9. The cost of dry-flakes of turmeric varied from ₹ 51.50 to ₹ 89.70 across the states of NEHR. It was notably higher in the state of Mizoram (₹ 89.70/kg) and followed by Meghalaya (₹ 63.50/kg) and Sikkim (₹ 62.38/kg)

whereas, it was the lowest in Manipur (₹ 51.50/kg). The dry-flakes produced in the state of Sikkim attracted to fetch higher prices than the dry-flakes of other states. Consequently, low cost and higher prices of dry-flakes produced in the state of Sikkim fetched higher net returns except the state of Manipur (Table 7).

TABLE 6. COSTS AND RETURNS OF RAW TURMERIC (RHIZOME) PRODUCTION IN NEH REGION (₹ /kg)

Particular (1)	Sikkim (2)	Mizoram (3)	Meghalaya (4)	Manipur (5)
Cost of production	17.38	23.70	16.44	13.20
Sale price	34.45	32.77	26.92	21.38
Net return	17.07	9.07	10.48	8.18

Source: Household survey, 2017-20.

Note: Figures in parentheses are percentage difference (increase or decrease) with Sikkim.

TABLE 7. COSTS AND RETURNS OF DRY FLAKE PRODUCTION OF TURMERIC IN NEH REGION (₹ /kg)

Particular (1)	Sikkim (2)	Mizoram (3)	Meghalaya (4)	Manipur (5)
Cost of production	62.38	89.70	63.50	51.50
Sale price	169.00	135.00	160.00	165.00
Net return	106.62	45.30	96.50	113.50

Source: Household survey, 2017-20; *Include the production and process cost.

Note: Figures in parentheses are percentage difference (increase or decrease) with Sikkim.

Similarly, the conversion of raw turmeric into powder is presented in Table 9. It is evident from the Table 9 that the quality of raw turmeric of Sikkim involves minimum loss in further processing it into dry-flakes as well as powder turmeric. The cost in processing of raw turmeric into powder has been estimated and found to be higher in the state of Mizoram and it was lowest in the state of Manipur. The price offered by consumer was recorded at higher level for the produce of Sikkim state. Hence, the net returns were estimated to be higher in the state of Sikkim and lowest in the state of Mizoram (Table 8).

TABLE 8. COSTS AND RETURNS OF PRODUCTION OF POWDER TURMERIC IN NEH REGION (₹ /kg)

Particulars (1)	Sikkim (2)	Mizoram (3)	Meghalaya (4)	Manipur (5)
Cost of production*	72.80	99.70	73.50	61.50
Selling price	258.00	225.00	246.00	195.00
Net return	185.20	125.30	172.50	133.50

Source: Household survey, 2017-20; *Include the production and process cost.

Note: Figures in parentheses are percentage different (increase or decrease) with Sikkim.

TABLE 9. CONVERSION FACTOR OF RAW TURMERIC TO FINAL PRODUCT (DRY FLAKES/POWDER) (kg)

Type of final product (1)	Sikkim		Mizoram		Meghalaya		Manipur	
	Raw product (2)	Final product (3)	Raw product (4)	Final product (5)	Raw product (6)	Final product (7)	Raw product (8)	Final product (9)
Dry flake	3.50	1.0	3.70	1.0	3.74	1.0	3.75	1.0
Turmeric powder	4.70	1.0	4.90	1.0	4.96	1.0	4.96	1.0

Source: Household survey, 2017-20.

Hence, from the analysis of cost of production of turmeric and its by-product it is clear that the processed product has fetched higher returns of the product. The processing is not possible for all resource poor turmeric growers of the region. Therefore, establishment of slice/flakes maker, dryers, grinder and packing machines is the need of the hour in the region to enhance their due share in the consumers' price of turmeric and its by-products.

Factor Share Analysis

Human labour was the key factor of production in turmeric across the states. Labour comprised family labour as well as hired labour for turmeric cultivation. The lowest factor share of human labour in turmeric production was observed in the state of Sikkim (27.25 per cent) comparing to the other state of Mizoram (37.45 per cent), Meghalaya (30.57 per cent) and Manipur (34.61 per cent), respectively (Table 10). In all the selected states, a higher share in the human labour was contributed by family labour, which calls for intervention of machinery to reduce the human labour use. Hence, site-specific mechanisation is the need of hour and must be encouraged to enhanced labour efficiency. Rhizome (seed) was another major factor contributing in the productivity and uniqueness of turmeric crop. The factor share of rhizome has been estimated of 25.33 per cent, 24.42 per cent, 20.45 per cent and 18.37 per cent in Mizoram, Meghalaya, Manipur and Sikkim, respectively. The usage of organic manure was found to be significant contributing only in the state of Mizoram with an estimation of 3.43 per cent. Organic manure helps in enhancing yield of crops as organic matter content in the soil is increased by supply of farm yard manure and other organic compounds (Sharma and Reynnells, 2018). Therefore, the application of organic manures should be encouraged for its use in cultivation of turmeric which has manifold benefits for the turmeric growers. The share of depreciation ranged 0.1 to 0.4. Mizoram was found to be the leading state in this aspect. Usage of new innovative farm tools and implements should be encouraged as farm assets exert a considerable influence on farming activities. Hence, the factor share analysis has provided the way forward for research and development in pre-harvest arrangements.

Producers' Surplus

The producer's surplus estimation is way forward for post-harvest management of the produce. The marketable surplus and marketed surplus of turmeric has been observed more or less equal and there was no distress sale of the produce. The loss of turmeric was a major concern which was estimated in the range of 5.35 qtl to 14.80 qtl across the states (Table 11). Hence, development of suitable storage facilities need to be facilitated in this area.

TABLE 10. STATE WISE FACTOR SHARE ANALYSIS OF TURMERIC PRODUCTION IN NEHR

Factors of production (1)	Mizoram			Meghalaya			Manipur			Sikkim		
	Value (₹/ha) (2)	Turmeric /ton (3)	Factor share (Per cent) (4)	Value (₹/ha) (5)	Turmeric /ton (6)	Factor share (Per cent) (7)	Value (₹/ha) (8)	Turmeric /ton (9)	Factor share (Per cent) (10)	Value (₹/ha) (11)	Turmeric /ton (12)	Factor share (Per cent) (13)
Output	110764.26	3.38	100	135657.85	5.04	100	112460.94	5.57	100	189817.63	5.51	100
Seed	28051.73	0.86	25.33	33127.52	1.23	24.42	22999.44	1.08	20.45	34863.63	0.01	18.37
Manure	3808.55	0.12	3.43	1535.17	0.06	1.13	2340.56	0.11	2.08	3943.00	0.11	2.07
Hired Labour	11489	0.35	10.37	11726	0.44	8.64	6486.00	0.30	5.76	5385.00	1.16	2.83
Family labour	29988	0.92	27.07	29748	1.11	21.93	32440.00	1.52	28.85	46341.00	1.35	24.41
Total human labour	41477	1.27	37.45	41474	1.54	30.57	38926.00	1.82	34.61	51726.00	1.5	27.25
Depreciation	443.21	0.01	0.4	506.21	0.02	0.37	388.80	0.02	0.34	350.95	0.01	0.18
Interest on working capital	3284.44	0.1	2.96	3517.12	0.13	2.59	2416.11	0.11	2.14	33470.72	0.1	1.76
Rental value of land	3031.84	0.09	1.99	2703.49	0.12	1.99	2340.00	0.11	2.08	1524.62	0.04	0.80

TABLE 11. PRODUCER'S SURPLUS OF TURMERIC IN NEH REGION

Particulars (1)	(qtl/hh)			
	Mizoram (2)	Meghalaya (3)	Manipur (4)	Sikkim (5)
Total Production	2614.40	1632.12	1379.65	1045.06
a) Consumption	14.23	12.19	10.38	5.22
b) Used as seed	526.93	330.60	233.83	236.17
c) Loss at farmer's field	6.85	14.80	5.35	5.43
d) Gift	2.01	-	-	-
Total (a+b+c+d)	550.02	357.93	249.57	246.82
Marketable Surplus	2098.22	1288.99	1135.43	803.67
	(80.26)	(78.98)	(82.30)	(76.90)
Marketed Surplus	2091.38	1274.00	1130.08	798.24
	(79.99)	(78.05)	(81.91)	(76.38)

Note: Figures in parentheses are the percentage of total production, Source: Household survey, 2017-20.

Mapping of Value Chain Actors in Turmeric

As stated earlier the turmeric crop is disposed-off in three forms, viz., raw (rhizome), dry flakes/slices and turmeric powder. There was only one channel for each of raw and turmeric powder. Whereas, for dry flakes/slices of turmeric two channels were identified in the markets of Mizoram state (Table 12). Out of total production the largest quantity has been disposed-off in the form of dry flakes/slices through channel-I (61.26 per cent) and channel-II (30.86 per cent). Only 5.44 per cent of the production was disposed-off in the form of turmeric powder (Figure 1).

TABLE 12. MAJOR MARKETING CHANNELS AND ACTORS OF VALUE CHAIN OF TURMERIC IN MIZORAM

Channels (1)	Actors (2)	(per cent) Quantity (3)
Raw turmeric		
Channel-I	Producer→ Consumer	2.44
Dry flake/slice turmeric		
Channel-I	Producer→ Village Trader→ Trader-cum-Processor→ Assam	61.26
Channel-II	Producer→ Village Trader→ Processor-cum-Wholesaler-cum-Retailer→ Retailer→ Consumer	30.86
Powder of turmeric		
Channel-I	Producer→ Consumer	5.44

Source: Household survey, 2017-20.

Meghalaya state produces high quality turmeric called '*lakadang*'. It is disposed-off in three forms, viz., raw, dry and powder turmeric. The larger portion as dry flakes is disposed through four major channels followed by raw turmeric which was disposed through four major channels. A meagre quantity was disposed in form of powder turmeric through direct channel (Table 13). For the raw turmeric channel-II was major whereas for dry flakes channel-IV was major and followed by channel-I and channel-III. Only 3.69 per cent of the total production of turmeric was converted into powder and disposed through direct channel (Figure. 2).

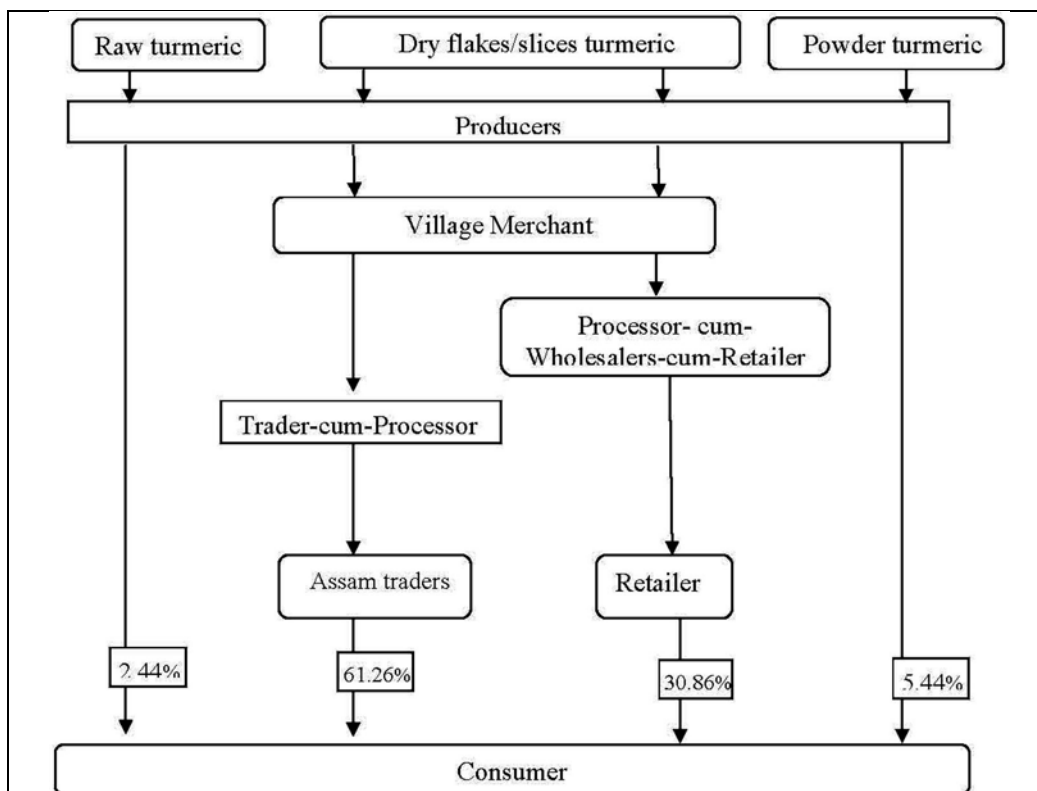


Figure 1. Map of Value Chain Actors of Turmeric in Mizoram.

TABLE 13. MAJOR MARKETING CHANNELS AND ACTORS OF VALUE CHAIN OF TURMERIC IN MEGHALAYA

Channels (1)	Actors (2)	Quantity (per cent) (3)
Raw turmeric		
Channel-I	Producer→ Consumer	1.02
Channel-II	Producer→ Village Trader→ Traders (Assam)	18.63
Channel-III	Producer→ Village Trader→ Processor-cum-Wholesaler-cum-retailer→ Retailer→ Consumer.	3.19
Channel-IV	Producer→ Processor-cum-Wholesaler-cum-retailer→ Consumer	6.19
Dry flake/slice turmeric		
Channel-I	Producer→ Village Trader→ Trader-cum-Processor→ Tamil Nadu/ Kerala	24.67
Channel-II	Producer→ Village Trader→ Trader-cum-Processor→ Consumer	1.03
Channel-III	Producer→ Village Trader→ Processor-cum-Wholesaler-cum-Retailer→ Consumer	14.87
Channel-IV	Producer→ Processor-cum-Wholesaler-cum-Retailer→ Retailer→ Consumer	26.71
Powder of turmeric		
Channel-I	Producer→ Consumer	3.69

Source: Household Survey, 2017-20.

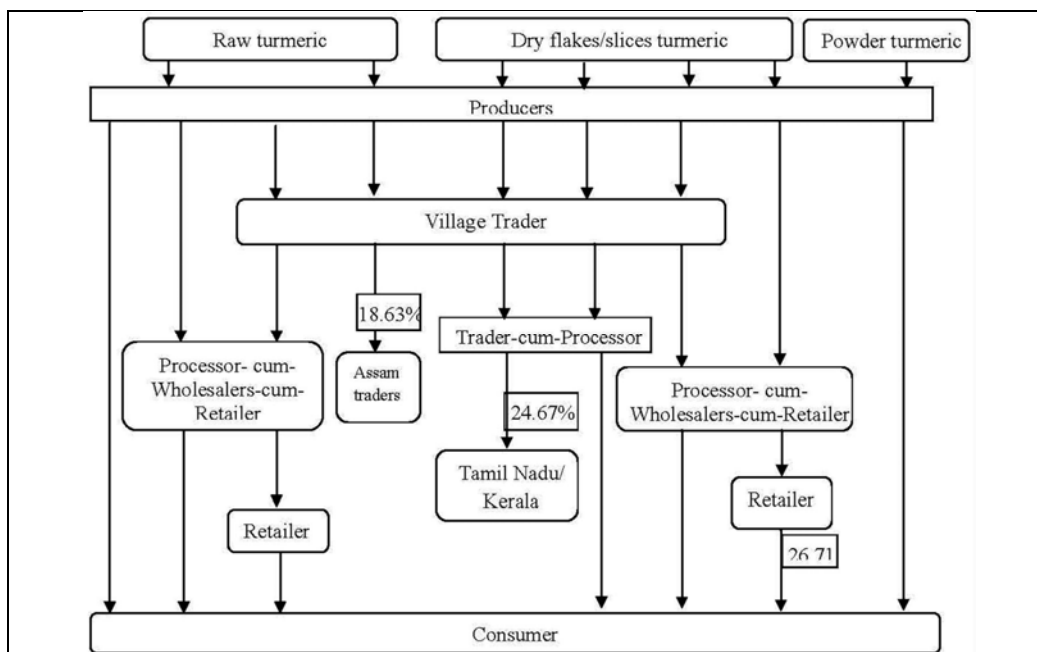


Figure 2. Map of Value Chain Actors of Turmeric in Meghalaya.

In the state of Manipur it has been observed and reported that more than 11 per cent of turmeric (Figure 3) has been converted into powder form and sold through direct channel. The remaining less than 89 per cent turmeric is disposed-off in raw form (Table 14). Hence, the state of Manipur has more scope for turmeric processing at farmers' level.

Similarly, in the state of Sikkim more than 25 per cent (Figure 4) of turmeric has been converted into powder form and sold through two major channels. The remaining was sold in raw form through three major channels (Table 15). Hence, the organic state of Sikkim has also ample scope for processing of turmeric.

Value Addition and Compliance Cost

The channel and extent of disposal of turmeric in different forms has been discussed in the previous section. The value addition (price spread) has been estimated highest in the state of Meghalaya for dry flakes/slices of the turmeric whereas it was lowest in the state of Mizoram across the channels, which fetched less net price of producer. Therefore, the intervention for dry flakes needs to be initiated in the state of Mizoram. Similarly, the value addition cost for powder turmeric has been estimated to be the highest in the state of Sikkim and lowest in Manipur (Table 16). But the net returns were higher in the state of Sikkim and lowest in the state of Manipur across the channels of the commodity, which calls for immediate improvement in price mechanism in the state of Manipur.

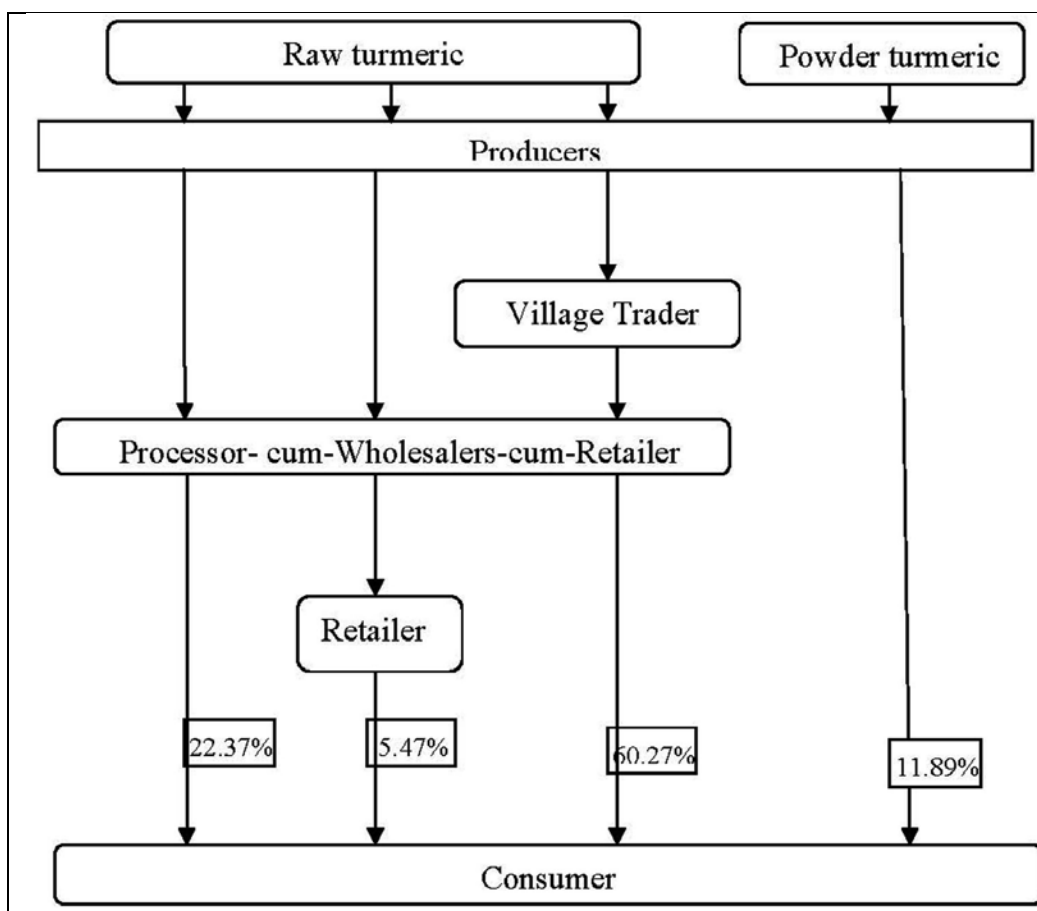


Figure 3. Map of Value Chain Actors of Turmeric in Manipur

TABLE 14. MAJOR MARKETING CHANNELS AND ACTORS OF VALUE CHAIN OF TURMERIC IN MANIPUR

Channels (1)	Actors (2)	Quantity (per cent) (3)
Raw turmeric		
Channel-I	Producer→ Processor-cum-Wholesaler-cum-Retailer→ Consumer	22.37
Channel-II	Producer→ Processor-cum-Wholesaler-cum-Retailer→ Retailer→ Consumer	5.47
Channel-III	Producer→ Village Trader→ Processor-cum-Wholesaler-cum-Retailer → Consumer	60.27
Powder of turmeric		
Channel-I	Producer→ Consumer	11.89

Source: Household Survey, 2017-20

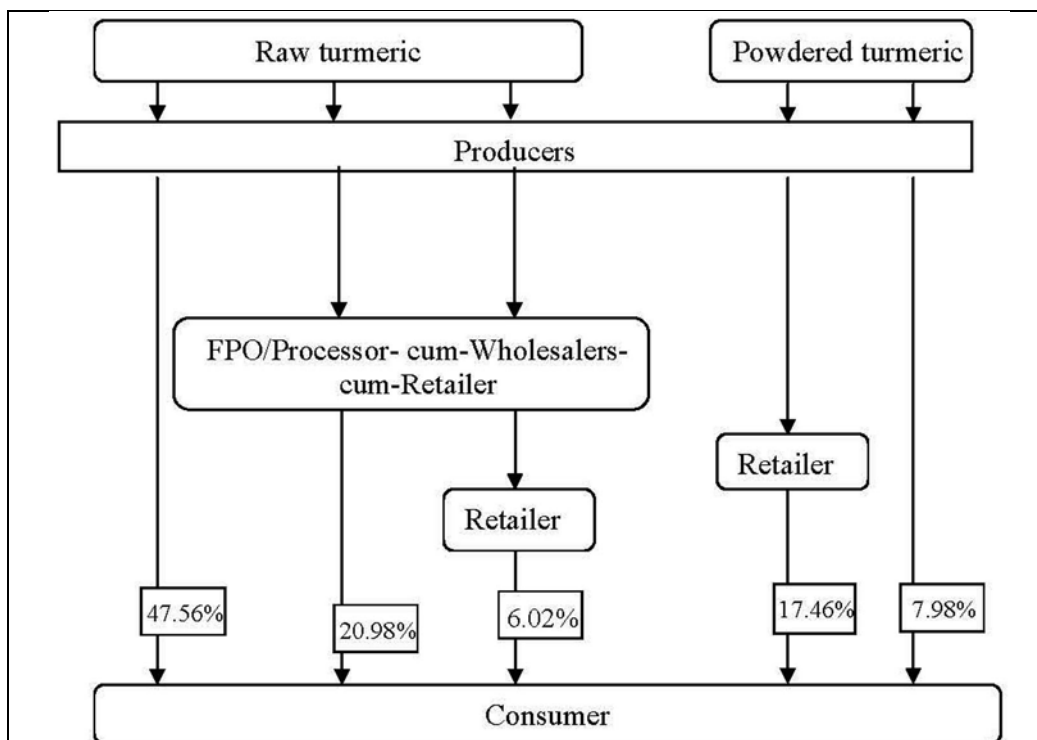


Figure 4. Map of Value Chain Actors of Turmeric in Sikkim.

TABLE 15. MAJOR MARKETING CHANNELS AND ACTORS OF VALUE CHAIN OF TURMERIC IN SIKKIM

Channels (1)	Actors (2)	Quantity (per cent) (3)
Raw turmeric		
Channel-I	Producer → FPO/Processor-cum-Wholesaler-cum-Retailer → Retailer → Consumer	47.56
Channel-II	Producer → FPO/Processor-cum-Wholesaler-cum-Retailer → Consumer	20.98
Channel-III	Producer → Consumer	6.02
Powder of form		
Channel-I	Producer → Retailer → Consumer	17.46
Channel-II	Producer → Consumer	7.98

V

CONCLUSION

From the analysis of cost of production of turmeric and its by-product it is clear that the processed products have fetched higher returns for the product. The state wise analysis of costs and returns has proved that the turmeric is highly profitable in the state of Sikkim which has been certified as a state of organic turmeric. Therefore,

TABLE 16. PRICE SPREAD/VALUE ADDITION OF TURMERIC MARKETING IN NEH REGION
(₹/qtl)

State (1)	Channel (2)	(3)	Net price received by producer (4)	Marketing cost (5)	Marketing margin (6)	Consumer's price (7)	Price spread (8)	Producer share in consumer's rupee (9)	
Mizoram	Raw	Channel-I	18.97	1.92	-	20.89	1.92	90.83	
		Channel-II	19.14	0.97	5.89	26	6.86	73.62	
	Dry flake	Channel-I	44.84	85.27	4.90	135	90.17	33.21	
		Channel-II	42.56	87.44	5.00	135	92.44	31.52	
	Powder of turmeric	Average	43.70	86.35	4.96	135	91.30	32.37	
		Channel-I	122.98	103.69	-	226.67	103.69	54.26	
	Meghalaya	Raw	Channel-I	36.55	2.38	0	38.93	2.38	93.89
			Channel-II	19.14	0.97	5.89	26	6.86	73.62
			Channel-III	23.83	0.75	3.42	28	4.17	85.11
			Channel-IV	21	-	-	21	-	100
Average			25.13	1.03	2.32	28.48	3.35	88.23	
Dry flake		Channel-I	52.95	97.42	9.63	160	107.05	33.09	
		Channel-II	52.95	93.74	3.31	150	97.05	35.30	
		Channel-III	49.90	100.98	4.12	155	105.01	32.19	
		Channel-IV	55.23	94.77	-	150	94.77	36.82	
		Average	52.76	104.08	4.27	153.75	100.99	34.31	
Powder of turmeric	Channel-I	110.17	104.08	0	214.25	104.08	51.42		
Manipur	Raw	Channel-I	20.50	0.52	-	21.02	0.52	97.55	
		Channel-II	22.62	1.13	-	23.75	1.13	95.24	
		Channel-III	19.95	1.31	7.24	28.50	8.55	70	
		Average	21.02	0.99	2.41	24.42	3.40	86.08	
		Channel-I	99.34	91.43	0.00	190.77	91.43	52.07	
Sikkim	Raw	Channel-I	30.84	1.21	-	32.25	1.21	96.25	
		Channel-II	33.18	1.23	-	34.41	1.23	96.42	
		Channel-III	44.87	1.29	-	46.15	1.29	97.22	
		Average	36.36	1.24	-	37.60	1.24	96.63	
		Powder of turmeric	Channel-I	114.57	117.34	33.10	265.00	150.43	43.23
Sikkim	Powder of turmeric	Channel-II	134.63	124.40	0.00	259.03	124.40	51.97	
		Average	124.60	120.87	16.55	262.02	137.42	47.55	

the Sikkim model needs to be replicated in the region as a whole. Human labour was the key factor and the depreciation share was minimal in production of turmeric across the states which are matter of concern for mechanisation of the region for farming. Losses during storage of rhizome were also a major concern found through producers' surplus analyses which necessitates the establishment of good storage facilities in the region. The mapping of value chain actors and value addition analysis emphasised the intervention of the channel which was mostly preferred by the turmeric grower, no doubt the net price received was higher in the direct channel of powder but practically such type of channel cannot be encouraged in the market. Therefore, the preference of channel must be encouraged and intervened for further enhancing its efficiency.

REFERENCES

- APEDA (2018). Agricultural and Processed Food Products Export Development Authority, India. Available at http://apeda.gov.in/apedawebsite/organic/Organic_Products.htm. Accessed on 05th September, 2019.
- Ashraf, K.; A. Ahmad, S.A.A. Shah and M. Mujeeb (2017), "Genetic Diversity in Accessions of Indian Turmeric (*Curcuma Longa* L.) using Rapid Markers", *International Journal of Pharmacy and Pharmaceutical Sciences*, Vol.9, No.10, pp.288-291.
- ASTA (2002), A Concise Guide to Spices, Herbs, Seeds, and Extractives, American Spice Trade Association. pp.48-50.
- Buescher, R., and L. Yang (2000), Turmeric, in: Natural Food Colorants, Science and Technology. G.L. Lauro, and F.J. Fancis (Eds.) (2000), Marcel Dekker, New York. pp.205-226.
- Dahal, K.R., and S. Idris (1999), *Curcuma Longa* L., in de Guzman, C.C. and J.S. Siemonsma, (Eds.) (1999), Plant Resources of South East Asia No. 13, Spice Backhuys Publishers, Leiden, The Netherland, Pp-111-116.
- Dhondyal, S.P. (1977), Farm Management: Economic Approach, Aman Publishing House, Meerut, Uttar Pradesh (India), pp.292-93.
- Government of India (1979), *Special Expert Committee Report on Cost of Cultivation (Chairman: Dr. S.R.Sen)*, New Delhi.
- Government of India (2017), Horticultural Statistics at a Glance 2018, Government of India, Ministry of Agriculture and Farmers Welfares, Department of Agriculture, Cooperation and Farmers Welfare. Horticulture Statistics Division.
- Hnamte, V.; R. Chatterjee, P.K. Chattopadhyay and A. Pariari (2012), "Spices Scenario in the North Eastern States of India with Special Reference to Production and Marketing", *Journal of Crop and Weed*, Vol.8, No.2, pp.109-112.
- Momin, K.C.; C.P. Suresh, Y.S. Singh and B.C. Momin (2018), The Promising Spices of North East India: India's Flavourful Contribution to the World, in Indian Spices Indian Spices: The Legacy, Production and Processing of India's Treasured Export. Springer, pp.47-60.
- SFAC (2012), Value Chain Analysis of Selected Crops in North Eastern State, Available at http://sfacindia.com/PDFs/SFAC_Value-Chain-Analysis.pdf
- Sharma, M. and R. Reynnells (2018), "Importance of soil Amendments: Survey Of Bacterial Pathogens in Manure and Compost used as Organic Fertilizers", *Pre harvest Food Safety*, 2018, Wiley online library, Pp-159-175.
- Sugasini, D.; P.C.R. Yalagala, B. Kavitha, T. Kasthuri, Y. Vijayalakshmi, P.K. Kumar and S. Kumar (2018), "Indian Culinary Ethnic Spices Uses in Foods are Palate of Paradise", *Acta Scientifica Nutritional Health*. Vol.2, No.8, pp.22-28.
- Viraja, V.; V.M. Thumar, N. Singh, P.M. Thanki and V.B. Tandel (2018), "Resource Use Efficiency in Turmeric Cultivation in Navsari District of Gujarat", *International Journal of Agriculture Sciences*, Vol.10, No.15, pp.6779-6780.