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Performance of onion in Karnataka: An economic analysis

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Abstract

The study on economic analysis of onion revealed that, onion area, production and productivity have positive growth for both India and Karnataka. The cultivation expenses for onions amounted to Rs. 89,187 per acre, while the net returns stood at Rs. 35,189 per acre, demonstrating the viability of this agricultural enterprise. The marketing cost of onion sold through commission agents was Rs. 62.82/quintal followed by wholesalers. The marketing cost was higher in the Channel-II (Rs. 347.86/ql), while the marketing margin was higher in Channel-I (Rs. 326.39/ql) compared to other channels. The highest producer's share in consumer's rupee per quintal (84.78%) and the marketing efficiency (5.57) was observed in Channel-III. Problems faced by farmers in production and marketing of onion in the order of preference were crop damage due to erratic rainfall/flood and the price fluctuation. For a long-term solution, onions could be dehydrated and onion skin could be used in nanogenerator which avoids waste dumping. Further, the generation of electricity is possible.

Keywords: CAGR, instability analysis, marketing cost, margin, price spread

Introduction

Fruits and vegetables constitute a significant portion of consumers' expenditures. Vegetables play a crucial role in human diets and are consumed daily. Onion (*Allium cepa*) stands out as one such essential vegetable originating in Central Asia. Leading onion producers include China, India, the United States, and Spain (Tripathi and Lawande, 2019) ^[1]. India, with an area of 194.1 thousand hectares, produced 31,687.2 metric tonnes during the 2021-22 period. Karnataka ranks second after Maharashtra, covering an area of 231.84 thousand hectares and producing 2779.50 metric tonnes, with a productivity of 11.99 tonnes/ha during the same period (source: www.indiastat.com).

Onion is consumed widely across the world. It has been revered for their culinary use and therapeutic properties. onion, whether utilized in its raw form or dehydrated, serves to enhance the flavor and taste of Indian cuisine. Additionally, it holds medicinal value. Their chemical composition varies among varieties, containing oil and organic sulphides. Notably rich in chromium, a trace mineral aiding in insulin response, onions also provide vitamin C and numerous flavonoids, including quercetin (Deshmukh, 2015) ^[3].

Despite substantial production and trade opportunities for onion very high volatility in price leads to instability to the growers (Sudhir, 2004) ^[8]. The volatility in prices has a huge impact on the food security as well as farmer's and consumer's welfare. This effect becomes noticeable when the government and households are adept at managing regular fluctuations but overlook or neglect to prepare for significant unexpected events. (Chengappa *et al.*, 2012) ^[2].

Efficient marketing of onions plays a pivotal role in determining the crop's profitability, given its perishable nature, bulkiness, and seasonal characteristics. Prices tend to be low when arrivals are abundant and high during the lean season. Recognizing the crucial role of the marketing system and its efficiency, the current investigation aimed to identify different marketing channels, along with analyzing marketing costs and margins. Additionally, the study sought to pinpoint various constraints in onion marketing within the study area, with the overarching goal of stabilizing farmers' income and consumers' budgets. To address these objectives, specific goals were formulated.

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Objectives

- Estimation of the growth in area, production and productivity of onion in India and Karnataka
- Identifying the channels involved in the marketing of onion
- Assessment of marketing cost, margins, price spread and marketing efficiency of different channels
- Identification of constraints in onion production and marketing in the study area if any and to suggest suitable measures

Methodology

The current study made use of secondary time series data on area, production and productivity of onion from the year 2000-01 to 2021-22. This was collected from National Horticultural Research and Development Foundation (NHRDF), National Horticulture Mission (NHB). Similarly, the instability in area, production, productivity of onion was also assessed through Della Valle Instability index. The primary data was gathered through a survey method employing a pre-tested schedule administered via personal interviews. The necessary primary data concerning costs, yields, prices, and expenditures for the year 2021-22 were gathered from selected districts of Belgaum and Dharwad. The data collection took place at two different Agricultural Produce Market Committees (APMCs) in Karnataka, specifically Hubli and Belgaum, chosen based on the volume of market arrivals of the produce. Five samples each of traders, wholesalers, commission agents-cum-wholesalers, and retailers were selected from each market and personally interviewed to gather the required information. Primary data from market intermediaries were collected through personal interviews using pre-tested structured schedules. Additionally, an opinion survey on production and marketing constraints was conducted by interviewing 30 farmers. The severity of issues encountered by farmers during both onion production and marketing within the study area was assessed using the acute index technique. This method involved analyzing the data obtained through opinion surveys conducted among the sampled respondents.

Statistical Tools and Techniques

Compound growth rate

To analyze the data, the compound growth rate technique was utilized to determine the annual percentage growth in area, production, and productivity of onions from India. The methodology employed for calculating the compound growth rate is outlined as follows:

$$Y_t = AB^t V_t \quad (1)$$

Where,

Y_t = data on area, production and productivity in the year 't'

A = intercept indicating Y in the base period ($t=0$)

T = time period

V_t = error term

$B = (1+g)$

g = average compound growth rate to be estimated

Instability Analysis

To examine stability in onion regarding area, production, and yield, the Cuddy Della Valle Instability Index (Cuddy and Della Valle, 1978) was employed as a measure of variability. This index is considered superior to scale-

dependent measures such as standard deviation, which tend to overestimate instability in time series data. The CDV Index adjusts the coefficient of variation to accommodate trends present in time series data, providing a more accurate indication of instability. The calculation of the Cuddy Della Valle Index (CDVI) is as follows:

$$CDVI = I = CV\sqrt{X}$$

I = Instability index (in percent)

Where,

$$X = 1 - \bar{R}^2$$

CV = coefficient of variation and

\bar{R}^2 is adjusted coefficient of determination.

The ranges of CDVI (Sihmar, 2014) are between 0 and 15 for low instability, greater than 15 but lower than 30 as moderate instability and higher instability above 30.

Profitability analysis of onion cultivation

Profitability depends both on cost and returns. Hence, it was studied under following heads.

Cost and returns

The estimates of profitability of onion production, gross return, gross margin, net return and benefit cost ratio were assessed using farm business cost concepts as detailed below:

Cost concepts

1. The total cost was predominantly divided into Variable Cost and Fixed Cost. Fixed Cost encompassed the opportunity cost of land use and family labor. Variable Costs, including irrigation, pesticide, land preparation, seed and seedling, fertilizer, and hired labor costs, were determined based on prevailing market input prices. The total cost was computed by aggregating Variable Costs and Fixed Costs. Gross returns were assessed by considering the output of onions and their corresponding prices.
2. **Gross income:** It is total value of main product and byproduct
3. **Net farm income:** Gross income – Cost C
4. **Cost per quintal** = $\frac{\text{Total Cost per acre}}{\text{Yield per acre}}$

$$\text{Producer's share in consumer's rupee (\%)} = \frac{\text{Net price received by the farmer}}{\text{Price paid by the consumer}} \times 100$$

The absolute and percentage margin of middlemen involved in marketing were estimated as under:

$$\text{Absolute margin of } i^{\text{th}} \text{ middleman} = PR_i - (PP_i + Cm_i)$$

Where,

PR_i = Sale price of the i^{th} middleman

PP_i = Purchase price of the i^{th} middleman

Cm_i = Cost incurred on marketing by the i^{th} middleman

$$\text{Percentage margin of } i^{\text{th}} \text{ middleman} = \frac{PR_i - (PP_i + Cm_i)}{PR_i} \times 100$$

The total cost incurred on marketing of produce by the farmers and intermediaries involved in the process of marketing was computed as:

$$C = CF + C_{m_1} + C_{m_2} + \dots + C_{m_n}$$

Where,

C = Total cost of marketing

CF = Cost incurred by the producer in marketing of produce and

C_{m_i} = Cost incurred by the i^{th} middleman in marketing of produce

Marketing efficiency was computed by employing the following formula

$$MME = \frac{RP}{(MC+MM)} - 1$$

$$RP = FP + MC + MM$$

Where,

MME = Modified measure of marketing efficiency

RP = Prices paid by the consumer

MC = Total marketing costs

MM = Net marketing margins

FP = Prices received by the farmer

Acute index analysis

The acute index was worked out by multiplying the rank assigned for particular problem with the frequency of expression of that problem by sample farmers, divided by the total number of sample farmers chosen for the study.

$$\text{Acute index} = \frac{\text{Rank of } i^{\text{th}} \text{ problem} \times \text{Frequency of expression of respondents of } i^{\text{th}} \text{ problem}}{\text{Total number of sample respondents}}$$

Results and Discussion

In order to assess the consistency of growth performance the imperative study was done through instability index. It revealed from the Table 1 that, Onion area in India was 448.9 thousand hectare has increased to 1941.1 thousand hectare with the growth rate of 6.46 percent per annum. In case of production and productivity it was 9.69 percent per annum and 2.64 percent per annum respectively. With respect to area, production and productivity the variation was 15.59, 16.42 and 10.09 percent respectively. Variation in production was more in India mainly due to high yielding varieties of onion used by farmers in recent years. Similar observations were made by Patil *et al.* (2016) [7].

The growth rates in area, production, and productivity of onions in Karnataka were found to be 3.12%, 9.53%, and 5.67% per annum, respectively. The instability indices for Karnataka, concerning area, production, and productivity, were determined to be 10.85%, 34.34%, and 31.57%, respectively. The variation was more pronounced in production, indicating that farmers leaned towards high-yielding varieties of onions, increased irrigation coverage, and faced high volatility in market prices for onions. These findings align with studies conducted by Dhakre and Bhattacharya (2013) [4] and Dhakre and Sharma (2009) [5].

Cost and Returns structure in onion production

All the inputs measured in terms of per acre basis and presented in Table 2. The average variable cost per acre

onion production was about Rs. 44894 (50.34%) in Belgaum and Dharwad district together. The major cost was on labour (19.64%). Again amongst labour, female labour requirement was more especially for the operations like weeding, planting and harvesting. Among the inputs the major share of cost was on FYM followed by seeds. The FYM usually used were from different areas, for which they paid higher prices. There is a need to develop cost effective FYM. Farmers used more FYM than chemical fertilizers. The opportunity cost associated with family labor and the land utilized in onion production were regarded as fixed costs. The average fixed cost of onion production per acre amounted to approximately Rs. 44,293.2 (49.66%). On average, the total cost per acre of onion production was Rs. 89,187. The estimated average yield of onions was 51.7 quintals per acre in the selected districts. Farmers generated a total revenue of about Rs. 1,24,377 per acre, with net returns (Rs. 35,189.8 per acre) constituting approximately 35 percent of the total revenue as profit margin (Table 3). During the study period, prices were higher compared to previous years due to significant crop damage caused by heavy rains, resulting in a considerably lower yield.

Marketing cost, margin, Price spread and efficiency

The marketing expenses accrued by onion growers are detailed in Table 4. A higher marketing cost was observed when sold through a commission agent (Rs.62.82/quintal), followed by wholesalers (Rs. 57.97/quintal), village merchants/traders (Rs. 50.13/quintal), and retailers (Rs. 43.59/quintal). Among the various components of marketing costs, the expenses for cleaning and grading ranged from 30.20 percent for wholesalers to 37.27 percent for village merchants. Transportation costs were lowest for village merchants (20.55%) and highest for wholesalers (24.64%), owing to the proximity of distance.

The details of marketing costs incurred by different intermediaries in the marketing of onions are outlined in Table 5. The average total marketing cost of onions borne by commission agents was Rs. 106.28/quintal, followed by wholesalers (Rs. 96.76/quintal), retailers (Rs.82.00/quintal), and village merchants (Rs. 73.61/quintal). Among the various cost components borne by village merchants, cleaning and grading accounted for 30.98 percent, the highest due to the produce being affected by excess rainfall. Other costs included transportation (30.92%), loading and unloading (14.95%), and damage/spoilage (8.49%). Among the various marketing cost components borne by Commission agents, transportation costs accounted for 24.77 percent, followed by cleaning and grading (23.36%), commission (14.68%), loading and unloading (12.71%), damage/spoilage (6.87%), other miscellaneous (6.08%), packing (4.80%), market fee (3.43%), and weighing charges (3.30%). Commission agents incurred the highest marketing cost compared to other intermediaries.

The marketing cost incurred by retailer was the highest for cleaning and grading (25.37%) followed by transportation (25.00%), commission (17.69%), loading and unloading (9.76%), damage/spoilage (7.02%), other miscellaneous (4.60%), packing (4.27%) market fee (3.85%) and weighing charges (2.44%).

Based on data collected from farmers and market functionaries, the study presents the marketing costs, margins, and price spreads across all channels for onion distribution. Three channels were identified in the study area:

Channel-I: Producer - Local Merchant/Traders - Consumer, prevalent in Hubli market.

Channel-II: Producer - Commission agent - Wholesaler - Retailer - Consumer, prevalent in Belgaum market.

Channel-III: Producer - Wholesaler - Retailer - Consumer, in Belgaum market.

In the study area, the distribution of onion quantities through Channels II, III, and I averaged approximately 54.80%, 19.39%, and 11.10%, respectively. A breakdown of costs, margins, and price spreads across all channels is provided in Table 6. In Channel-II, various market functionaries earned a total margin of Rs. 164.96 per quintal of onions. Notably, wholesalers earned a higher margin (Rs. 63.24/quintal) compared to retailers (Rs. 58/quintal), constituting 2.04% and 1.87% of the consumer's price, respectively. The total marketing cost incurred by different functionaries amounted to Rs. 347.86 per quintal of onions, representing 11.22% of the consumer's price in Channel-II. Among the marketing costs, the commission agent bore the highest expense (3.43%), followed by the wholesaler (3.12%), retailer (2.65%), and producer (2.03%). The price spread, encompassing marketing costs and margins, was 16.54%, while the producer's share in the consumer's price was lowest in Channel-II, accounting for 83.45%.

In Channel-III, various functionaries earned a total margin of Rs. 171.24 per quintal of onions. Notably, retailers garnered a higher margin (Rs. 88/quintal) compared to wholesalers (Rs. 83.24/quintal), constituting 3.28% and 3.10% of the consumer's price, respectively. The total marketing cost incurred by different functionaries amounted to Rs. 236.73 per quintal of onions, accounting for 8.8% of the consumer's price. Among these costs, the highest was incurred by the wholesaler (3.61%), followed by the trader (3.06%) and producer (2.16%). Furthermore, the producer's share in the consumer's price was 84.78%, with a price spread of 15.22% in Channel-III.

In Channel-I, the total margin earned by traders amounted to Rs. 326.39 per quintal of onion. The marketing cost incurred by various functionaries totaled Rs. 123.74 per quintal of onion, representing Rs. 2450 of the consumers' price. Among these costs, traders bore the highest expense at Rs. 73.61 per quintal, followed by producers at Rs. 50.13 per quintal. Furthermore, analysis from the data revealed that the producer's share in the consumer's rupee was 83.95%, with a price spread of 16.04% in Channel-I.

The marketing cost per quintal was highest in Channel-II (Rs. 347.86/qrtl), followed by Channel-III and I. Additionally, from the data, it is evident that the marketing margin per quintal was highest in Channel-I (Rs. 326.39/qrtl), followed by Channel-III and II. Therefore, the results of price spread analysis indicate that the producer's share per quintal is highest in Channel-III (84.78%), followed by Channel-I and II.

Using Acharya's modified formula, the marketing efficiency for onions was calculated and the results are summarized in Table 7. Among the channels, Channel-II exhibited the highest total marketing cost and marketing margin (Rs. 347.86/qrtl and Rs. 326.39/qrtl, respectively). However, the consumer's price was higher for Channel-II (Rs. 3100/qrtl) compared to Channel-I and Channel-III. Notably, Channel-III achieved the highest modified marketing efficiency of 5.57.

In the marketing of onions in both the Hubli and Belgaum markets of Karnataka, Channel-III demonstrates superior efficiency compared to the other two existing channels. In this channel, the producer's share in the consumer's rupee is higher at 84.78%, while the price spread is relatively lower at 15.22%. Moreover, it exhibits the highest marketing efficiency of 5.57.

Problems faced by farmers in production and marketing of onion

In this study, the severity of problems faced by sample farmers in onion production is presented in Table 8, with ranks assigned as follows: less acute (1), acute (2), medium acute (3), and highly acute (4).

The majority of sample respondents identified crop damage due to erratic rainfall/flood as a highly acute problem (ranked 3.50). This was due to the production period for kharif onion falling between June and December, coinciding with the planting of late kharif crop seedlings and raising nursery for rabi season. In 2020, the monsoon was delayed by one month, followed by continuous rainfall until November, with unusually high rainfall of 200-300 mm recorded in onion-growing states during October-November. November saw heavy rains in many onion-growing areas of Karnataka, causing damage to onion crops at various stages. To mitigate this, agronomic management techniques such as adjusting planting dates to avoid periods of heavy rainfall and adopting planting on broad bed furrow (BBF) instead of traditional flat beds may reduce flood-related losses during the kharif season. BBF planting, combined with drip irrigation, can help farmers overcome drought and salinity conditions.

Similarly, the majority of respondents considered the non-availability of labor as a medium acute problem (ranked 2.90) due to the labor-intensive nature of onion cultivation. Availability of labor during peak harvesting times was a challenge, followed by management issues (ranked 2.50) as many farmers lacked training in crop management. To address the labor shortage, irrigation via micro-sprinklers can mitigate micro-temperature increases in the summer season, reducing the adverse effects of high temperatures on bulb development. Extension officials should also recommend appropriate training for onion growers to adopt micro-irrigation methods, thereby reducing labor costs. Integrated pest management systems should be implemented to address poor management problems and reduce pesticide costs. Mulching with organic waste and bi-colored polythene can conserve moisture, control weed populations, and maintain soil temperature.

Credit availability was considered a medium acute problem (ranked 2.30) as most farmers had their own funds. Resource availability was identified as an acute problem (ranked 1.86) among the majority of respondents. However, production-related issues such as capital availability (ranked 1.50) and irrigation (ranked 1.20) were perceived as less acute by most sample farmers. The challenges encountered by sample farmers in onion marketing are outlined in Table 9. Price fluctuation was identified as highly acute (ranked 2.90) by most sample farmers compared to other marketing issues. During periods of high market prices, farmers tend to increase onion production to capitalize on higher prices, resulting in increased arrivals and subsequent market glut situations. Storage problems were considered medium acute, primarily due to space constraints for storing onions. To

alleviate storage issues, farmers can construct onion storage structures in their fields with limited capacity to avoid distress selling during peak seasons (May-June). Scientific storage structures can also help store kharif onions with minimal sprouting, a major constraint in kharif onion storage. Long-term solutions such as dehydration to produce onion chips and onion powder could be explored.

Transportation issues were ranked as medium acute due to poor road conditions and limited vehicle frequency for

transportation. Problems such as non-availability of market information, distance to markets, and mutual understanding between commission agents and traders were perceived as less acute compared to other marketing challenges. Adequate storage facilities can help mitigate supply volatility and steep rises in onion prices. Post-harvest loss interventions should be tailored to the socioeconomic and business context of the country, as suggested by Kitinoja *et al.* (2011) [6].

Table 1: Compound growth rates and instability in area, production and productivity of Onion in India and Karnataka during (2000 to 2021)

	India			Karnataka		
	Area	Production	Productivity	Area	Production	Productivity
CAGR (%)	6.46	9.69	2.64	3.12	9.53	5.67
CDVI	15.59	16.42	10.09	10.85	34.34	31.57

Table 2: Cost structure of Onion production in Karnataka: 2021-22 (Rupees/Acre)

SL. No.		Units	Cost/Return	%
A	Variable Cost		44894	50.34
I	Human Labour	73.38	17519	19.64
	Hired			
	Male (No.)	17.11	5114.18	5.73
	Female (No.)	32.46	6528.68	7.32
	Family			
	Male (No.)	11.12	3323.77	3.73
	Female (No.)	12.69	2552.34	2.86
II	Machine & Bullock Labour		5185.24	5.81
	Tractor (Hrs)	5.53	5005.48	5.61
	Bullock (Days)	0.16	179.76	0.2
III	Inputs		15814.8	17.73
	FYM (Tractor loads)	1.36	4839.11	5.43
	Manure (Kgs)	0.25	308.18	0.35
	Seeds (Kgs)	3.66	4778.5	5.36
	Fertilizer (Kgs)	211.58	4390.29	4.92
	Pesticides (ltr)	2.74	1408.83	1.58
	Weedicides (Kgs/Litres)	0.06	48.06	0.05
	Micronutrients (Kgs/Litres)	0.49	41.82	0.05
IV	Marketing Expenses (Rs)		3242.84	3.64
V	Interest on working capital (7.5%)**		3132.14	3.51
B	FIXED COST		44293.2	49.66
I	Crop insurance/Risk premium (2% of sum insured)*		1416	1.59
II	Land and water tax		17	0.02
III	Depreciation on farm machinery and farm buildings		132.86	0.15
VI	Rental value of land (25% Gross income)**		31094.26	34.86
VII	Managerial cost (15 % of all cost)**		11633.12	13.04
C	COST			
	Cost A1 + FL		46459.84	52.09
	TOTAL COST (C3)		89187.2	100
D	OUTPUT			
	Main Product (Qtl.)	51.7	124377	
	Price (Per Qtl.)		2405.58	
E	RETURN			
	Gross Return		124377	
	Return Over Cost A1 + FL		77917.2	
	Return Over total cost		35189.8	
F	COST OF PRODUCTION (Rs./Qtl.)			
	Cost A1 + FL		898.58	
	COST C3		1724.97	

Table 3: Returns structure of onion Production in Karnataka during 2021-22

Sr. No.	Cost items	Value (Rs./acre)
A	Variable cost	44894
B	Fixed cost	44293
C	Total cost of cultivation C= (A+ B)	89187.2
D	Production in quintal /acre	51.7
E	Gross Return @ Rs. 2405.58	124377
F	Net Return/acre(E – C)	35190
G	Cost of production per quintal/acre (C÷D)	1725.08
H	Profit per quintal (2405.58 – 1725.08)	680.5
I	Benefit cost Ratio (E ÷ C)	1.39

Table 4: Marketing cost incurred by the onion growers (Rs. /quintal)

Particular	Traders (n=5)	Wholesalers (n=5)	Commission Agent (n=5)	Retailer (n=5)
Weighing Cost	0.55 (1.10)	0.58 (1.0)	0.62 (0.99)	0.31 (0.72)
Cleaning and Grading	18.68 (37.27)	17.51 (30.2)	19.72 (31.40)	16.02 (36.76)
Packing Charges	4.20 (8.38)	5.20 (8.97)	4.40 (7.01)	3.80 (8.72)
Loading and Unloading Charges	10.60 (21.15)	12.60 (21.74)	14.20 (22.61)	9.60 (22.03)
Transportation Cost	10.30 (20.55)	14.28 (24.64)	15.28 (24.33)	9.36 (21.48)
Damage and other cost	5.80 (11.55)	7.80 (13.45)	8.60 (13.66)	4.50 (10.29)
Average Total Marketing Cost	50.13 (100.00)	57.97 (100.00)	62.82 (100.00)	43.59 (100.00)

Note: Figures in parenthesis indicate percentage to total marketing cost

Table 5: Marketing cost incurred by different middleman (Rs. /quintal)

Particular	Traders (n=5)	wholesalers (n=5)	Commission Agent (n=5)	Retailer (n=5)
Cleaning and Grading	22.8 (30.98)	23.03 (23.81)	24.82 (23.36)	20.80 (25.37)
Weighing Charges	2.30 (3.13)	2.60 (2.69)	3.50 (3.30)	2.00 (2.44)
Transportation	22.76 (30.92)	24.50 (25.32)	26.32 (24.77)	20.50 (25.00)
Loading and Unloading Charges	11.00 (14.95)	12.50 (12.92)	13.5 (12.71)	8.00 (9.76)
Packing charges	4.00 (5.44)	4.50 (4.65)	5.10 (4.80)	3.50 (4.27)
Market fee	0.00 (0.00)	3.33 (3.45)	3.64 (3.43)	3.15 (3.85)
Commission	0.00 (0.00)	14.25 (14.73)	15.60 (14.68)	14.50 (17.69)
Damage/Spoilage	6.25 (8.49)	6.65 (6.88)	7.30 (6.87)	5.75 (7.02)
Others	4.50 (6.09)	5.40 (5.55)	6.50 (6.08)	3.80 (4.60)
Average Total Marketing Cost	73.61 (100.00)	96.76 (100.00)	106.28 (100.00)	82.00 (100.00)

Note: Figures in parenthesis indicate percentage to total marketing cost

Table 6: Costs, margin and price spread in marketing of onion (Rs. /quintal)

Sl. No.	Particulars	Channel-I (P-T-C)	Channel-II (P-CA-W-R-C)	Channel – III (P-W-R-C)
1	Producer's selling price	2405.58	2650	2331
2	Producer's net price	2355.45 (83.95)	2587.18 (83.45)	2273.03 (84.78)
3	Marketing Cost			
	(a) Producer	50.13 (1.79)	62.82 (2.03)	57.97 (2.16)
	(b) Local merchant/ Traders	73.61 (2.62)	--	--
	(c) Commission agent	--	106.28 (3.43)	--
	(d) Wholesaler	--	96.76 (3.12)	96.76 (3.61)
	(e) Retailer	--	82.00 (2.65)	82.00 (3.06)
	Total cost	123.74 (4.41)	347.86 (11.22)	236.73 (8.83)
4	Marketing margin			
	(a) Local merchant/ Traders	326.39 (11.63)	--	--
	(b) Commission agent	--	43.72 (1.41)	--
	(c) Wholesaler	--	63.24 (2.04)	83.24 (3.10)
	(d) Retailer	--	58 (1.87)	88 (3.28)
Total Margins	326.39 (11.63)	164.96 (5.32)	171.24 (6.39)	
	Price spread (cost + margins)	450.13 (16.04)	512.82 (16.54)	407.97 (15.22)
	Consumer's purchase price	2805.58 (100.00)	3100 (100.00)	2681 (100.00)
	Producer's share in consumer's rupee (%)	83.95	83.45	84.78

Note: 1. P-T-C: Producer-Local Merchant/Traders-Consumer

2. P-CA-W-R-C: Producer-Commission agent-Wholesaler-Retailer-Consumer

3. P-W-R-C: Producer-Wholesaler-Retailer-Consumer

Table 7: Marketing Efficiency of onion

Particulars	Channel -I	Channel -II	Channel -III
Consumer's price (Rs. /qtl)	2805.58	3100	2681
Producer's net price (Rs. /qtl)	2355.45	2587.18	2273.03
Marketing cost (Rs. /qtl)	123.74	347.86	236.73
Marketing margin (Rs. /qtl)	326.39	164.96	171.24
Price spread (Rs. /qtl)	450.13	512.82	407.97
Marketing efficiency	5.23	5.04	5.57

Table 8: Problems faced by sample farmers in production of onion (n=30)

Sr. No.	Attributes	Less acute	Acute	Medium acute	Highly acute	Acute index
1	Crop damage due to erratic rainfall/flood	0 (0.00)	3 (10.00)	9 (30.00)	18 (60.00)	3.50 (100.00)
2	Labour shortage at the time of transplanting	9 (30.00)	3 (10.00)	18 (60.00)	0 (0.00)	2.90 (100.00)
3	Lack of pesticides/poor management	9 (30.00)	0 (0.00)	18 (60.00)	3 (10.00)	2.50 (100.00)
4	Credit problem	9 (30.00)	3 (10.00)	18 (60.00)	0 (0.00)	2.30 (100.00)
5	Unavailability of seed on time	3 (10.00)	18 (60.00)	9 (30.00)	0 (0.00)	1.86 (100.00)
6	Capital availability	21 (70.00)	6 (20.00)	0 (0.00)	3 (10.00)	1.50 (100.00)
7	Irrigation problem	27 (90.00)	0 (0.00)	3 (10.00)	0 (0.00)	1.20 (100.00)

Note: Figures in parenthesis indicate percentage to total marketing cost

Table 9: Problems faced by sample farmers in marketing of onion (n=30)

Sr. No.	Attributes	Less acute	Acute	Medium acute	Highly acute	Acute index
1	Fluctuation in market prices	9 (30.00)	3 (10.00)	0 (0.00)	18 (60.00)	2.90 (100.00)
2	Lack of transportation facilities	6 (20.00)	0 (0.00)	18 (60.00)	6 (20.00)	2.80 (100.00)
3	Lack of storage facilities	6 (20.00)	3 (10.00)	18 (60.00)	3 (10.00)	2.60 (100.00)
4	Collusion among traders/ trade malpractices	9 (30.00)	0 (0.00)	18 (60.00)	3 (10.00)	2.00 (100.00)
5	Long distance of market	18 (60.00)	3 (10.00)	9 (30.00)	0 (0.00)	1.70 (100.00)
6	Lack of availability of market information	21 (70.00)	6 (20.00)	0 (0.00)	3 (10.00)	1.50 (100.00)
7	Mutual understanding between commission agents and traders	27 (90.00)	0 (00.00)	3 (10.00)	0 (0.00)	1.20 (100.00)

Note: Figures in parenthesis indicate percentage to total marketing cost

Conclusion

The growth in area, production, and productivity of onions in Karnataka can be attributed to the widespread adoption of improved varieties, the availability of quality seed production and distribution, expansion of cultivation into non-traditional areas, and contract farming for export purposes. To stabilize onion production and reduce postharvest losses, a systematic and phased approach to planning production is essential. Interventions are required to enhance pre-harvest crop management, improve postharvest handling practices, and optimize storage facilities. Additionally, there is a need to enhance market information services and upgrade the value chain through initiatives that empower farmers to take charge of their own market strategies. Skills-building interventions play a crucial role in achieving these objectives.

The study reveals that farmers face significant challenges such as crop damage due to erratic rainfall or floods during onion production and price fluctuations during onion marketing. To address these issues, there is a pressing need to invest in research to develop optimal technological solutions for onion storage. Efforts should focus on establishing cost-effective storage solutions at the farm level, with an emphasis on low-cost options like thatched bamboo storage promoted by government initiatives such as the National Horticulture Mission (now known as the Mission for Integrated Development of Horticulture). For a sustainable, long-term solution, onions could be dehydrated to produce onion chips and onion powder. These products serve as alternatives to fresh onions and are commonly used in foreign markets, particularly during periods of soaring onion prices. Dehydrating onions not only minimizes waste to the tune of 3 to 4% but also offers a cost-effective solution. Therefore, promoting onion dehydration is essential to mitigate losses and ensure market stability.

Onion waste can be utilized as a bio-waste source, with onion skins suitable for use in nano generators due to their piezoelectric properties, contributing to electricity generation while addressing waste disposal issues. Reducing food loss and waste requires collaborative efforts across various sectors, including researchers, households, the private sector, policymakers, farmers, and extension services. Government campaigns promoting the consumption of processed onion products with longer shelf lives can help mitigate shortages and reduce waste. Shifting

focus from marketing raw produce to processed products could be beneficial in this regard.

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