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Value chain analysis of Lakadong turmeric in Meghalaya: a micro-level study

Ram Singh[1]*, Alethea Dympep[1], S Passah[1], S M Feroze[1], A Choudhury[1], Shiv Kumar[2], and A Jhajharia[2]

[1]School of Social Sciences, College of Post Graduate Studies in Agricultural Sciences, Central Agricultural University(CAU) (Imphal), Umiam 793 103
[2]ICAR-National Institute of Agricultural Economics and Policy Research, New Delhi 110012

*Corresponding author: ramsingh.cau@gmail.com

Abstract This paper analyses the performance of the value chain of Lakadong turmeric in the north-eastern state of Meghalaya. It assesses the activities, value added, and prices received at each stage of the product's journey, from farming by producers to sale to consumers. The powdered form of Lakadong turmeric fetched a higher price, but farmers and processors sold their produce in the form of dry flakes because proper processing units, like dryers and grinders, are lacking. Many opportunities have been identified, and tapping these would prove useful in processing turmeric and generating employment in Meghalaya.

Keywords Value chain, turmeric, micro-study,Lakadong, Meghalaya

JEL code R_2

India is the largest producer, consumer, and exporter of spices in the world; it produces 75% of the world's spices (Foretell Business Solutions 2017). India is also the top producer of turmeric(*Cucurma longa*), contributing about 78% of the world's production (Viraja et al. 2018). In 2016–17, 8,122,000 metric tons (MT) of spices were produced from the total cultivated area of 3,671,000 hectares (ha)(GoI 2017). Within India, Rajasthan is the leading state in spice production, contributing about 27.35% of the area and 17.14% of the production. The north-eastern region of India is considered a major hub of spices, with a share of 9.38% of total production in 2016–17 and 6.51% of the country's land area under cultivation. Turmeric ranks fifth in area and fourth in production among the major spices, and it occupies about 6% of the area and 13% of the production of spices and condiments in the country (National Horticulture Board 2017). In 2016–17, the leading turmeric producers in India were Telangana (294 MT) and Maharashtra (224 MT). The north-eastern region of India is considered a major hub of spices. In 2016–17, its share of the country's production was 9.38% and of the land area under cultivation was 6.51%. The leading turmeric producers in the north-east were Assam (16.75 MT), Mizoram (27.82 MT), and Meghalaya (15.86 MT) (Table 1).

Turmeric is widely grown in all the districts of Meghalaya. The Khasi-Jaintia Hills districts contribute 72% of the state's production and the Garo Hills districts 28% (GoM 2018). Turmeric can be of 40 species (Ashraf et al. 2012); the varieties commonly grown in Meghalaya are Lakadong, *Lashien, Ladaw, Lakachain, Yangau, and Megha-1*. Lakadong, a small village in the West Jaintia Hills, gives its name to the variety of turmeric. *Curcumin* is the main active compound and the main colouring agent. The cucurmin content of Lakadong turmeric is about 6.8–7.5%, almost 2.00% higher than of any other variety in the world (*Megh Self Help* 2006; Daimei et al. 2012). Lakadong turmeric has therapeutic properties and it is

Table 1 Turmeric growing states in NE India (2015–16)

State	Area (000' ha)	Production (000' MT)
Assam	16.89 (51.54)	16.75 (16.61)
Meghalaya	2.54 (7.75)	15.86 (15.54)
Mizoram	7.2 (21.97)	27.82 (27.26)
Manipur	1.4 (4.27)	16.40 (16.07)
Nagaland	0.69 (2.11)	9.12 (8.94)
Arunachal	0.8 (2.44)	3.84 (3.94)
Tripura	1.3 (3.97)	6.59 (6.46)
Sikkim	1.95 (5.95)	5.68 (5.57)
Total (NE)	32.77 (100.00)	102.06 (100.00)
Total (India)	185.9	943.3
% Share	17.6277569	10.81946359

Source GoI 2017

considered to be the world's best. It attracts much attention from the pharmaceuticals, textiles, and food industries. Lakadong turmeric obtained its Geographical Indications tag in the year 2015.

A value chain is the series of activities that create and build a product's value (Hellin and Meijer 2006).The traditional way of food production is being replaced by greater vertical coordination across stakeholders in the agriculture value chain to manufacturing processes (Kumar et al. 2011), and this transformation has led integrated food supply and value chains to emerge (Kumar and Sharma 2016; Reno 2019). Indian agriculture is mostly a smallholder phenomenon; the landholdings of most agrarian households are marginal or small. Marginal farmers and smallholders have the opportunity to take advantage of these transformations in the food system to meet the increasing demand for value-added products and increase their incomes (McCarthy, Singh, and Schiff 2008).Value chains enable farmers and agribusiness entrepreneurs to transform commodities and meet the consumer demand for safe and high-quality processed products (Boehlje, Hofing, and Schroeder 1999; CSR Asia 2017), and they allow businesses to respond to the marketplace by linking production, processing, and marketing activities to demand (Ensign 2001; Imtiyaz and Soni 2016; Stein and Barron 2017).

Sensing the commercial potential of Lakadong turmeric, corporate players have been sourcing it from the turmeric-growing villages of the Jaintia Hills (GoM 2020). To meet the growing demand, the Government of Meghalaya launched Mission Lakadong in 2018. The mission targets production of 50,000 MT in a period of five years (GoM 2020); it aims also to build brand equity for Lakadong, introduce the latest technology and management practices, and create an environment for enabling public–private partnerships.

Against this backdrop, it becomes essential to analyse the value chain of Lakadong turmeric to understand and identify each stage of value addition in the value chain and provide policy suggestions towards opportunities for interventions to increase the efficiency of such chains.

Study area

Most of the land used to cultivate turmeric (53.49%) lies in the West Jaintia Hills district of Meghalaya, and it contributes about 54.31% of the turmeric produced in the state (GoI 2017). We conducted the study in the West Jaintia Hills district, and we selected two collection centres, Laskein and Thadlaskein blocks, based on the maximum concentration of turmeric disposed of by the farmers in the district. We selected a cluster of at least two adjacent villages, situated within 10 km from the collection centre, from each block. We randomly selected three adjacent villages in Laskein block (Shangpung, Moolibang, and Khliehmushrut) and two adjacent villages in Thadlaskein block (Sandro and Pdein Ladaw).We prepared semi-structured questionnaires for the categories of chain actors involved at each of the stages. We selected and surveyed 13 chain actors, 4 village traders, 1 trader-cum-processor, 4 processors-cum-wholesalers, and 4 retailers. We also selected a sample of 56 Lakadong turmeric cultivar growers. We prepared a detailed value chain map of the turmeric in the study area and estimated the volume of market transactions.

Mapping the actors in the value chain

Turmeric may be raw or sliced or in powder form. We estimated the quantity of the turmeric disposed of in each of these forms by each of the actors in the value chain to the agencies involved between the producer and the consumer and we mapped it in the value chain.

We used semi-structured questionnaires to interview each of the actors in the value chain and the turmeric producers. We computed the cost incurred by the actors and the value added at each stage and also the

distribution of margin through chasing the lot (Acharya and Aggarwal 2004) along the chain.

We recorded and analysed the costs incurred by each of the actors in the value chain: washing, transportation, packaging, packing, loading, unloading, weighing, slicing/cutting, drying, and grinding.

Cost and return analysis

The Special Expert Committee proposed the concepts of cost—Cost A_1, Cost A_2, Cost B_1, Cost B_2, Cost C_1, and Cost C_2 —on 30 January 1979 (Sen 1979). We used these concepts to ascertain the cost of cultivation of Lakadong turmeric.

Cost A_1 is the value of hired human labour; animal labour (hired and owned); charges on hired farm machinery; value of seed owned and purchased; value of manures, fertilizers, and plant protection chemicals; depreciation, repair, and maintenance of farm machinery, implements, and buildings; irrigation charges; land revenue, cesses, and other taxes; interest on working capital; and miscellaneous expenses.

Cost A_2 is Cost A_1 + rent paid for leased-in land.

Cost B_1 is Cost A_2 + interest on value of owned fixed capital assets (excluding land).

Cost B_2 is Cost B_1 + rental value of owned land (minus land revenue).

Cost C_1 is Cost B_1 + imputed value of family labour.

Cost C_2 is Cost B_2 + imputed value of family labour.

The net returns over these cost concepts have been calculated as the difference between the gross farm income (GFI) and particular cost.

GFI = value of main product (quantity x price)

Net return including family labour = GFI – total cost including family labour

Net return excluding family labour = GFI – total cost excluding family labour

Farm business income = GFI – Cost A_2

Family level income = GFI – Cost B_2

Net farm income = GFI – Cost C_2

Farm investment income = farm business income – imputed value of family labour.

We performed the break-even analysis by computing the break-even point (BEP), or the volume of produce that generates returns just equal to the cost of production.

$$BEP = \frac{F}{(P - V)}$$

We computed the monetary value of the BEP.

$$BEP = F \div \left[1 - \frac{V}{P}\right]$$

where,

F = fixed costs in INR per hectare of turmeric

P = price of turmeric (per quintal in INR)

V = variable costs (per quintal of turmeric in INR)

Producer's surplus

The quantity of produce that is, or can be, made available by the grower to the non-farm population is the producer's surplus. The producer's surplus can be marketable surplus or marketed surplus.

Marketable surplus

The marketable surplus is the residual left with the producer-farmer after meeting their requirement for family consumption; farm needs for seeds; payment (to labour in kind, artisan, blacksmith, potter, and mechanic); payment to landlord as rent; and social and religious payments in kind.

$$M_s = T_P - (C_h + C_k) \quad \ldots(1)$$

where,

M_s = marketable surplus,

T_P = total production (worked out after deducting the decayed, spoiled, or diseased produce),

C_h = home consumption, and

C_k = gifts and payments in kind.

Marketed surplus

The quantity of produce that the producer-farmer actually sells in the market irrespective of his requirement for family consumption, farm needs, and other payments is the marketed surplus; it may be more, less, or equal to the marketable surplus.

Table 2 Value chain activities and actors in Lakadong turmeric

Activities / Stages in Value Chain	Value chain actors
Cultivation	Farmers
Processing	Farmers, SHGs, processors
Disposal	Farmers, SHGs, processors, wholesalers, retailers, post office (powder)
Logistics	Post office, 1917iTEAMS*

*1917 integrated Technology Enabled Agri Management System

$$M_t = M_s - (L_m - L_t) \quad \ldots(2)$$

where,

M_t = marketed surplus,

M_s = marketable surplus,

L_m = losses during transportation and marketing, and

L_t = arbitrary deduction or under weighing by traders at market.

Value addition in Lakadong turmeric

We divide value addition into cultivation, processing, disposal, and logistics. Pre-harvesting value addition includes the selection of disease-free rhizome, spacing of plants, and the use of plant protection measures and its reflection on yield of turmeric. The post-harvest value addition is the main component of value addition.

Turmeric is disposed of raw or sliced or in powder form. Raw turmeric is put into packs of different sizes; it does not attract any form of value addition. Sliced turmeric needs many economic activities, like washing, slicing, drying, packing, making small packs, loading, unloading, and transportation. Grinding the dried slices and putting the powder into packets of different sizes for final consumption is another value addition activity.

We capture and estimate the costs incurred by the actors, including producers, in performing the activities at each stage of the value chain (Table 2).

Farming

The crop is planted during the months of March and April. Eight or nine months later, the crop appears, and it is harvested on maturity. Farmers select for planting disease-free mother and finger rhizomes that are whole or split. Most farmers apply farm yard manure (FYM) by broadcasting at the time of land preparation, or as basal dressing, and hardly apply inorganic material (Wani et al. 2017). The direct cost includes components of variable cost (labour and raw materials like rhizomes and manure). Fixed costs include the costs of purchasing or leasing the farmland. We worked out the total cost of cultivation to be INR 85,692 per ha (Table 3); the cost of purchasing rhizome seeds was INR 34,958 per ha.

Table 3 Cost in Lakadong turmeric cultivation during 2018–19

Cost	Particulars	Costs (INR/ha)
Cost A_1	Seed rhizome	34,958
	Hired human labour	13,372
	Manure	1,187
	Depreciation	502
	Interest on working capital	3,751
	Cost A_1	53,771
Cost A_2	Cost A_1	53,771
	Rent paid for leased-in land	-
	Cost A_2	53,771
Cost B_1	Cost A_2	53,771
	Interest on fixed Assets	-
	Cost B_1	53,771
Cost B_2	Cost B_1	53,771
	Rental value of land	2,642
	Cost B_2	56,414
Cost C_1	Cost B_1	53,771
	Imputed value of family labour	29,278
	Cost C_1	83,049
Cost C_2	Cost B_2	56,414
	Imputed value of family labour	29,278
	Cost C_2	85,692

Source Author's calculation using primary data

Yield and returns

Farmers plough the land with spades to loosen the soil so that they can pick or lift the rhizomes by hand. The yield was 51.40 quintal, worth INR 10,483, and the BEP was 4.56 quintal. The price of raw Lakadong turmeric was INR 2,296 per quintal and its variable cost INR 1,606 per quintal. An investment of INR 85,691 per ha fetches a return of INR 118,035 per ha (Table 4).

Table 4 Break-even output in Lakadong turmeric cultivation

Particulars	Unit	Value
Fixed costs	INR/ha	3,145
Variable costs	INR/ha	82,546
Total costs	INR/ha	85,691
Price	INR/qtl	2,296
Volume of output	Qtl/ha	51.40
Total revenue	INR/ha	118,035
Net revenue	INR/ha	32,344
Variable cost	INR/qtl	1,606
Break-even output	qtl	4.56
BEP in monetary value	INR	10,483

Source computed based on primary data of turmeric farmer

Producer's surplus

The average production of fresh Lakadong turmeric was 1903.57 quintal per household, and 25.58% of the produce was utilized as rhizome for planting in the next season. There is a clarion call on the part of farmers to maintain the purity of the rhizome (seed). The marketed surplus (75.77%) was higher than the marketable surplus (73.54%), which may be because turmeric is perishable and prone to infestation by diseases and pests on account of the traditional way of storage (Table 5). The loss during storage was 1.32% of the total production on average. Although the loss was negligible, it was a matter of concern. From the analysis of producer's surplus it has been observed that seed replacement was hardly practised in the study area as turmeric growers believed in their own seed.

Processing

At the household level, primary processing involves harvesting, cleaning, separation of rhizomes, boiling, and drying. Commercial processing is usually done at major market centres or community centres. The fresh harvested turmeric is washed thoroughly in water; growers do not commonly cure the turmeric. Then the rhizomes are sliced for drying. Lakadong turmeric is processed into dry flakes and powder to earn higher prices (Table 6).

Table 5 Producer's surplus of turmeric

Particulars	Quantity (kg)	Quantity (%)
Total production	1903.57	100.00
a) Consumption	16.80	0.88
b) Used as seed	486.96	25.58
c) Losses	25.18	1.32
Total (a+b+c)	461.14	24.23
Marketable surplus	1,467.61	73.54
Marketed surplus	1,442.43	75.77

Source computed based on primary data of turmeric farmer

The ratio of raw turmeric to sliced turmeric was 3.74:1, whereas the ratio of raw and powder turmeric was 5.57:1. Semi-processed turmeric (dry flakes/slices) fetched higher gross returns than raw and powder turmeric (Table 6), because dry flakes are considered pure and preferred to the powdered form of turmeric, which can be adulterated. Consequently, all the 56 sampled turmeric growers in the study area dispose of turmeric in its semi-processed form, and 94.83% of Lakadong turmeric is sold in the form of slice/flakes as the marketing agencies seek purity which is more in slices/flakes than the powder form. We surveyed 13 processors and farmers-cum-processors to obtain information on the processing of Lakadong turmeric.

Raw turmeric

Farmers in the study area sold Lakadong turmeric in its raw form at the village or weekly market or to informal contacts (friends and relatives). The price was INR 38.93 per kg, and the farmers earned a producer's share in consumer rupees of 93.89% (Table 7). The raw form of turmeric was transacted as a seed rhizome in meagre quantities by a few turmeric grower to use as seedfor next season crop (Table 6). Most turmeric growers are unable to store raw the turmeric in large quantities or sell it on a large scale because they are resource-poor and they lack the facilities to store the rhizome in large quantites.

Table 6 Disposal of Lakadong turmeric in different form

Particulars	Farmers (No)*	Raw qty (kg)	Final qty for Disposal (kg)	Conversion ratio	Gross returns realized (INR/kg)
Raw turmeric	14	20.75 (1.44)	20.75	1:1	38.91
Dry slice/flakes	56	1,367.84 (94.83)	366.06	3.74: 1	270
Powder	5	53.84 (3.73)	10.45	5.57:1	146.21
Total	56	1,442.43 (100.00)			

Source computed based on primary data of turmeric farmer
*Multiple responses of turmeric producer

Table 7 Compliance costs and margins of Lakadong Turmeric (INR/kg)

Particulars	Channel: Raw	Channels: Semi-processed				Channel: Processed
	I	I	II	III	IV	I
Quantity (Kg)	20.75 (100.00)	134.23 (36.67)	5.59 (1.53)	145.34 (39.70)	80.90 (22.10)	10.45 (100.00)
Number of respondent (No.)*	14	21	21	11	20	5
Selling price of producer	38.93	145.71	145.71	148.42	150	246
Cost incurred by producer						
i) Transportation	1.40 (58.82)	-	-	-	0.87 (0.92)	1.40 (7.87)
ii) Deduction costs	-	86.29 (93.03)	86.29 (93.03)	91.95 (93.33)	86.77 (91.56)	-
iii) Cleaning and washing	0.73 (30.67)	0.83 (0.89)	0.83 (0.89)	0.78 (0.79)	0.86 (0.91)	0.73 (4.10)
iv) Slicing	-	1.67 (1.80)	1.67 (1.80)	1.58 (1.60)	1.74 (1.84)	1.53 (8.60)
v) Drying	-	2.5 (2.70)	2.5 (2.70)	2.50 (2.54)	2.73 (2.88)	2.4 (13.49)
vi) Loss in weight (Storing)	-	1.26 (1.36)	1.26 (1.36)	1.48 (1.50)	1.50 (1.58)	1.48 (8.32)
vii) Packaging material	0.25 (10.50)	0.21 (0.23)	0.21 (0.23)	0.23 (0.23)	0.30 (0.32)	0.25 (1.40)
viii) Processing	-	-	-	-	-	10.00 (56.22)
Total (i to viii)	2.38 (100)	92.76 (100)	92.76 (100)	98.52 (100)	94.77 (100)	17.79 (100)
Net price received by the producer	36.55	52.95	52.95	49.9	55.23	228.21
Cost incurred by village merchant (N=4)						
i) Transportation	-	-	-	0.5 (20.33)	-	-

Contd...

ii) Loading & unloading	-	-	-	0.4 (16.26)	-	-
iii) Gunny bags/pack	-	0.4 (40.82)	0.4 (40.82)	0.33 (13.41)	-	-
iv) Loss in weight (storage)	-	0.58 (59.18)	0.58 (59.18)	1.23 (50)	-	-
Total (i to iv)	-	0.98 (100)	0.98 (100)	2.46 (100)	-	-
Selling price of village merchant	-	150	150	155	-	-
Village merchant's margin	-	3.31	3.31	4.12	-	-
Cost incurred by trader-cum-processor's margin (N=4)/ processor-cum-wholesaler-cum-retailer's margin (N=1)						
i) Transportation	-	2.75 (74.73)	2.75 (12.00)	1.1 (7.62)	0.82 (5.63)	-
ii) Loading & unloading	-	-	-	-	0.4 (2.75)	-
iii) Gunny bags/packaging material	-	0.48 (13.04)	6.48 (28.27)	0.44 (3.05)	0.44 (3.02)	-
iv) Loss during in weight (storage)	-	0.22 (5.98)	0.22 (0.96)	2.25 (15.58)	2.25 (15.45)	-
v) Labour charges	-	0.23 (6.25)	3.27 (14.27)	0.2 (1.39)	0.2 (1.37)	-
vi) Miscellaneous	-	-	0.2 (0.87)	0.45 (3.12)	0.45 (3.09)	-
vii) Processing	-	-	10 (43.63)	10 (69.25)	10 (68.68)	-
Total (i to vii)	-	3.68 (100)	22.92 (100)	14.44 (100)	14.56 (100)	-
Price paid by retailer	-	160.00	400.00	249.64	249.64	-
Margin	-	6.32	227.08	80.20	85.08	
Cost incurred by the retailer (N=4)						
i) Transportation	-				1.2 (70.59)	-
ii) Packaging material	-	-	-	-	0.20 (11.76)	-
iii) Market charge	-	-	-	-	0.30 (17.65)	-
Total (i to xii)	-	-	-	-	1.70 (100)	-
Price paid by consumer	-	-	-	-	270.00	-
Retailer's margin	-	-	-	-	18.66	-
Producer's share in consumer rupee	93.89	33.09	13.24	19.99	20.46	92.77

*indicates the multiple response, N-indicates the no. of stakeholder/value chain actors

Dry flakes

Most of the produce is disposed of in the form of dry flakes (Table 6) and through four channels:

1. producer→ village trader→ trader-cum-processor (Tamil Nadu and Kerala);
2. producer→ village trader→ trader-cum-processor→ consumer (local);
3. producer→ village trader→ processor-cum-wholesaler-cum-retailer→ consumer; and
4. producer→ processor-cum-wholesaler-cum-retailer→ retailer→ consumer.

In Channel 1, farmers sell their produce in the semi-processed form to the traders in their village. The price is INR 145.71 per kg. About 36.67% of the turmeric farmers use Channel 1. Converting the raw turmeric into dry flakes earned the producer a net price of INR 52.95 per kg. The process of conversion also involves deduction, or weight loss, which contributed 93.03% of the total cost incurred by the producer or farmer. Loss during storage accounts for 59.18% of the cost incurred by village traders, and packaging (in bags and packs) accounts for 40.82% of the cost. The village trader earned a net margin of INR 3.31 per kg. The produce was then passed to the trader-cum-processor, who transported it to states like Tamil Nadu and Kerala. The marketing cost was INR 3.68 per kg; transportation contributed the highest share (74.74%). The selling price for traders was INR 160 per kg, and the net marketing margin INR 6.32 per kg. The producer's share in consumer rupees was 33.09% (Figure 1).

In Channel 2, farmers sold their produce in the semi-processed form to traders in their village, and these traders sold the produce to traders-cum-processors. A minute share (1.53%) of the turmeric farmers used Channel 2. In this channel, however, the traders process the dry flakes into powdered form. The marketing cost was INR 22.92 per kg; processing accounted for 43.63%. The traders-cum-processors sold the powdered turmeric at INR 400 per kg. The producer's share in consumer rupees was13.24% (Figure 1).

Most farmers (39.70%) sold their produce through Channel 3. Deduction, or the loss of weight in the process of converting the raw turmeric into dry flakes, accounted for 93.33% of the total cost. The producers earned a net price of INR 55.23 per kg. The produce then moved on to village traders, who earned a net margin of INR 4.12 per kg. The processors-cum-wholesalers-cum-retailers incurred a marketing cost of INR 14.44 per kg; processing contributed 69.25% of

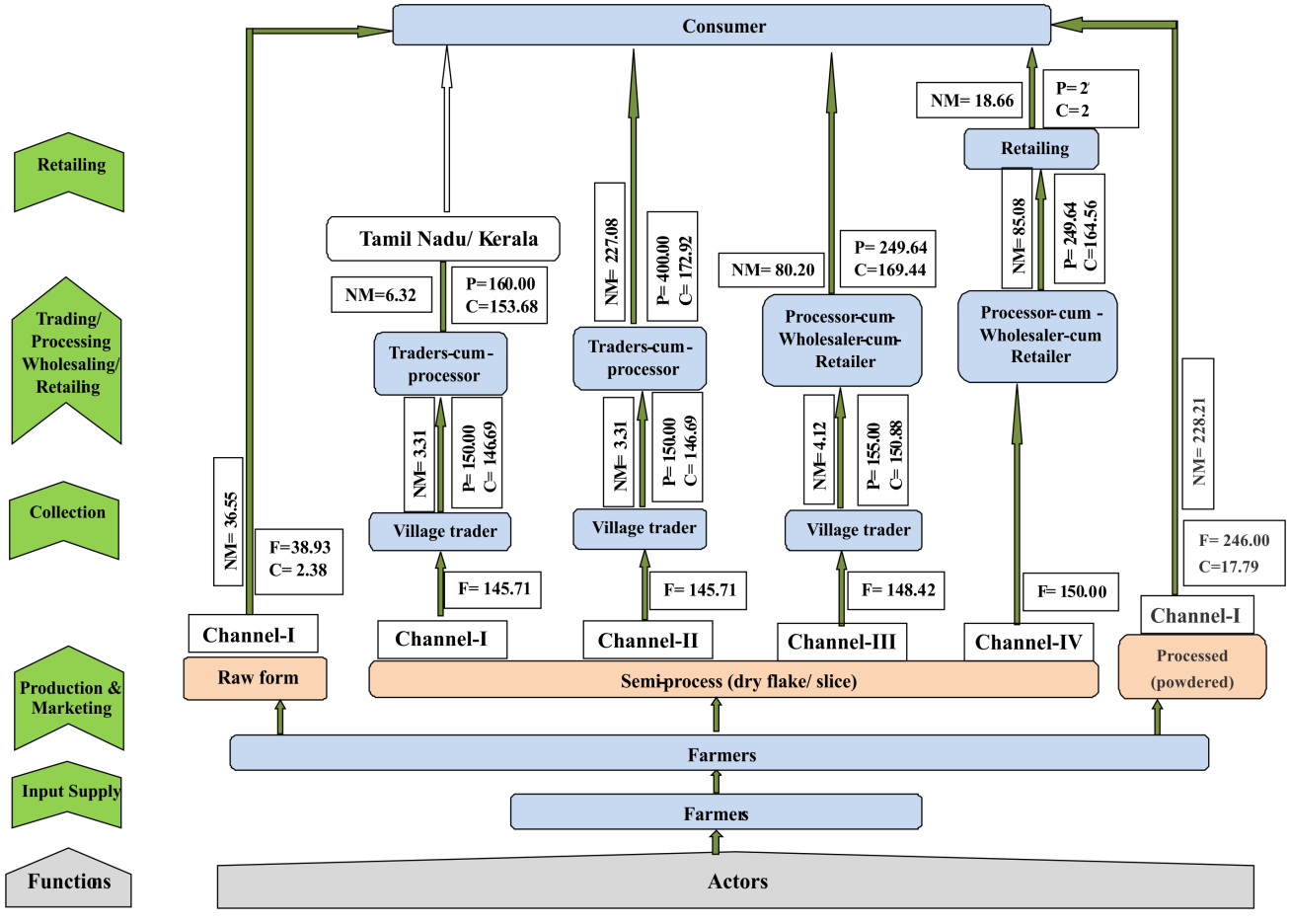

Figure 1. Value chain actors and their compliance cost in different forms of Lakadong Turmeric

Table 8 Flow of turmeric volume in different form across to different chain

Channels	Raw turmeric		Dry flake turmeric		Powder turmeric	
	Farmer (No.)	qty (Kg)	Farmer (No.)	qty (Kg)	Farmer (No.)	qty (Kg)
Channel-I	14*	20.75 (100)	21*	134.23 (36.67)	5*	10.45* (100)
Channel-II	-	-	21*	5.59 (1.53)	-	-
Channel-III	-	-	11*	80.90 (22.10)	-	-
Channel-IV	-	-	20*	145.34 (39.70)	-	-
RawTotal		20.75 (100)		366.06 (100)		10.45 (100)

Note Figure in parentheses are percentage to the total, *Multiple response*Source:* Household survey 2017–20

the cost and loss during storage 15.85%. The processor's selling price was INR 249.64 per kg. The producer's share in consumer rupees was 19.99% (Figure 1).

In Channel 4, farmers sold their produce in the semi-processed form (flakes or slices) to the processors-cum-wholesalers-cum-retailers in the processing unit at INR 150 per kg. About 22.10% of the turmeric farmers used Channel 4. The producers incurred a total marketing cost of INR 94.77. The producer earned a net price of INR 55.23 per kgon average. The processors-cum-wholesalers-cum-retailers incurred a marketing cost of INR 14.56 per kg. The selling price of traders was INR 249.64 per kg. The marketing cost of retailers averaged INR 1.70 per kg; transportation accounted for 70.59% of the cost. The retailer's selling price, or consumer price, was estimated at INR 270 per kg. The producer's share in consumer rupeeswas 20.46% (Figure 1).

Disposal pattern of powdered turmeric

Producers in the study area sold directly to consumers. Growers disposed of the powdered turmeric either in the village market or weekly market at INR 246 per kg (Table 7). The producers incurred a total marketing cost of INR 17.79 per kg; processing accounted for 56.22% of the share. The producers earned a net price of INR 228.21 per kg on sales to consumers. The producer's share in consumer rupees, 92.77% (Figure 1), was higher than in other channels, due to value addition through processing.Few growerscan afford the slicers, dryers, or grinders needed to process the turmeric into its powder form, and very little turmeric is processed into powder. Therefore, the state should intervene by providing the processing technology in the study area to enhance the due share in the consumers' price of raw and semi-processed turmeric.

Logistics

The outbound distribution of the commodity from the farmers' field or processors to consumers is the logistics stage. Lakadong turmeric was transported from the farmers' field to different value chain actors. The raw turmeric was disposed of through only one channel (20.75 kg). The dry flakes of turmeric were disposed of through four channels. Channel 4 was used by 20 turmeric growers (39.70%). Channel 1 was used by 21 turmeric growers (36.67%). Channel 3 was used by 11 turmeric growers (22.10%). Channel 2 was used by 5 turmeric growers(1.53%) (Table 8). Hence, Channels 1 and 4 should be prioritized for further investigation and intervention to study its preferences by turmeric growers.

Conclusions

Consumers are attracted to Lakadong turmeric, andthe cultivation of this spice crop is beneficial in Meghalaya—its BEP is only 4.56 quintals.

The cost of cultivation analysis shows that the Lakadong turmeric cultivar is highly remunerative. Our

estimation of the producers' surplus found evidence of loss of produce and distress sale. These are matters of concern and warrant further investigation. The economic analysis of existing value chains of Lakadong proved that at each stage of marketing, semi-processed turmeric (dry slices) and processed (powder) turmeric fetched higher prices, but few growers powder turmeric, because they cannot afford the slicers, dryers, or grinders that are needed.

Out of the four value chains, Channels 1 and 4 were pivotal and preferred for semi-processed turmeric. The producer's share in consumer prices was low, and it can be enhanced through technological interventions, like providing small processing units at the cluster level, along with curcurmin testing machines, which would fetch better prices.

Linking farmers with pharmaceutical firms and terminal markets may fetch better prices for Lakadong turmeric.Proper tie-ups of SHGs with public and private processing units will popularize this promising local cultivar in the state and the country. Value chain integration has scope to generate mutual benefits for smallholder farmers and the business community.

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