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Supply Chain Management of Apple Production and Marketing in Kinnaur District of Himachal Pradesh

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Abstract

Present study was conducted to assess the impact of Supply chain Management of Apple Production and study the existing status of Apple production and marketing in Kinnaur district of Himachal Pradesh, India using data for the period 2021–2022. To identify the objectives of the study, a sample of 200 respondents was interviewed through structured interview schedule. The orchard area was 79.26% in Kinnaur, in which irrigated and un-irrigated land was 32.71 and 67.29%. 44% of the sampled respondents were in the category of marginal land holdings, small land holdings were possessed by 46.00%, medium were possessed by 9.00% and large land holdings only 1.00% of sampled household in study area. The various input supply chains identified in apple production in the study area are Channel-I, Channel- II, Channel- III. . Out of all three channels, the channel III is found to be efficient with modified market efficiency of 47.3%. The producer share for consumer's rupees is 81.81% with net marketing margin was 180 with price spread value of 380. The total cost for production of apple on one hectare of land holdings was observed to be ₹ 51258 on overall basis. 77.00% of the respondents were aware about the constraints in supply chain apple producers were not so aware about the effective supply chain management and it can be reduced by the efficient supply chain management.

Keywords: Apple production, apple marketing, supply chain management

1. Introduction

Wani and Songara (2019) examined the production and marketing efficiency of apple farming in Shimla and Kullu districts of Himachal Pradesh. Their study revealed that the inputs, viz., density of plants per hectare, fertilizers, organic manure and labor were the four significant variables positively influencing apple yield. Among the five marketing channels prevailing in the study area, channel III (Grower–Retailer–Consumer) was the most efficient channel as indicated by the modified marketing efficiency. The major production constraints faced by apple growers were inadequate irrigation and finance problems while the major marketing constraints faced by them were lack of storage facility and malpractices in market. Shrivastava and Islam (2018) studied the trend in area, production and productivity of apple and reported that apple in India are predominantly grown in Jammu and Kashmir, Himachal Pradesh and Uttarakhand, however small percentage of apple production in India accrues to

other regions like Nagaland, Sikkim, Arunachal Pradesh and Nilgiri Hills in Tamilnadu. Saxena et al. (2017) made a study and analyzed awareness and perception of apple growers regarding amended APMC Act. Two districts of Himachal Pradesh viz. Shimla and Kullu were selected on the basis of highest apple production. Apple growers were divided in two group's viz. Group 1 (Growers who follow traditional supply chain) and group 2 (growers who follow both traditional and modern supply chain). Their study reported that Indian agriculture marketing system is suffering from various problems viz. improper warehousing, lack of grading and packaging, inadequate transport facilities, presence of large number of middle men, malpractices of traders, inadequate market information and insufficient funds. Through Agriculture Produce Marketing Committees (APMCs) under the Agricultural Produce Marketing Committee Act, 1964 there was control and regulate buying and selling operations at all regulated agricultural marketing yards yet there is lot of inefficiencies involved in practices of APMCs. Negi et al.



(2014) highlighted the need and importance of efficient supply chain to remove various bottlenecks and reduce the losses and wastage in fruits and vegetable sector. Their research conducted on the supply chain of fruits and vegetables sector in India suggested that the supply chain is highly inefficient which is leading to huge losses and wastages and less income to the stakeholders. The authors stressed upon the need to set up the cold chain infrastructure and food processing units to reduce post production spoilage.

Nagpal and Jain (2015) examined the impact of global warming and climate change in recent years on apple yield in Naggar Valley of Kullu district, Himachal Pradesh which was based on climate information and growers perceptions. The climate change has demonstrated its impact of decreasing productivity of apple crop in recent years. It was found that temperature in apple growing regions of Kullu has resulted in the upward shift of apple belts. Many initiatives have been undertaken by the government, apple growers associations and individual farmers to protect their traditional crop. Deliya et al. (2012) reported the various constraints faced by marginal and small farmers in supply chain management of horticulture products. Due to improper supply chain, almost 30% loss is evident in fruits. Their study indicated that the benefits to consumers and producers can increase by 20–25% in the most perishable commodity with appropriate supply chain operations Nityanand and Prachee (2011) observed that the supply-chain management of perishable food products is a very typical issue, which is to be adequately managed to gain the competitive advantage for optimum profit in the current scenario. Rauf et al. (2011) examined the production and marketing of apple in Himachal Pradesh and Jammu and Kashmir. It was observed that human labor and plant protection chemical were being used efficiently by orchardist in both the states. In Himachal Pradesh there is scope of increasing investment on fixed assets. Himachal Pradesh farmers were losing share in total production of temperate fruits. It was suggested that marketing system should be strengthened by institutions like corporate societies for the benefit of apple growers. Cold storage, grading and packing house facility, chemical washing and waxing facilities must be provided to apple growers. Kumar et al. (2007) worked out costs and returns of apple cultivation in Himachal Pradesh and reported that the initial investment was found to be very high. Maintenance cost incurred by farmers for 7 years has been found to be ranging from ₹ 34,962 during first year to ₹ 67,444 per hectare during seventh year. Per hectare production costs on marginal orchards was found to be ₹ 1,31,976 ha⁻¹ followed by ₹ 1,35,149, ₹ 1,28,099, ₹ 1,27,321 and ₹ 1,27,182 ha⁻¹ on large, semi medium, medium and small orchards, respectively. A net return per hectare from apple was found to be highest on marginal orchards (₹ 1, 53,408).

2. Materials and Methods

Based on the set objectives, impact of Supply chain Management of Apple Production and study the existing

status of Apple production and marketing in Kinnaur district, the five point likert scale, simple tabular analysis, Producers Shares in Consumers Rupee, Marketing Efficiency, Marketing Cost and Price Spread, and Cost and Returns was conducted among the Apple producers to know about the impact of Supply chain Management of Apple Production and study the existing status of Apple Production in Kinnaur District of Himachal Pradesh (India). Among the respondents a sample size of 200 respondents belongs to Kinnaur district and was selected as respondents using preference sampling technique. Sample size was calculated at 5% level of error term.

2.1. Simple tabular analysis

Percentages

$$\text{Percentage} = (X/Y) \times 100$$

Where;

X=Number of respondents falling in specific category to be measured

Y=Total number of respondents

$$\text{Averages} = (a_1 + a_2 + \dots + a_n) / N$$

Where;

a_1 = 1st observation

a_2 = 2nd Observation

a_n = Nth Observation.

N=Number of observations.

2.2. Cost and returns

The total age of apple plantation was considered to be 50 years. The cost incurred in the initial year i.e., 0 year has been termed as initial cost of plantation or cost of establishment. The cost incurred in age group of 1–5 years has been termed as operational and maintenance cost during the non-bearing stage and cost incurred in age group of 6–12, 12–35 and >35 years has been termed as operational and maintenance cost during the bearing stage. The total cost of establishment has been spread over the bearing stage as pro-rated establishment cost by adopting following formula:

$$\text{Amortized establishment value} = \text{Total establishment cost} \times (1+r)^n \times r / ((1+r)^n - 1)$$

Likert Scales used for the study

Sl. No.	Option	Point
1.	Strongly agree	5
2.	Agree	4
3.	Neutrality	3
4.	Disagree	2
5.	Strongly disagree	1

Likert scale was used for studying the “Constraint in Supply Chain Management” with twenty-four number of dimensions. The studied parameter of expectations of stakeholders was further intervened through social dimensions and attributes



of the respondents that is age, gender profile, education, occupation availability of forests in nearby approachable locations.

2.3. Producer's share in consumer's rupee

It is the price received by the farmer expressed as a percentage of the retail price (i.e., the price paid by the consumer). If PP is the retail price, the producers share in consumer's rupee, the price spread (PS) may be expressed as follows.

$$(PF/PP) \times 100$$

2.4. Marketing efficiency

Marketing efficiency is essentially the degree of market performance. It is the competence with which a market structure performs its designated function.

$$MME = (PF/PP) \times 100$$

Where;

MME=Modified measure of marketing efficiency

PF=Prices received by the producer

MC=Marketing cost

MM=Marketing margin

2.5. Marketing channel, marketing cost, price spread and marketing margins

Marketing channel refers to the alternate routes of product flow from the producer to final consumer. Apple is marketed in the form of fresh fruits. The marketing channels prevailing in the study area were analyzed for the present study. Marketing cost is the cost incurred by the producer-seller/market intermediary in marketing of produce. Apple was packed in boxes and marketed and accordingly the cost and margins per box have been estimated. The price spread was worked out by computing the difference between the prices received by the producers and the prices paid by the consumers.

PP=Price paid by the consumer

PF=Price received by the producer

2.6. Marketing margin

Marketing margin of middleman was calculated as the difference between the total payments (marketing cost+purchase price) and was receipts (sale price) of the middlemen and was calculated as follows"

$$A_{mi} = P_{Ri} - (P_{pi} + C_{mi})$$

Where;

A_{mi} =Absolute margin of middlemen

P_{Ri} =Total value of receipts per unit (sale price)

P_{pi} =Purchase value of goods per unit

C_{mi} =Cost incurred on marketing per unit

2.7. Marketable and marketed surplus

The Marketable and Marketed surplus of apple has been worked as follows.

2.8. Marketable surplus

$$M_s = T_p - C_h - C_k$$

Where;

M_s =Marketable Surplus

T_p =Total production

C_h =Home consumption.

C_k =Gift and kind payment.

2.9. Marketed surplus

$$M_t = M_s - L_m - L_t$$

Where;

M_t =Marketed Surplus i.e., actual quantity sold in the market.

M_s =Marketable surplus.

L_m =Losses during transportation & marketing.

L_t =Arbitrary deduction by traders at market

3. Results and Discussion

The perusal of data presented in table 1 shows demographic characteristics of the sampled respondents in the study

Table 1: Demographic profile (Age, Gender, Educational status) of the sampled respondents

Age wise distribution of the respondents	
Age in Years	Kinnaur
20-30	28 (14.00)
31-40	47 (23.50)
41-50	64 (32.00)
Above 50	61 (30.50)
Total	200 (100.00)
Gender	Kinnaur
Male	152 (76.00)
Female	48 (24.00)
Total	200 (100.00)
Education	Kinnaur
Illiterate	13 (6.50)
Primary	33 (16.50)
Secondary	92 (46.00)
Graduate	35 (17.50)
Post Graduate	27 (13.50)
Total	200 (100.00)

Figures in parentheses represent percentages to total



area. It can be seen from the table that nearly 30.50% of the respondents belong to the age group of above-50 year which was highest in the study area. The proportion of males amongst the sampled respondents was higher in the study area that was 76.00% followed by 24.00% as females. In Kinnaur, majority of the respondents 46.00% were found to be educated up to secondary levels. The proportion of the male respondents was more as compared to female respondents. The educational status revealed that majority of the respondents that is 46.00% was educated up to secondary level.

The table 2 shows the sample profile with respect to the family size and structure in Kinnaur, 77.00% of the respondents were head of family, the joint family was 59.00 % and nuclear family was 41.00 % respectively in Kinnaur district. The families members 1-4 are 35.50 %, 5-8 are 21 %, 9-12 are 27.50% and above 12 are 16.00% respectively.

Table 2: Demographic characteristics (Family Size and Structure) of the sampled Respondents

Family structure of the respondents	
Head of family	Kinnaur
Yes	154 (77.00)
No	46 (23.00)
Total	200 (100.00)
Type of family	Kinnaur
Nuclear	82 (41.00)
Joint Family	118 (59.00)
Total	200 (100.00)
Number of family members	Kinnaur
1-4	71 (35.50)
5-8	42 (21.00)
9-12	55 (27.50)
Above 12	32 (16.00)
Total	200 (100.00)

Figures in parenthesis represent percentages to total

Table 3 revealed that, In Kinnaur, 44% of the sampled respondents were in the category of marginal land holdings. Small land holdings were possessed by 46.00% of the sampled households in study area. The medium and large land holdings were possessed by 9.00% and only 1.00% of sampled household in study area.

In Table 4, Area under crops and vegetables was 10.37%, in which irrigated and un-irrigated land was 57.14 and 42.86%. The orchard area was 79.26% in Kinnaur, in which irrigated and un-irrigated land was 32.71 and 67.29%. The forest land was 0.74% and Grass land was 7.41 %. Land put to non-agricultural use was 2.22%, while in average land holdings irrigated and

Table 3: Land owned pattern of sampled respondents

Land owned pattern of sampled respondents	
Classification of land holding	Kinnaur
Marginal land holding	88 (44.00)
Small land holding	92 (46.00)
Medium land holding	18 (9.00)
Large land holding	2 (1.00)
Total	200

Figures in parenthesis represent percentages to total

Table 4: Land use pattern of sampled respondents

Sl. No.	Particulars	Kinnaur
1.	Area Under Crops and Vegetables (ha)	0.14 (10.37)
a)	Irrigated	0.08 (57.14)
b)	Un-irrigated	0.06 (42.86)
2.	Area Under Orchard	1.07 (79.26)
a)	Irrigated	0.35 (32.71)
b)	Un-irrigated	0.72 (67.29)
3.	Grass Land	0.10 (7.41)
4.	Forest Land	0.01 (0.74)
5.	Fallow/Barren/Non-Agriculture use land	0.03 (2.22)
6.	Average Land Holding (ha)	1.35 (100.00)
a)	Irrigated	0.43 (31.85)
b)	Un-irrigated	0.92 (68.15)

Figures in parenthesis represent percent number of respondents

un-irrigated land are 31.85 and 68.15% respectively.

3.1. Identification of supply chain

In this section, an attempt has been made to identify the various supply chains prevailing among apple growing farmers in Kinnaur district of Himachal Pradesh. This includes input supply to farmers, post-harvest management and marketing supply chain of apple. The data pertaining to is compiled from primary data collected from sampled producers.

3.2. Identification of supply chain in apple production

The supply chain of apple starts from various agri inputs which a grower uses to produce apple. There are a large number of input suppliers in the supply chain of farmers in the study area. These input suppliers either supply directly to the farmer or through wholesalers or agents in the villages. The various input supply chains identified in apple production in the study area are as follows.

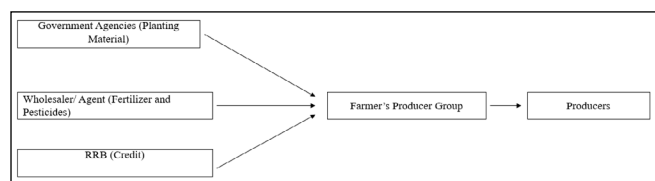
Channel I

Figure 1: Schematic representation of input supply chain in apple production

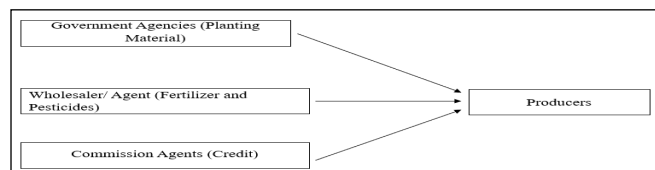
Channel II

Figure 2: Schematic representation of input supply chain in apple production

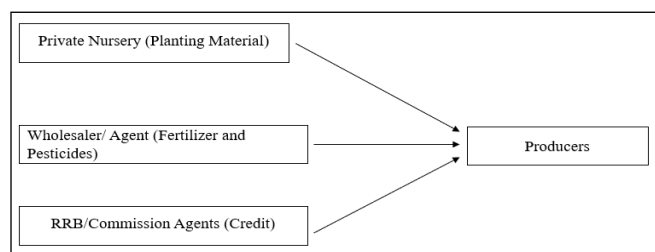
Channel III

Figure 3: Schematic representation of input supply chain in apple production

In Channel I, different research stations and KVKs that is government agencies sell planting material to the farmers producer organizations. Farmers producers organization also purchases fertilizers and pesticides from the wholesalers in bulk while Regional Rural Banks (RRBs) provide the credit. The farmers producers and farmers cooperatives provide these inputs to the farmers at reasonable rates.

Channel II, shows that the producer directly purchases the planting material from the government agencies. Commission agents provide credit facilities to the farmers. Farmers are bound to sell their produce to the commission agent in this channel. Usually, small farmers who cannot avail credit from institutional sources avail this input supply chain.

Channel III, shows that the producers purchase the planting material from the private nurseries and agents sell fertilizers and pesticides at the village level. Both RRBs and commission agents are providing credits to producers

3.3. Identification of supply chain in apple marketing

Apple is made available to the final consumer through these three channels after production. (Figure 4) Apple growers of the selected areas sell the standing crop to pre-harvest contractors at flowering stage for a year or two in the month of March-April. The crop contractor negotiates and settles the price to be paid and terms and conditions of payment

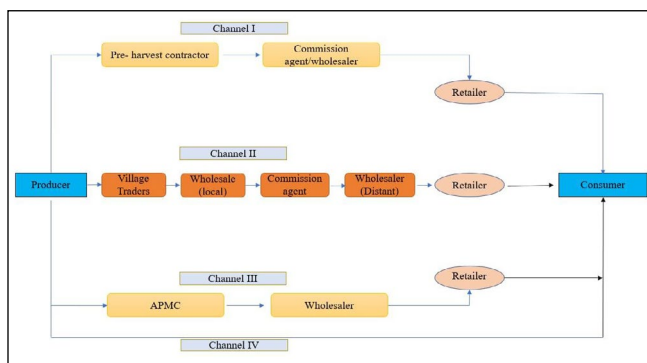


Figure 4: Schematic representation of Supply Chain in Apple marketing

directly with the grower. The pre-harvest contractors have a clear picture of the yield potential of the orchard as a whole and decide the price of the lease accordingly. The price offered on a per tree basis varies according to the age category. Harvesting of fruits is done by the contractor. The farmer receives 50 % of settled price in advance (at the point of framing of deal) and the rest at the time of harvest. Loading the truck for transport to distant cities is done at the farm gate itself. The pre-harvest contract system prevailing in the study area has an impact on the health and life of the apple orchards. In case of pre harvest contract or who arrive at “pink bud stage” of apple tree, it is valid for only that year. In this one-year contract, the orchard owner is responsible for the cultural operations except spray against Apple Scab which is done by contractor. However, the cost incurred on this account would be deducted by the contractor in the final settlement.

The percentage of highly unsatisfied sampled households was 50.00%, 20.00% neutral, 10% satisfied, 5% highly satisfied and 15% highly unsatisfied, respectively in Kinnaur district (Table 5). The satisfaction percentage of sampled respondents was lower in Kinnaur district in study area. Thus it can be concluded that majority of the respondents in the study area was

Table 5: Satisfaction level with the present system of supply chain marketing

Sl. No.	Particulars	Kinnaur
1.	Highly unsatisfied	30 (15.00)
2.	Unsatisfied	100 (50.00)
3.	Neutral	40 (20.00)
4.	Satisfied	20 (10.00)
5.	Highly Satisfied	10 (5.00)
6.	Total	200 (100.00)

Figures in parenthesis represent percentage to total

unsatisfied with the existing supply chain management system. The reason may be high cost of production and comparatively less price received from the produce.

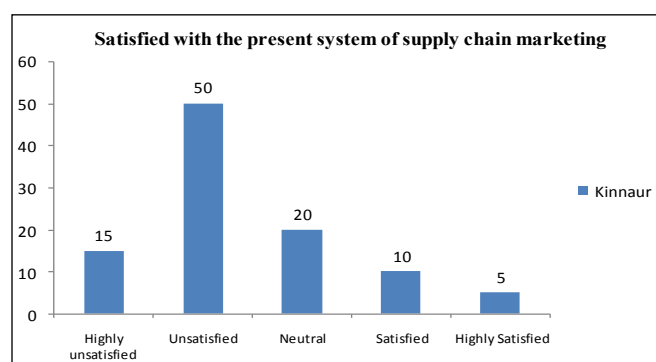


Figure 5: Grafical representation of satisfaction level with the present system of supply chain marketing

The input cost for apple production one hectare of land holdings is shown in table 6. It can be seen from the table that on overall basis maximum percentage of cost that is 43.01% was incurred on the purchase of nursery plants followed by

Table 6: Cost of inputs in apple production at Kinnaur (per hectare basis)

Sl. No.	Cost components	Cost	%
1.	Labour	4369.50	8.52
2.	Manure	6584.25	12.85
3.	Fertilizers	14598.75	28.48
4.	Plant Protection	2265.50	4.42
5.	Plant	22044.75	43.01
6.	Miscellaneous	1395.25	2.72
	Total	51258.05	100.00

28.48% of cost incurred on the purchase of fertilizers. Labour constituted only 8.52% of total expenditure. The total cost for production of apple on one hectare of land holdings was observed to be ₹ 51258 on overall basis.

Table 7 shows that the three different channels through which the apple is supplied to consumer in Kinnaur market. Out of all three channels, the channel III is found to be efficient with modified market efficiency of 47.3%. The producer share for consumer's rupees is 81.81% with net marketing margin was 180 with price spread value of 380. Channel I have modified market efficiency of 41.60% and the producer share for consumer rupees was 62.11% with net marketing margin of 240 and price spread value of 610. Channel II have low modified market efficiency of 20% and the producer share for consumer rupees was 78.94% with net marketing margin of 200 and price spread valued 400.

In table 8, different problems faced by the apple growers in supply chain managements parameters viz. Labour, Financial problem, Institutional problem, social problem and Economic problem were analyzed through Likert scale.

In Kinnaur District, Highest rank (I) was recorded under labour problem, followed by economic problem, social problem, financial problem and lowest rank (V) was recorded under

Table 7: Price spread in apple supply chain of Kinnaur district

Sl. No.	Particulars	Channel 1	Channel 2	Channel 3
1. Producers				
	Net price received	1000	1500	1800
2. Village traders				
	Purchase price	-	1500	-
	Marketing cost	-	250	-
	Sale price	-	1800	-
	Margin	-	50	-
3. Contractor				
	Purchase price	1000	-	-
	Marketing cost	300	-	-
	Sale price	1380	-	-
	Margin	80	-	-
4. Wholesaler				
	Purchase price	1200	1550	-
	Marketing cost	100	100	-
	Sale price	1350	1700	-
	Margin	50	50	-
5. Retailer				
	Purchase price	1300	1600	1800
	Marketing cost	200	200	200
	Sale price	1610	1900	2200
	Margin	110	100	180
	Price spread	610	400	380
	Net marketing margin	240	200	180
	Producers share in consumer's rupee (%)	62.11	78.94	81.81
	Modified marketing efficiency	4.16	2.00	4.73

Note: 1 box=25 kgs

Table 8: Problem faced by the growers in supply chain management in the study area

Sl. No.	Particulars	Kinnaur					score	Rank
		VH	H	M	L	VL		
1.	Labour problem	90	40	50	20	0	800	I
2.	Financial problem	50	30	80	40	0	690	III
3.	Institutional problem	30	50	90	30	0	680	V
4.	Social problem	40	50	70	40	0	690	III
5.	Economic problem	50	80	50	20	0	760	II

VH: Very high; H: High; M: Medium; L: Low; VL: Very low

financial problem respectively.

It can be seen from the table 9, that 77.00% of the respondents were aware about the constraints in supply chain and 23.00% of the respondents were not.

Table 9: Awareness of apple producers about constraints in Supply chain management of the study area

Awareness of producers about constraints in supply chain	
Awareness	Kinnaur
Yes	154 (77.00)
No	46 (23.00)
Total	200 (100.00)

4. Conclusion

Apple dominates the fruit production in the state and contributes about 91.38% of the temperate fruit production and about 33.14% of the total fruit production in the state. The state produces about 6.25 lakh MT apple that constitutes 28.55 % of the total apple production in the country. Himachal Pradesh is the second largest producer of apple in the country after Jammu and Kashmir but in term of quality, Himachal apples enjoy a consumer preference and are considered to be better for storage. The supply chain of apple starts from various Agri inputs which a grower uses to produce apple. The total input cost of apple production denotes that the cost of plant (₹ 22044.75 ha⁻¹) made the highest value in inputs of apple production, followed by fertilizer cost (14598.75 ha⁻¹), manure cost (₹ 6584.25 ha⁻¹), labour cost (₹ 4369.50 per ha⁻¹), plant protection cost (2265.50 per ha) and miscellaneous cost (₹ 1395.25 per ha⁻¹). The total input cost for 1 ha in of apple was amounted to ₹ 51258.05. Majority of the respondents in the study area was unsatisfied with the existing supply

chain management system. The reason may be high cost of production and comparatively less price received from the produce. Three different channels through which the apple is supplied to consumer in Kinnaur market, out of all three channels, the channel III is found to be efficient with modified market efficiency of 47.3%.

5. Acknowledgement

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6. References

- Abhishek, Ranaut, S., Raina, K.K., 2022. Constraints of supply chain management of apple production in Kinnaur and Kullu districts of Himachal Pradesh (India). *The Pharma Innovation Journal* 12, 3078–3082.
- Dahiya, P.S., Saraswat, S.P., 2000. Marketing of apples in Himachal Pradesh price spreads, Problems and Strategies. *Journal of Applied Horticulture* 2, 58–61.
- Kumar, S., Karol, A., Singh, R., Vaidya, C.S., 2007. Cost and return from apple cultivation: A study in Himachal Pradesh. *Agricultural Situation in India* 64, 307–14.
- Nagpal, C., Jain, S., 2015. Global warming and apple farming in Naggar belt of District Kullu, Himachal Pradesh. *Indian Journal of Social Research* 56, 229–234.
- Negi, D.S., Pratap, S.B., Pramod, K.J., Aggarwal, S., 2014. Changing sources of growth in Indian agriculture. *International Food Policy Research Institute*, 132.
- Nityanand, S., Prachee, J., 2011. Supply chain management of perishable food products: A strategy to achieve competitive advantage through knowledge management. *Indian Journal of Marketing* 41, 3–9.
- Rauf, A., Saraf, S.A., Wani, S.A., 2011. Economics of production and marketing of Apple in H.P. and J&K- a comparative study. *Indian Journal of Agricultural Marketing* 25, 97–119.
- Saxena, A., Hussain, M., Singh, A., 2017. Impact of amended APMC act on apple business in Himachal Pradesh, India. *Indian Journal of Agricultural Research* 51, 38–43.
- Wani, F.A., Songara, M., 2019. Production and marketing efficiency of apple farming- A study in Shimla and Kullu District of Himachal Pradesh. In: *Proceeding of 6th International Conference on multidisciplinary research*, held at Osmania University, Hyderabad, 536–542.