Research Article

Indian Journal of Extension Education
Vol. 58, No. 3 (July–September), 2022, (163-169)

ISSN 0537-1996 (Print)
ISSN 2454-552X (Online)

An Insight into Value Chains of Green Gram in Bundelkhand Region of India

Uma Sah[1]*, Vikrant Singh[2], Jitendra Ojha[3], Mohit Katiyar[4] and S. K. Dubey[5]

[1]Principal Scientist (Agril. Extension) & Head, Division of Social Sciences, [2]Project Assistant, [4]Young Professional, Division of Social Sciences, ICAR-Indian Institute of Pulses Research, Kanpur-208024, Uttar Pradesh, India
[3]Business Manager, ABI Unit, ICAR-Indian Institute of Pulses Research, Kanpur-208024, Uttar Pradesh, India
[5]Principal Scientist (Agril. Extension), ICAR-Agricultural Technology Application Research Institute, Kanpur-208001, Uttar Pradesh, India
*Corresponding author email id: umasah@gmail.com

ARTICLE INFO

Keywords: Value chain analysis, Green gram, Bundelkhand region, Pulses

http://doi.org/10.48165/IJEE.2022.58333

ABSTRACT

The study was conducted during 2019-2021 to document the existing value chains of green gram in Bundelkhand region of India. The cost of production estimation showed crop to be profitable for farmers (1:2.61 BC ratio), however, poor uptake (10.9%) of improved varieties among farmers was recorded. An array of value chains actors and their inter linkages were engaged in furthering green gram from producers to consumers through four prominent channels. In addition, a number if enabling factors were observed to support green gram production in the region. Results indicated that producers added highest value to green gram (Rs. 2942.58/q to Rs. 3343.62/q), followed by processors (Rs. 1392.00/q to 2193.65/q) across all marketing channels. Processing component added highest share (29.28 to 35.55%) in total marketing cost across all the channels. Share of producer in consumer rupee for split grains (63.14%) and whole grains (72.78%) was lowest in marketing channel 4 wherein maximum actors were involved. Policy interventions for promotion of green gram producers for aggregation and trading functions need to be taken for them to draw better share in consumer rupee.

INTRODUCTION

Value chains refers to all sets of activities that are required to bring a product or services from conception through different phases of production, delivery to final consumer and final disposal after use (Kaplinsky & Morris, 2001). Value Chain Analysis (VCA) identifies the value being introduced to the service or product at each stage of chain (Kaplinsky & Morris, 2007). It refers to the degree of relationships among the different actors involved in different phases and coordination mechanism (Trienekens, 2011) with focus on the dynamics of complex linkages within a set of network, involving suppliers, distributors, partners, and collaborators (Zott et al., 2011).

Green gram (*Vigna radiata* L.) is an important legume crop that is cultivated in all the three crop seasons in different agro-ecological situations of India. Green gram grains forms an important ingredient of cuisines across India and are consumed as cooked whole seed, split grain, flour or as sprouts. Green gram grains are rich source of nutritional protein (24-28%), carbohydrate (59-65%), fiber (3.5-4.5%), mineral (4%) and ash (4.5-5.5%) (Kowalewska, 2018). Green gram is an important pulse crop cultivated in Bundelkhand region of Uttar Pradesh (Sah et al., 2021a; Kumar et al., 2017). The crop occupies about 3.44 million hectare in the region with about 1.78 million tonnes production (Anonymous, 2021). Bundelkhand is a hot and semi-humid region of UP state that lies between the Indo-Gangetic Plain toward the north and the Vindhya Range toward the south (Sah et al., 2021b) and is characterized by undulating topography and poor irrigation facility (Narain et al., 2016) The average productivity of green gram in UP Bundelkhand region (0.24 t/ha) and UP state (0.41 t/ha) is lower than the

Received 11-06-2022; Accepted 23-06-2022

corresponding national figures (0.47 t/ha). The crop has been traditionally cultivated as rainy season crop in the region, however, since past two decades, area under spring/summer green gram has witnessed increasing trend (Sah et al., 2021). Translating green gram cultivation into a better remunerative proposition for producers warrants better availability of seeds, fertilizer, plant protection chemicals and storage facilities in the region. Further, better post harvest management including value addition and market price for the green gram are needed for attracting larger area under the crop in the region as most times, the lack of regulated market (Kumar et al., 2010), poor adoption of harvesting and post-harvest management practices (Nain et al, 2014), poor availability of inputs (Kumbhare et al., 2014) etc. are reported reasons of low profitability in pulses.

The present research study was conducted to bring out a comprehensive perspective of green gram value chain in Bundelkhand region of UP for generating empirical evidences to support policy decisions as well as better understanding among researchers and development wings for devising appropriate technology design and delivery options. The results may also support producers for enhancing their capacities for a greater market proportion. The study brings out the share of value added by different actor working along the value in furthering green gram from producers to consumers.

METHODOLOGY

The study was carried out in 2019-21 in the Bundelkhand region of Uttar Pradesh using descriptive research design (Koh & Owen, 2000). All of the seven districts of UP Bundelkhand region were selected for the purpose. Multistage stratified random sampling was used for selection of blocks (14), villages (28), farmers (840), members of Agriculture produce marketing Committee (APMC) (14), retailers (21), whole sellers (21), trader (56) and village trader (28), green gram processors (18) from the region. Data on variables like cost of production, marketing efficiency, marketing cost, and margin carried out with use on the prevailing green gram market prices were recorded using semi-structured interviews, group meetings and focused group discussions to elicit facts from respective sampled respondent. Marketing Efficiency Index (MEI) and producer's share in consumer's rupee were also worked out (Acharya & Agarwal, 2016). The value added by an actor was operationalised as the sum of cost incurred by the actor in performing value chain functions in furthering the green gram to consumers and the marketing margin gained by the actor in the process.

Value chain map indicates an array of actors and activities involved in drift of transaction from sourcing of raw materials and inputs, to production, processing, marketing and ultimately consumption. Illustrative methodology of value chain analysis as enunciated by FAO (2005) was used for the study. The related activities and actors in green gram chains operating in the region were mapped and the value added by each actor during the activity performed by them were worked out and analyzed.

RESULTS AND DISCUSSION

Green gram production scenario in Bundelkhand region of Uttar Pradesh

Analysis of temporal data on green gram indicates substantial area expansion (76%) along with productivity enhancement (39%) in the span of 2000-01 to 2019-20 in Bundelkhand region of Uttar Pradesh. Further, the annual growth rate during the period was recorded to be 3.48 per cent, 3.61 per cent and 0.13 per cent in area, production and productivity of green gram, respectively, which was higher than pigeon pea, chickpea, lentil, field pea, urdbean and comparable with total pulse crop in the region during the same period (Sah et al., 2022).

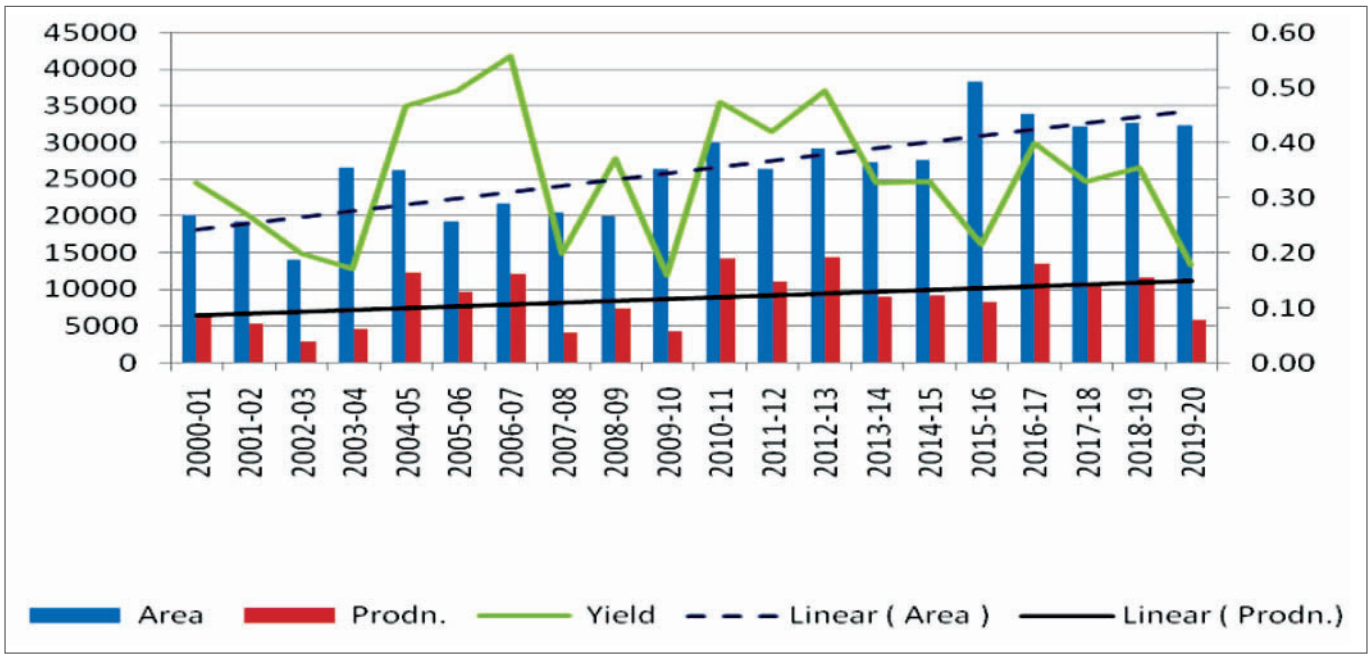

Figure 1. Time trends of green gram in Bundelkhand region

Table 1. Existing Mungbean varieties in the Bundelkhand region

S.No.	Green gram varieties	Frequency (%)
1.	PDM 139 (Samrat)	27 (3.2)
2	IPM 2-14	19 (2.3)
3	IPM 2-3	22 (2.6)
4	IPM 410-3	03 (0.36)
5	IPM 205-07 (Virat)	24 (2.9)
6.	Local non descript and to	745 (88.7)

Varietal mapping of green gram in Bundelkhand region of Uttar Pradesh reflected poor uptake (10.9%) of improved green gram varieties among the sampled farmers. Among the improved varieties, PDM 139 (Samrat) followed by IPM 205-07 (Virat) and IPM 2-3 were documented to be cultivated by 3.2, 2.9 and 2.6 per cent of the sampled producers, respectively.

Mapping of green gram value chains

Input dealers, producers, village level aggregators, aggregators, trader, processors, wholesalers, retailers, market intermediaries, and consumers were the major actors associated in the green gram value chain in the region. Well developed linkages were observed to exist among them for forwarding the green gram from producer to consumers in the region. Four prominent channels engaged in this process as mentioned and discussed in Table 3. Green gram production in the region was enabled by technological support from existing research institutes, *Krishi Vigyan Kendras*, agricultural universities and extension advisory support from state agriculture department. Further, presence of network of APMC markets provided the needed support for sale of green gram in the region. Presence of six seed hubs in the region supported farmers' access to quality green gram seed. The favorable policy environment also complimented green gram production in the region that included declaration of minimum support price and presence of electronic national agriculture markets (e-NAM). The existing seed stores (973 nos), fertilizer stores (1369 nos), and plant protection chemicals stores (699 nos) provided basic production inputs for supporting green gram production in the region. The value chain by and large in this region, is depicted in Figure 2 and can be inferred that green gram value chain involved flow of both split grain and whole grain from producer to end consumers. Presence of multiple channels in green gram value chain was reported to exist by several studies. Mahendra et al., (2020) recorded three major channels for marketing of green gram including producer -village trader-wholesaler-cum-commission agent - retailer –consumer; producer - wholesaler-cum-commission agent- retailer- consumer and producer –consumer from Rajasthan. From the same state, Kumawat (2020) also recorded multiple channels for marketing of green gram including producer-wholesaler- miller –retailer-consumer, producer-wholesaler-retailer-consumer and producer- commission agent- wholesaler-miller –retailer-consumer.

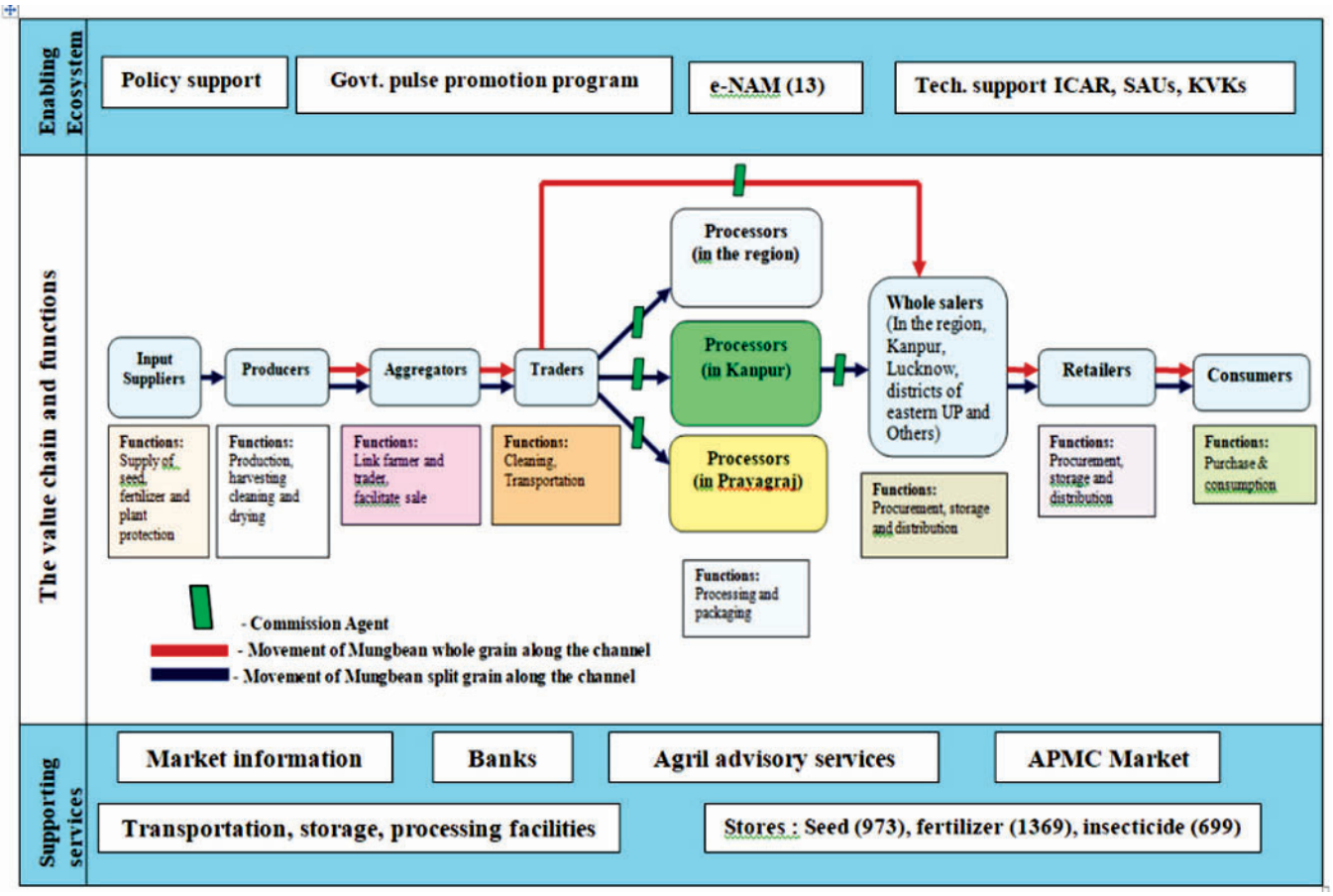

Figure 2. Map of green gram value chain of Bundelkhand region

The results suggest limited direct access of producers to traders or processor in the region. Market intermediaries or the commission agents acted as the primary link between every two marketing nodes right from aggregators to retailers in green gram value chains. The commission agent added value to the produce by providing assurance for payment, quality and timely delivery of produce between the value chain actors. During harvest season and a few months after, green gram was disposed of by traders to processors located in the region or processing units located in nearby cities like Kanpur or Prayagraj. During off season, these processing units received green gram from traders located outside states specially Chhattisgarh state. The outward movement of processed green gram from these processing units catered to the demands of nearby districts like Kanpur, Lucknow, Pratapgarh and other districts of eastern UP state. The quantum of transacted produce however depended on the negotiation for the prices, best and timely delivery between the commissions agents present between the trader and processor. Kumawat (2020) also reported presence of commission agents in the marketing channels of green gram in Rajasthan.

Build-up of value of green gram along the value chains

For estimation of value build up at producers' level, cost of cultivation of green gram was worked out. The average cost of cultivation of green gram in Bundelkhand region of Uttar Pradesh was recorded to be Rs. 14451/ ha. The cost incurred on human labor constituted highest cost (28.3%), followed by machine labour (23.6%). The share of insecticides use (8.3%), irrigation (9.9%) and fertilizer and manures (10.9%) was least in the total cost of cultivation of green gram in the region. The results indicate low resource use situation in which green gram is cultivated in the region (Table 2). The average productivity level of green gram 5.89q/ha and producers received an average gross return of Rs. 37696/ha. The green gram cultivation in the region was fairly profitable with benefit cost ratio of 2.61.

The presence of series of actors and the inter linkages between them were observed to exists in movement of green gram from producer to consumers. Each of these actors in the value chain performed certain functions and added their margins before furthering the green gram towards consumers. The two values together added to the total value addition by the actor. In view of the market demand for consumption of green gram in split as well a whole grain, all the green gram marketing channels were recorded to bifurcate into two channels at traders' level.

Table 2. Average cost of cultivation of green gram in Bundelkhand region of Uttar Pradesh

Particular	Operational cost (Rs)
Human labour	4092 (28.3)
Machine labour	3417 (23.6)
Seed	2054 (14.2)
Fertilizer & manure	1570(10.9)
Insecticides	1199.52(8.3)
Irrigation charges	1435(9.9)
Total operational cost	13767.52(95.3)
Interest on working capital	683.38(4.7)
Total cost	14450.9
Average yield (q./ha)	5.89
Gross return (Rs/q)	37696
Benefit-cost ratio (gross return)	2.61

Figures in parenthesis indicate percentage

In marketing channel 1, the trader incurred marketing cost Rs. 323.04/q and added value of Rs. 706.80/q before shifting green gram to processor and wholesaler in the chain. Processor incurred marketing cost of Rs. 350.29/q for processing of green gram into split grain and added highest value (Rs. 1408/q) to the produce. On the other hand, while forwarding the green gram whole grain, wholesaler incurred marketing cost of Rs. 200/q and added highest value (Rs 771.04/q) among all the actors in furthering green gram to retailer. Retailer on the other hand incurred least cost (Rs. 38.36/ q) in furthering green gram to consumer and added least value (Rs. 413.70 to 460.81/q). Wholesaler and retailer were recorded adding higher value in the chain in furthering green gram whole grain than split grain. Total marketing cost and total value added were observed to be lower in case of whole grain as compared split grain. However, the marketing efficiency (2.67) and producer share in consumer rupee was found to be higher (Rs.73.98/q) in marketing of whole grain as compared to split grain.

In channel 2, the producer furthered green gram to aggregator cum trader (ACT) located in the marketing yards. In this channel the ACT collectively incurred marketing cost (Rs. 308.08/q) and accrued market margins (Rs. 558.67/q) and thus added value (Rs. 866.75/q) in moving the green gram from traders to wholesalers. Among all the actors operating in this channel value added by processor was highest (Rs. 1407.6/q) with maximum market margin (Rs. 1059.28/q). The value addition in green gram value chain was observed to be least at retailer level for both the products. Among all the existing marketing channels, this marketing channel was found to be most efficient for split (1.75) as well as whole grain (2.82). Further, producer share in consumer rupee was also found to be highest (75.09) in this channel (Table 3).

In channel 3, producer was observed incurring relatively higher marketing cost (Rs. 112.35/q) as compared to other existing marketing channels. In this channels, the aggregator performed without incurring any cost observed gaining a margin of Rs. 248.63/ q before moving the produce to trader. The trading and processing functions were observed integrated at one marketing node in this channel. The marketing cost incurred (Rs. 683.15/q), the margins earned (Rs. 1509.75/q) and the total value added (Rs. 3674.52/q) at this marketing node was recorded to be highest within the channel as well as across all the existing marketing channels, resulting into highest marketing margins (Rs. 2193.65/q) drawn.

Marketing channel 4 was observed to include an additional actor who was engaged in aggregation of green gram for marketing directly from producer at the village level. Among all the existing marketing channels, the producer was recorded incurring least cost (Rs. 81.24/q). The village level aggregator incurred cost of Rs. 93.24/ q and earned a margin of Rs. 127.48/q before supplying the green gram to aggregator located in APMC market yards. The aggregator in turn forwarded the produce to trader after adding value of Rs. 253.5/q. The value added by trader (Rs. 312.80/q) and processor (Rs. 1392/q) found to least in this channel among all other marketing channels. The total marketing margin (Rs. 1647.73/q) earned in this

Table 3. Value addition along the green gram value chains in Bundelkhand region

Actors	Heads	Marketing channel 1		Marketing channel 2		Marketing channel 3	Marketing channel 4	
Producer	Marketing cost	105.67		107.78		112.35	81.24	
	Marketing margin	3237.97		3223.85		3080.30	2861.34	
	Total value added	3343.64		3330.93		3192.65	2942.58	
	Producers Price	6220.15		6207.44		6215.75	6124	
Village aggregator	Marketing cost	-		-		-	93.24	
	Marketing margin	-		-		-	122.48	
	Total value added	-		-			215.72	
Aggregator	Margins	248.81		-		248.63	253.59	
Trader/Aggregator	Marketing cost	323.64		308.08		-	312.80	
	Marketing margin	383.44		558.67		-	329.66	
	Total value added	706.78		866.75		-	642.46	
		WGG	SGG	WGG	SGG	SGG	WGG	SGG
Processor	Marketing cost	350.29	-	348.29	-	683.13	347	-
	Marketing margin	1057.71	-	1059.28	-	1509.75	1045	-
	Total value added	1408	-	1407.57	-	2193.65	1392	-
Whole saler	Marketing cost	190.33	200.04	188.71	198.90	192.37	187.42	199.69
	Marketing margin	493.28	571	509.09	546.43	503.75	487	532
	Total value added	683.61	771.04	697.80	745.33	696.12	674.42	731.69
Retailer	Marketing cost	38.36	38.36	39.64	39.64	37.50	37	37
	Marketing margin	375.43	422.45	367.15	407.15	386.25	360	410
	Total value added	413.79	460.81	397	446.79	423.75	397	447
	Total Marketing cost (Rs/q)	1008.09	667.71	991.60	653.71	1026.75	1058.70	723.97
	Market margin	2558.37	1625.40	2494.38	1512.24	2648.38	2597.73	1647.73
	Total value added	3566.65	2293.10	3485.91	2165.94	3674.52	3656.43	2290.46
	Marketing efficiency index	1.71	2.67	1.75	2.82	1.66	1.65	2.64
	Producer share in consumer rupee	64.25	73.98	64.75	75.09	63.57	63.14	72.78

SGG: Split Green Gran; WGG: Whole Green Gram

channel for moving green gram whole grain was observed to be highest among all the existing channels. This channel was observed to be least efficient along with lowest share of producer in consumer rupee for split grains as well as whole grains. The results of the study indicated that producers incurred substantial cost (Rs. 81.24 to Rs. 112.35/q) in marketing of green gram in different channels. In contrast, Kumawat (2020) reported that producers incurred cost of Rs 44.5/q in performing marketing function in the green gram value chain in Nagaur district of Rajasthan. In contrast to results of present study, Mahendra et al., (2020) from Rajasthan recorded that producer share in consumer rupee was 89.9 percent, 91.49 percent and 100 percent in sale of green gram at village, regulated market and direct sale to consumer, respectively.

Findings helped to understand that the constrained linkages between producers and traders/processors made the value chain longer and less efficient. Strengthening these linkages shall work for mutually useful arrangements with assured quantity and quality of green gram to processors as well as assured market place for producers. This arrangement could secure farmers against the fluctuation in market prices. Besides producers, processors were observed to bear highest marketing cost and gain maximum margins among all the value chains actors across all the existing channels for furthering green gram to consumers. This could be attributed to high investment in establishment of processing units with high maintenance and operational cost involved in processing of green gram. Traders were also observed adding substantial value to the green gram while furthering it in the value chains. Marketing efficiency as well producers share in consumer rupee was found to be highest in movement of green gram whole grain across all the reported channels as compared to green gram split grain. This could be attributed to involvement of lesser number of actors in marketing of whole grains as compared to split grains of green gram. The results are in tandem with those of Deep et al., (2020).

Share of cost components in the marketing cost

Component wise assessment of marketing cost incurred on various value addition functions was carried out for each marketing channel (Table 4). The total marketing cost was observed to be highest for green gram split (Rs. 1058.7/q) and wholegrain (Rs. 723.96/q) in channel 4 that included maximum value chain actors while it was recorded lowest for channel 2, wherein aggregation and trading functions were integrated. Among different cost components, processing component was recorded to add highest share in total marketing cost across all the channels, with highest share (35.55%) in channel 3. Besides processing component, share of transportation cost followed by cost incurred on commission charges of market intermediary was highest across all the channels, in the same order. However, the actual cost incurred under these component varied with the product handled i.e., green gram split and wholegrain. Among all the cost components, the share of rental cost was found to be least across all the channels. The low share of rental cost could be attributed to the practice of short period of storage of green gram followed in the region. High share of transportation component in the total marketing cost could be explained on

Table 4. Percent share of different cost component to total marketing costs

Cost component	MC 1		MC 2		MC 3	MC 4	
	WGG	SGG	WGG	SGG	SGG	WGG	SGG
Weighing on related	85.53	75.53	83.63	75.65	82.85	76.74	69.24
	(12.81)	(7.49)	(12.79)	(7.63)	(8.07)	(10.60)	(6.54)
Loading unloading	53.43	53.54	54	54	69	66	66
	(8.00)	(5.31)	(8.26)	(5.45)	(6.72)	(9.12)	(6.23)
Transportation	123.21	144.54	118.09	139.78	105.5	115	133
	(18.45)	(14.34)	(18.06)	(14.10)	(10.28)	(15.88)	(12.56)
Aggregation	-	-	-	-	-	61.24	61.24
						(8.46)	(5.78)
Cleaning	31.53	11.43	30.86	10.86	10.59	29	10
	(4.72)	(1.13)	(4.72)	(1.10)	(1.03)	(4.01)	(0.94)
Packing and handling	40.13	40	40.23	40	40	39.64	40
	(6.01)	(3.97)	(6.15)	(4.03)	(3.90)	(5.48)	(3.78)
Storage	15	35	15	35	35	15	35
	(2.25)	(3.47)	(2.29)	(3.53)	(3.41)	(2.07)	(3.31)
Commission charges	112.17	129.31	107.68	119.54	111.97	113.9	125.9
	(16.80)	(12.83)	(16.47)	(12.06)	(10.91)	(15.73)	(11.89)
Market fee	97.03	97.03	93.11	93.11	96.97	93.9	98.9
	(14.53)	(9.62)	(14.24)	(9.39)	(9.44)	(12.97)	(9.34)
Rental	5	5	5	5	5	5	5
	(0.75)	(1.60)	(4.71)	(0.50)	(0.49)	(0.69)	(0.47)
Other misc.	106.67	103.76	106.11	102.23	104.87	108.54	104.42
	(15.98)	(10.29)	(16.23)	(10.31)	(10.21)	(14.99)	(9.86)
Processing		313.14		311.43	365		310
		(31.06)		(31.41)	(35.55)		(29.28)
Total marketing cost	667.7	1008.17	653.71	991.6	1026.75	723.96	1058.7
	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)

MC: Marketing Channel; WGG: Whole Green Gram; SGG: Split Green Gram

grounds of distant location of market yards and processing units from the production sites. This calls for suitable infrastructural support for establishing more number of processing units within the region for catering to the regional consumption demands of green gram. A high share of cost incurred as commission agent charges could also be attributed to the fact that the commission agents actually facilitated the movement of green gram from trader to processor and from processor to wholesaler, wherein certain commission was levied from actors operating on either side.

CONCLUSION

Efforts for enhanced awareness among producers about available varietal options need to be taken for sustaining the growth in green gram production in the region. Green gram value chain was long and complex with an array of actors performing diverse functions for furthering the it from producers to customers. Integration of value addition functions along the value chains though existed, however, they failed to translate better share of monetary benefits for producers. Promotion of farmer associations for aggregation and trading function in green gram value chain need to done to help them draw a larger share in consumer rupee. Green gram being a premium pulse in terms of cost and nutritional value, offers several entrepreneurial opportunities for improving market efficiency. Suitable infrastructural support for processing units in the region may contribute for meeting the demands of consumers at better price and higher returns to producers.

ACKNOWLEDGMENTS

Funding support received from IMPRESS-ICSSR, New Delhi for conducting this study is acknowledged.

REFERENCES

Acharya, S. S. & Agarwal, N. L. (2016). Agricultural Marketing in India. Sixth Edition, Oxford and IBH, New Delhi; 199-201 and 402.

Anonymous. (2021). A Brief Handbook (2020-21), Directorate of Pulses Development Government of India Ministry of Agriculture & Farmers Welfare Department of Agriculture Cooperation & Farmers Welfare Bhopal -462004, Madhya Pradesh, pp 25.

Deep, A., Singh, S. P., Kachroo, J., Dwivedi, M. C., Bhat, A., Kumar, N., Kumar, S., & Sharma, S. (2021). An economic analysis of marketing efficiency and constraints for cultivation of major pulses in Samba district of Jammu and Kashmir. *Journal of Food Legumes, 34*(2), 105-111.

Food and Agriculture Organization of the United Nations. (2018). *Food loss analysis: causes and solutions - Case study on the chickpea value chain in the Republic of India*. Rome. 52 pp. Licence: CC BY-NC-SA 3.0 IGO.

Kaplinsky, R., & Morris, M. (2007). The structure of supply chains and their implications for export supply. Paper prepared for African Economic Research Consortium: pp 1-35. http://asiandrivers.open.ac.uk/documents/Kaplinsky%20Morris%20GVCs,%20AERC%20Nov%2006.pdf

Koh, E. T., & Owen, W. L. (2000). Descriptive research and qualitative research. In *Introduction to Nutrition and Health Research*.

Boston, MA: Springer. https://doi.org/10.1007/978-1-4615-1401-5_12 .

Kowalewska, A. (2018). Mung beans nutritional value and recipes. Feed the future, The U.S. Government global hunger and food security initiatives. https://ingenaes.illinois.edu/wp-content/uploads/ING-Info-Sheet-2018_05-Mungbeans-nutritional-value-recipes-Kowalewska.pdf

Kumar, P., Peshin, R., Nain, M. S., & Manhas, J. S. (2010). Constraints in pulses cultivation as perceived by the farmers. *Rajasthan Journal of Extension Education, 17&18,* 33-36.

Kumar, R., Singh, S. K., & Sah, U. (2017). Multidimensional study of pulse production in Bundelkhand region of India. *Legume research, 40*(6), 1046-1052. DOI: 10.18805/LR-3502.

Kumawat, S. (2020). Efficiency of marketing of mung bean (*Vigna radiata*) in Nagaur district of Rajasthan. *International Journal of Management and Applied Science, 1*(10), 159-162.

Kumbhare, N. V., Dubey, S. K., Nain, M.S., & Bahal, R. (2014). Micro analysis of yield gap and profitability in pulses and cereals. *Legume Research-An International Journal, 37*(5), 532-536.

Mahendra, Rajput, A. S., Yadav, A., & Kumawat, R. C. (2020). Marketing costs, margins and price spread in mungbean in Naguar district in Rajasthan. *International Journal of Agriculture Sciences, 12*(12), 9953-9956.

Nain, M. S., Bahal, R., Dubey, S. K., & Kumbhare, N. V. (2014). Adoption gap as the determinant of instability in Indian legume production: perspective and implications. *Journal of Food Legumes, 27*(2), 146-150

Narain, S., Gupta, S., & Kumar, S. (2016). Information sources used by farmers of bundelkhand region. *Indian Journal of Extension Education, 52*(3&4), 111-116.

Sah, U., Dixit, G. P., Kumar, H., Ojha, J., Katiyar, M., Singh, V., Dubey, S. K., & Singh, N. P. (2021a). Dynamics of pulse scenario in Bundelkhand region of Uttar Pradesh: A temporal analysis. *Indian Journal of Extension Education, 57*(4), 97-10. https://doi.org/10.48165/IJEE.2021.57422

Sah, U., Dixit, G. P., Kumar, H., Ojha, J., Katiyar, M., Singh, V., Dubey, S. K., & Singh, N. P. (2021b). Performance of millets in Bundelkhand region of UP State. *Indian Journal of Extension Education, 57*(4), 120-125. http://doi.org/10.48165/IJEE.2021.57426

Trienekens, J. (2011). Agricultural value chains in developing countries: A framework for analysis. *International Food and Agribusiness Management Review, 14*(2), 51-82. https://edepot.wur.nl/189057

Zott, C., Amit, R., & Massa, L. (2011). The business model: recent developments and future research. *Journal of Management, 37*(4), 1019-1042.