

**ROLE OF PACKAGING IN POST-HARVEST MANAGEMENT AND MARKETING
OF VEGETABLE PRODUCE**

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JAIPUR, RAJASTHAN - 302033

2019

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VEGETABLE PRODUCE**

**Report submitted in fulfillment of the requirement for
Research Internship Programme**

To

**Chaudhary Charan Singh National Institute of Agricultural Marketing,
Jaipur, Rajasthan**

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CERTIFICATE

This is to certify that the report entitled, "**ROLE OF PACKAGING IN POST-HARVEST MANAGEMENT AND MARKETING OF VEGETABLE PRODUCE**" submitted in fulfillment of **Research Internship Programme** to **Chaudhary Charan Singh National Institute of Agricultural Marketing, Jaipur, Rajasthan** is a record of bonafide research work carried out by Ms. **NEELIMA.P** under my supervision and guidance and that no part of the report has been submitted for the award of any other degree, diploma, fellowships or other similar titles or prizes.

Place: Jaipur

Date:

Approved by

ACKNOWLEDGEMENT

This research process would have never come to achievement without the help and encouragement I received from various individuals.

*I feel immense pleasure in placing my deep sense of gratitude and sincere thanks to beloved **Dr.P.Chandra Sekhara**, Director General, CCS National Institute of Agricultural Marketing, for his continued encouragement during the various stages of the research process.*

*I extend my gratitude and sincere thanks to **Mr.N.S.Ranawat**, Consultant, CCS National Institute of Agricultural Marketing, for his guidance throughout the research process. . I feel extreme happiness to the opportunity conferred upon me to work under his guidance.*

*I would express my heartfelt thanks to **Ms. Shikha Verma**, Training Consultant, CCS NIAM, who supports me a lot in all stages. Special thanks for her support and encouragement throughout my research.*

*I am thankful to **Dr. R K Mishra**, HOD, Dept. of Agricultural Economics, OUAT, Bhubaneswar, who informed us about this golden opportunity. Special thanks for his support and encouragement.*

I am grateful to all the vegetable producers, wholesalers, retailers, Agricultural Officer, Horticultural Officer of Ramabhadrapuram village without whose attention, patience and information, my research work would be incomplete.

Finally, I am most thankful to my mother who has always been there for me and encouraging in all stages.

(NEELIMA.P)

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ABSTRACT

ROLE OF PACKAGING IN POST-HARVEST MANAGEMENT AND MARKETING OF VEGETABLE PRODUCE

Vegetables constitute an essential part of daily diet. According to dietician, each adult requires 284 gm. of vegetable per day for maintaining good health. In marketing aspects the perishable nature of vegetable, losses during marketing and returns to grower are important. Packaging of vegetables assumes great significance in post-harvest management and marketing. The village market of Ramabhadrapuram was purposively selected because of high production of vegetables in and around the village and it is also the major marketing source for cities nearby. The objectives of study is study the role of packaging in marketing of vegetable produce, to identify the constraints faced by farmer in procuring and usage of packaging materials, to estimate packaging losses and to suggest better packaging measures to increase shelf life of vegetable produce and reduce spoilage so that the net returns of the producer can be increased. The data was collected from 30 vegetable producers, 10 wholesalers, and 10 retailers with the help of pretested schedule and the secondary data of latest particulars was also collected. The data was analysed by keeping in view the objectives of the study. The analytical tools used includes Henry Garett's ranking technique, averages. It was found that the marketing costs per kg of tomato, brinjal and okra would include extra Rs.4.962, Rs.5.025, and Rs. 4.84 respectively but it results in an extra net income of Rs. 10.068, Rs. 8.975 and Rs. 8.26 respectively for per kg of each vegetable when marketed through FPOs directly to consumers and Rs.4.068, Rs.3.975 and Rs.3.26 when marketed to retail markets. The producers were asked to list down the problems in the proposed system of packaging their vegetable produce and marketing directly and each of the problem statement was ranked from 1 to 8 based on the importance of each fact and solutions to each of them are given. Packaging plays a very crucial role in post-harvest management and if it is ignored, it results in major loss of the produce. The packaging loss % of Tomato is 17.09 which accounts for Rs. 92565 loss on the produce from one acre crop area. Similarly, the packaging loss % of Brinjal is 2.7 which causes Rs.6650 loss on one acre of crop area and packaging loss % of Okra is 3.36 % accounting for Rs.3275 loss on one acre crop area. It is finally concluded that packaging of vegetable produce enables safe and easy handling of the produce and thus protects it from spoilage. A major part of postharvest losses can be reduced by following better packaging practices. This leads to the increase in the availability of produce

and reduction in the market prices. On the producer's part, all his produce will be sold with remunerative prices.

CHAPTER I

INTRODUCTION

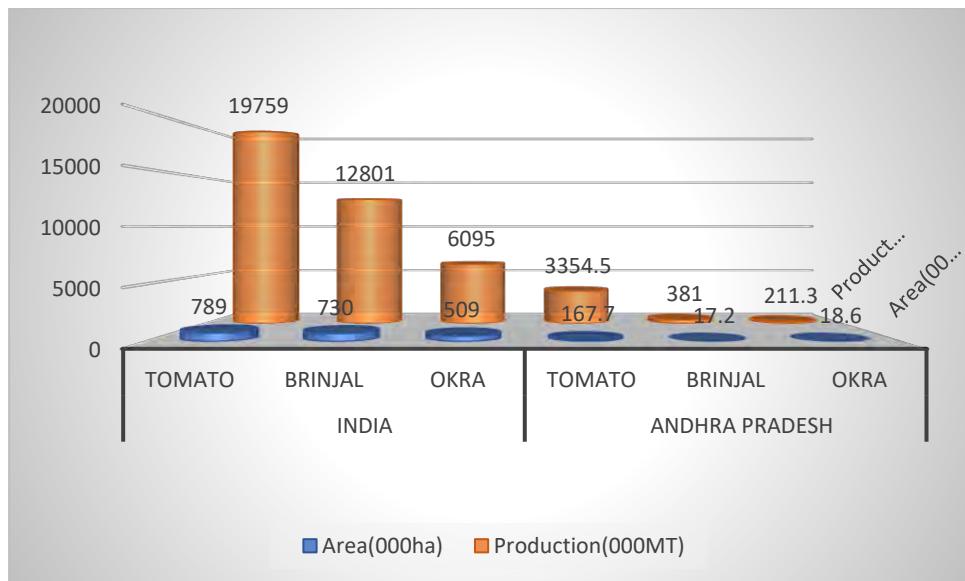
- Vegetables are an important supplement in human diet as they provide essential minerals, vitamins and fibre required for maintaining health. **India ranks second in world in production of vegetables at 187.5 million tons per annum which contributes to 14% of vegetable production in the world and 61.33% of total horticultural produce in the country.** The major problematic issue with vegetables is its perishability and being more susceptible for rapid development of senescence, quality deterioration, decay and rotting. Both respiratory and transpiration rates are proportional to temperature increase and so the product quickly dries, wilts, spoils unless properly taken care of. It has been variously estimated that **4.58-12.44%** of the vegetable produce and **30-40%** of vegetable and fruits together is lost before consumption because of poor post-harvest management practices.

Table:1.1.1 Area, Production and Productivity of major vegetables in India and A.P

Year 2018-19	India			Andhra Pradesh		
	Tomato	Brinjal	Okra	Tomato	Brinjal	Okra
Area(000ha)	789	730	509	167.7	17.2	18.6
Production(000MT)	19759	12801	6095	3354.5	381	211.3
Productivity (MT/ha)	25.04	17.53	11.97	20.00	22.15	11.36

Source: Ministry of Agriculture and Farmers' welfare,

Open Govt Data(OGD) platform India, data.gov.in



Bar graph showing area, production and productivity of Tomato, Brinjal and Okra in India and Andhra Pradesh

Packaging of fresh vegetables and fruits is the scientific method of holding the products so, as to prevent it from physical damage, chemical changes and further microbial contamination in addition to display the product in a more appealing manner to the consumers. The packages having an eye appeal, can markedly influence the consumer behaviour and play a part of marketing process. Though the existing quality of product is not improved, packaging mainly helps in maintaining the keeping quality of the product during transport and storage by providing a convenient means for easy and safe handling by the consumers.

Packaging is one of the most important steps in the long and complicated journey from grower to consumer. Bags, crates, hampers, baskets, trays, wooden boxes, polythene wraps, film packaging, bulk bins, palletised containers are convenient for handling, transporting, and marketing fresh produce. The trend in recent years has moved towards a wider range of package sizes to accommodate the diverse needs of wholesalers, consumers, food service buyers and processing operations.

Packing and packaging materials contribute a significant cost to the produce industry; so it is important that producers, packers, shippers, buyers and consumers have a clear understanding of wide range of packaging options available.

PACKAGING POINTS:

- **SHELF LIFE:** Packaging of the produce enhances shelf life and lessens deterioration of it.
- **PROTECTION:** The package protects the produce from mechanical damage and poor environmental conditions during handling and distribution.
- **CONTAINMENT:** The container must enclose the produce in convenient units for handling and distribution.
- **IDENTIFICATION:** The package must identify and provide useful information regarding the produce.
- **RECYCLABILITY:** Many export markets have waste disposal restrictions for package materials. The packaging material must be recyclable and biodegradable keeping in view of environmental issues.



Table 1.12: Post-harvest losses of vegetables at various stages

Vegetables	Average Quantity Purchased	Stages				Total losses
		Harvesting	Grading & Packaging	Handling & Transportation	Marketing	
Potato	10.24	0.15 (1.46)	0.08 (0.78)	0.06 (0.59)	0.7 (0.68)	0.36 (3.52)
Tomato	5.56	0.22 (3.59)	0.95 (17.08)	0.18 (3.24)	0.05 (0.89)	1.38 (24.83)
Cauliflower	1.24	0.13 (10.48)	0.08 (6.450)	0.03 (2.42)	0.02 (1.61)	0.26 (20.96)
Cabbage	1.32	0.12 (9.09)	0.10 (7.57)	0.04 (3.03)	0.01 (0.75)	0.27 (20.45)
Onion	2.48	0.03 (1.21)	0.07 (2.82)	0.08 (3.23)	0.09 (3.63)	0.27 (10.88)
Brinjal	1.85	0.14 (7.56)	0.05 (2.70)	0.12 (6.48)	0.10 (5.51)	0.41 (22.16)
Okra	1.49	0.09 (6.04)	0.05 (3.36)	0.02 (1.34)	0.07 (4.690)	0.23 (15.44)
Pumpkin	1.38	0.04 (2.89)	0.03 (2.17)	0.01 (0.72)	0.02 (1.45)	0.10 (7.24)
Chilly	0.85	0.01 (1.17)	0.04 (4.70)	0.08 (9.41)	0.06 (7.06)	0.19 (22.35)

Note: Figures in parentheses represents percentage of the total production

Source: Economic analysis of post-harvest losses of major vegetables in Allahabad district of Uttar Pradesh by Harsh Bodh Paliwal 2

For the current study, based on primary data collected from farmers, assessment was done. For the purpose specified, Ramabhadrapuram village of Vizianagaram is selected as there are many major vegetable crops like brinjal, tomato, capsicum etc., grown in this area. Assessment of packaging and marketing losses and providing a solution to overcome them is the main purpose of this study.

1.1 RESEARCH PROBLEM: Farmers sell their produce through a long marketing channel. This will lead to increase in the price spread and reduction in share of producer in consumers' rupee which is all a result of lack of awareness of farmers about using packaging materials and marketing on their own. On the other hand, even if the farmers are conscious about packaging, there are some problems faced by them in procuring and using the packaging materials. Also farmers face more post-harvest losses due to non-packaging and improper packaging of their vegetable produce.

Marketing channels opted by vegetable producers in the survey area:

Producer → Trader → Wholesaler → Retailer → Consumer

Producer → Wholesaler → Retailer → Consumer

Producer → Retailer → Consumer

1.2 OBJECTIVES:

- To study the role of packaging in the marketing of vegetables.
- To increase the net profits of producers and also to increase their share in consumers' rupee by suggesting proper packaging and marketing practices.
- To know the constraints faced by farmers in procuring and usage of packing materials.
- To study the quantity of packaging losses occurring in the marketing of vegetables.

CHAPTER II

Description of the study Area

2.1 General particulars of the village:

For collection of data for the specified purpose, Ramabhadrapuram village of Ramabhadrapuram mandal, Vizianagaram district, Andhra Pradesh was selected.

Ramabhadrapuram village market is selected as the area under vegetables in the vicinity of the market is maximum. It is an agriculture dependent village with nearly 1121 farmers.

Geographic Location: 18.5000°N, 83.2833°E.

The village is located 22kms towards from district headquarters Vizianagaram.

2.1 Population details of the village

Census parameter	Census data (as per 2011 census)
Area of the village	3430 acres
Total population	10962
Number of houses	2820
Male population	5533
Female population	5429
Children	1147
Average sex ratio	981
Child sex ratio	1005
Total literacy rate	58.12%
Male literacy rate	67.75%
Female literacy rate	48.27%
Number of farmers in the village	1121
Number of people involved in production and marketing of vegetable produce	1600

Source: <https://www.census.gov.in/data/village/-ramabhadrapuram-andhra-pradesh.html>

2.2 Agricultural status of the village

Table 2.2.1: Land Holdings of farmers:

S. No	Type of farmers	Area(acres)	Number	Extent(ac)
1.	Marginal	<2.47	836	1028
2.	Small	2.47-4.93	196	675.23
3.	Semi-medium	4.94-9.87	56	374.43
4.	Medium	9.88-24.70	29	397.91
5.	Large	>24.71	4	147.57
	Total		1121	2623.14

Table 2.2.2: Total cultivable land and total area under cultivation

S. No	Land type	Area(acres)
1.	Gross cultivated area	2898
2.	Net cultivated area	2231
3.	Barren/Uncultivated land	72
4.	Non-agricultural land	292
5.	Others	168

Table 2.2.3: Major sources of irrigation

Irrigation Source	Number	Extent(acres)
Dug wells	464	668.32
Pedda Gadda canal	1	80
Bore wells	9	72.6
Tanks	24	587.89

- Major crops grown in the village**

Field crops Vegetables

Paddy Tomato

Maize Brinjal

Cotton Bhendi

Table 2.2.4: Production details of major crops from the village

Crop	Area(acres)	Production (MT)	Productivity (MT/ac)
Paddy	672	300	2.24
Maize	360	360	1
Cotton	13.44	56	0.24

- **Area of total land used for Horticultural purpose – 1125acres**

Table 2.2.5: Production Details:

	Area(acres)	Production (MT)	Productivity (MT/ac)
Vegetables	401	2271.4	5.66
Fruits	724	5868.4	8.1
Total	1125	8139.4	7.23

Table 2.2.6: Production details of selected vegetables from the village

Vegetable	Area(acres)	Production (MT)	Productivity (MT/ac)
Tomato	28	275.68	98.46
Brinjal	50	492	98.4
Bhendi	89	346.74	38.96
Total	167	1114.42	236.42

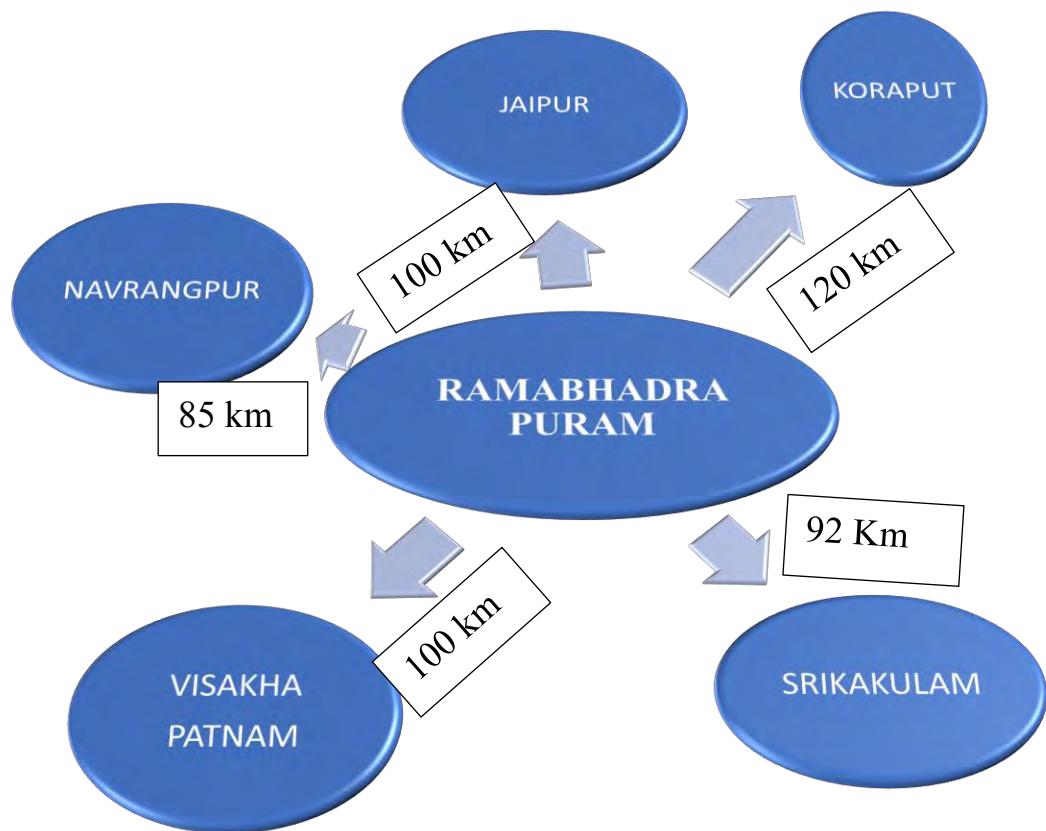
- **Details of Farmer Producer Organisations (FPOs) in the village**

Name: Ramabhadrapuram Agriculture and allied sectors mutual cooperative society limited.

It has 33 Farmer Producer Groups containing 10 farmers each.

- Functions:
1. Providing loans
 2. Providing subsidies to seeds and fertilizers
 3. Extension services to agriculture and allied activities.
 4. Aiding for Rythu Mithra Groups
 5. Linking farmers to consumers

Markets around Ramabhadrapuram village to where vegetables are exported regularly



CHAPTER III

METHODOLOGY

3.1 General:

In order to prepare a base and sound criteria for selection of area under study and vegetables to be included there in for collecting the data and analysis purpose, a bird's eye view on agricultural production of the district into consideration.

Methodology mainly depends on the objectives of the study. The investigation started with selection of appropriate number of respondents, preparation of schedule, selection of proper tools for collection of data and its analysis. The methodology used for present study is given below.

3.2 Data Collection:

Primary data: For the current study, 30 vegetable producers were interviewed using the formulated interview schedule to collect primary data regarding their practices of packaging and problems faced by them in this respect. A total of 10 wholesalers, 10 retailers and a few commission agents were also interviewed to have a detailed view on the packaging and marketing chain of vegetables.

The data in respect of vegetable producers was collected by paying visits to their fields while harvesting and also at doorsteps of producers. The data in respect of market intermediaries was collected by visiting them at Ramabhadrapuram village market while they were undergoing their marketing activities.

Simple Random sampling method was used in selecting sample respondents.

Secondary data: Data regarding general particulars of the village and villagers was collected from Village Panchayat Office.

Agricultural details and vegetable production details of the village were collected by survey methods from the available details with Agricultural and Horticultural offices respectively.

With the help of primary data, the costs of cultivation, packaging, transporting and marketing of vegetable produce of producers, traders, wholesalers and retailers were calculated. Finally, assessment of post-harvest losses, constraints faced by producers in procurement and usage of

vegetable produce was done. The increase in net profits of the producers with the proposed practice of proper packaging and marketing were determined.

Three major vegetables i.e., tomato, brinjal and okra are selected for the current study as the area under these vegetables is maximum in the village and also because of their high perishable nature.

3.3 Henry Garrett's ranking technique:

This technique is used to evaluate the most significant factor which influences the respondent. As per this method, respondents have been asked to assign ranks for all factors and the outcomes of such ranking have been converted into score value with the help of the following formula:

$$\text{Per cent position} = 100 (R_{ij} - 0.5) / N_j$$

Where, R_{ij} = Rank given for the i th variable by j th respondents

N_j = Number of variable ranked by j th respondents

With the help of Garrett's Table, the per cent position estimated is converted into scores. Then for each factor, the scores of each individual are added and then total value of scores and mean values of score is calculated. The factors having highest mean value is considered as the most important factor.

For the current study, the respondents were asked to rank from 1 to 8 for the problems considered by them for not following packaging practices in marketing of their produce. These scores were manipulated mathematically and each factor has been assigned a rank based on its importance and influence over the farmers.

CHAPTER IV

RESULTS AND DISCUSSION

The findings of the present study as well as relevant discussion have been presented under following heads:

Existing situation:

Currently, the farmers are selling their produce immediately after harvest at the nearby village market to wholesalers or retailers. They are carrying their produce to the village market by using gunny bags, net bags, plastic crates etc. and adopting the following market channels.

Producer → Trader → Wholesaler → Retailer → Consumer

Producer → Wholesaler → Retailer → Consumer

Through these channels, farmers receive an average price of Rs.46.9, Rs. 16.10, Rs. 16.9 for tomato, brinjal and okra respectively. This forms a very small portion of producer's share in consumer's rupee.

Proposal plan:

In order to fetch more prices for their produce, farmers are proposed to market their produce to distance high demand/ bigger markets around the village by following better packaging practices. Packaging of vegetable produce increases shelf life, reduces spoilage, provides easy handling and thus reduces post-harvest losses which plays a significant role in marketing. **The packaging materials proposed are plastic crates for tomatoes, corrugated fibre boxes for brinjal and jute bags for okra which are all spoilage reducing and cost-effective for the producers while handling in bulk.**

The new channel will be

Producer → Consumer

Producer → Retailer → Consumer

The possible solution to tackle this problem could be the establishment of producer co-operatives and linking farmers to FPOs to switch to various activities in relation to packaging and marketing of major vegetables. Since FPOs link farmers directly to the residential areas of the city where the farmers are provided with a new platform for selling their own produce to the people of metropolitan cities directly without any intermediary such as retailers or

wholesalers, it would enable a farmer to gain maximum possible share a consumer spends on purchasing the agricultural produce. It will not only help to reduce the packaging and post-harvest losses but also will increase the negotiating power of producers in marketing. The net returns of the producer can be increased to significant levels.

4.1 Rise in the net profits of farmers due to proposal plan:

TOMATO:

From the primary data collected, it was analysed that the cost incurred to the producer for selling one quintal of Tomato in the existing practice is Rs.5.71 and the net returns earned by him are Rs. 39.26 per kg. If the producer follows the proposing plan, the cost of production per kg of tomato produce will be increased to Rs.10.672 and the net returns per quintal will also raise to Rs. 43.328 if marketed to retailer markets and RS. 49.328 if linked to consumers directly. Though the marketing costs show a rise of Rs. 4.962 to the producer, it will give a rise of Rs.6.6 and RS. 15.03 income for retail markets and consumer market respectively per kg of produce. Ultimately, the increase in producer's net income from per acre per year of Tomato is Rs.80107.06 and Rs.198259.06 in case of retailer and consumer marketing respectively. The Producer's share in consumer's rupee will also be increased from **74.95 to 90% and 100%** respectively. The results are shown briefly in the following table.

Table 4.1.1: Comparison of profits received by the farmers in the existing and proposal system in case of TOMATO

Cost particulars	Costs and income in existing practice (Rs./kg)	Proposing costs and income (Rs./kg)	Change in costs and income (Rs. /kg)	Increase in producer's profits (Rs. /ac)	
				Retailer	FPO
Packaging	0.2	0.2	0		
Transportation	0.5	4.805	4.305		
Loading	0	0.387	0.387		
Unloading	0	0.27	0.27		

Total marketing costs		0.7	5.662	4.962		
Total cost of production (Rs. / kg)		5.71	10.672	4.962	40053.53	99129.53
Gross income received by the farmers (Rs. / kg)	Retailer	44.97	54	6.60	80107.06 per year	198259.06 per year
	FPO	44.97	60	15.03		
Net profit received by the farmer (Rs./kg)	Retailer	39.26	43.328	4.068	10.36% rise	25.64% rise
	FPO	39.26	49.328	10.068		
Producer's share in consumer's rupee (%)	Retailer	74.95	90	15.05		
	FPO	74.95	100	25.05		

BRINJAL:

From the primary data collected, it was analysed that the cost incurred to the producer for selling one quintal of Brinjal in the existing practice is Rs. 4.997 and the net returns earned by him is 11.003. If the producer adopts the proposing plan, the cost of production per kg of brinjal produce will be increased to Rs.10.022 and the net returns per kg will also raise to Rs. 14.978 if marketed to retailer markets and RS. 19.978 if linked to consumers directly. Though the marketing costs show a rise of Rs. 5.025 to the producer, it will give a rise of Rs.3.975 and RS.8.975 income for retail markets and consumer market respectively per kg of produce. Ultimately, the increase in producer's net income from per acre per year of Brinjal is Rs. 88314 and Rs.176628 in case of retailer and consumer marketing respectively. The Producer's share in consumer's rupee will also be increased from **53.33 to 83.33% and 100%** respectively. The results are shown briefly in the following table.

Table 4.1.2: Comparison between profits received by the farmers in the existing and proposal system in case of BRINJAL

Cost particulars	Costs and income in existing practice (Rs./kg)	Proposing costs and income (Rs./kg)	Change in costs and income (Rs. / kg)	Increase in net profits (Rs. /ac)	
				Retailer	FPO
Packaging	0.03	0.25	0.22		
Transportation	0.5	4.805	4.305		
Loading	0	0.255	0.255		
Unloading	0	0.245	0.245		
Total marketing costs	0.53	5.555	5.025		
Total cost of production (Rs./ kg)	4.997	10.022	5.025	39114	88,314
Gross income received by the farmers (Rs./ kg)	Retailer FPO	16 16	25 30	9 14	78228 per year 36.13% rise
Net income received by the farmer (Rs./ kg)	Retailer FPO	11.003 11.003	14.978 19.978	3.975 8.975	1,76,628 per year 81.56% rise
Producer's	Retailer	53.33	83.33	33.33	

share in consumer's rupee (%)	FPO	53.33	100	46.67		
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OKRA:

From the primary data collected, it was analysed that the cost incurred to the producer for selling one quintal of Okra in the existing practice is Rs. 9.137 and the net returns earned by him is 7.499. If the producer adopts the proposing plan, the cost of production per kg of okra produce will be increased to Rs.13.977 and the net returns per kg will also raise to Rs. 11.023 if marketed to retailer markets and RS. 16.023 if linked to consumers directly. Though the marketing costs show a rise of Rs. 4.84 to the producer, it will give a rise of Rs.3.26 and RS.8.26 income for retail markets and consumer market respectively per kg of produce. Ultimately, the increase in producer's net income from per acre per year of Okra is Rs. 25225.88 and Rs. 63915.88 in case of retailer and consumer marketing respectively. The Producer's share in consumer's rupee will also be increased from **56.33 to 83.33% and 100%** respectively. The results are shown briefly in the following table.

Table 4.1.3: Comparison between profits received by the farmers in the existing and proposal system in case of OKRA

Cost particulars	Costs and income in existing practice (Rs./kg)	Proposal costs and income (Rs./ kg)	Change in costs and income (Rs. /kg)	Increase in producer's profits (Rs. /ac)	
				Retailer	FPO
Packaging	0.03	0.03	0		
Transportation	0.5	4.805	4.305		
Loading	0	0.29	0.29		
Unloading	0	0.245	0.245		
Total marketing costs	0.53	5.37	4.84		

Total cost of production (Rs. / kg)		9.137	13.977	4.84		
Gross income received by the farmers (Rs. / kg)	Retailer	16.90	25	9.50	12,612.94	31,957.94
	FPO	16.90	30	14.50	25,225.88	63,915.88
Net profit received by the farmer (Rs./ kg)	Retailer	7.763	11.023	3.26	per year	per year
	FPO	7.763	16.023	8.26	50.14%	110%
Producer's share in consumer's rupee (%)	Retailer	56.33	83.33	27		
	FPO	56.33	100	43.67		

Table 4.1.4: Estimated increase in profits of farmers from the proposed plan per acre per crop season:

VEGETABLE	Increased cost of production (Rs. / kg)	Increased profit (Rs. /kg)		Increased profit (Rs./ac/year)	
		RETAIL MARKETS	FPO	RETAIL MARKETS	FPO
TOMATO	4.962	4.068	10.068	80,107.06	1,98,259.06
BRINJAL	5.555	3.975	8.975	88314	1,76,628
OKRA	4.84	3.26	8.26	25,408.44	63,915.88

4.2: Problems alleged by producers:

The producers were asked to list down the problems in the proposed system of packaging their vegetable produce and marketing and each of the problem statement was ranked from 1 to 8 based on the importance of each factor by the producers itself. Garrett's Ranking Technique was employed to analyse the ranked data and is presented as follows.

4.2 Problems listed by the farmers for not following packaging practices:

1. Lack of awareness
2. High packaging costs
3. Non availability of packaging materials
4. Regular and timely payment by wholesalers and retailers
5. Lack of storage facilities
6. Bulkiness of the produce
7. Immediate sales due to high need of money
8. High demand for the produce at local markets

Table 4.2.1: Preferences and ranking of problems listed by farmers

S. No	Particulars	Rank given by the respondents							
		1st	2nd	3 rd	4th	5th	6th	7th	8th
1	Lack of awareness	0	3	0	0	2	6	11	8
2	High packaging costs	1	8	6	1	6	6	1	1
3	Non-availability of packaging material	1	4	2	3	1	3	10	6
4	Timely payments by wholesalers and retailers	7	7	2	1	6	3	0	4
5	Bulkiness of produce	4	0	6	0	7	4	5	4
6	Lack of storage	0	2	1	6	8	7	0	6
7	Immediate need of	14	3	5	7	1	0	0	0

	money								
8	High demand in local market	3	3	8	11	0	1	3	1

The table shows the preference and ranking of problems anticipated by the producers in following the packaging practices and marketing of produce. Among the 30 farmers, immediate need of money for the producers was ranked as first by 14 respondents, second ranked by 3 respondents. Similarly, bulkiness of produce was ranked as first by 4 respondents, third ranked by 5 respondents.

The Garrett's ranks were calculated by using appropriate Garrett's Ranking formula. Based on the Garrett's ranks, the Garrett's value was calculated. The Garrett's tables and scores of problem listed in above table, and multiplied to records scores in table 2, finally by adding each row, the total Garrett's score were obtained

$$\text{Per cent position} = \frac{100 (R_{ij} - 0.5)}{N_j}$$

Where, R_{ij} = Rank given for the i th variable by j th respondents

N_j = Number of variable ranked by j th respondents=8

Table 4.2.2: Percent Position and Garrett's Value

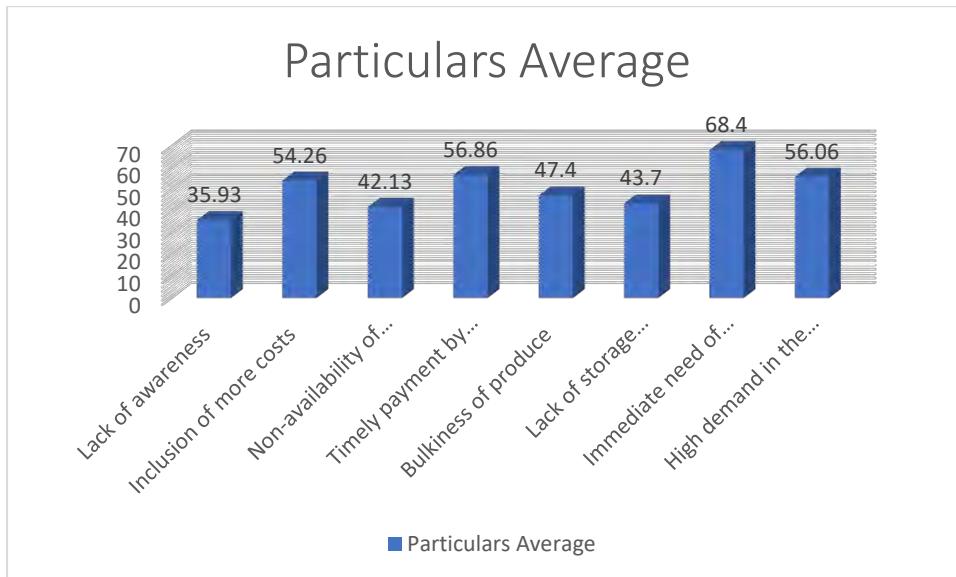
S. No.	100 (R_{ij} - 0.5) N_j	Percent position	Garrett's score
1	100 (1-0.5)/ 8	6.25	80
2	100 (2-0.5)/ 8	18.75	69
3	100 (3-0.5)/ 8	31.25	60
4	100 (4-0.5)/ 8	43.75	54
5	100 (5-0.5)/ 8	56.25	47
6	100 (6-0.5)/ 8	68.75	41
7	100 (7-0.5)/ 8	81.25	33
8	100 (8-0.5)/ 8	93.75	21

Table 4.2.3: Calculation of Garrett's score and Ranking for the problems listed by the sample respondents

Particulars	Garrett's score								Average	Rank
	1	2	3	4	5	6	7	8		
Lack of awareness	0	207	0	0	94	246	363	168	35.93	8
Inclusion of more costs	80	552	360	54	282	246	33	21	54.26	4
Non-availability of packaging material	80	276	120	162	47	123	330	126	42.13	7
Timely payment by wholesalers and retailers	560	483	120	54	282	123	0	84	56.86	2
Bulkiness of produce	320	0	360	0	329	164	165	84	47.4	5
Lack of storage facilities	0	138	60	324	376	287	0	126	43.7	6
Immediate need of money	112 0	207	300	378	47	0	0	0	68.4	1
High demand in the local market	240	207	480	594	0	41	99	21	56.06	3

From the above table, it is inferred that farmers state their main reason that they need immediate payments for their produce and it is being met by regular and timely payments by

market intermediaries. And also high demand for the produce in the local market. So they are not going for packaging and marketing to distance markets. But if they follow the proposed plan also, they'll get timely payments and also higher prices indeed. The next reason stated by them is high inclusion of packaging and marketing costs, but they tend to get more benefits if they follow the proposed plan. And the producers should be informed that more the bulkiness of the produce, the lesser will be the cost of packaging/marketing per unit. The farmers in fact stated that they are aware of packaging and procurement but they are not ready to follow them. The mindset of the producers should be changed in this regard.



Average Garrett's score of problems listed by farmers for not marketing their produce using packaging practices

Table: 4.3 Calculation of packaging losses:

Packaging plays a very crucial role in post-harvest management and if it is ignored, it results in major loss of the produce. The packaging loss % of Tomato is 17.09 which accounts for Rs. 92565 loss on the produce from one acre crop area. Similarly, the packaging loss % of Brinjal is 2.7 which causes Rs.6650 loss on one acre of crop area and packaging loss % of Okra is 3.36 % accounting for Rs.3275 loss on one acre crop area.

VEGETABLE	Production (kg/ac)	Packaging loss (%)	Post- harvest loss (%)	Quantity loss (kg/ac)	Loss in terms of income (Rs. / ac)
TOMATO	9846	17.09	24.83	1683	92565
BRINJAL	9840	2.7	22.16	266	6650
OKRA	3896	3.36	15.44	131	3275

CHAPTER IV

SUMMARY AND CONCLUSIONS

From the analysis of the data collected from farmers, the following conclusions are drawn regarding three major vegetables grown in the area taken under consideration.

TOMATO:

The packaging material suggested for tomatoes is plastic crates. The cost incurred to the producer for selling one quintal of Tomato in the existing practice is Rs.5.71 and the net returns earned by him are Rs. 39.26 per kg. If the producer follows the proposing plan, the cost of production per kg of tomato produce will be increased to Rs.10.672 and the net returns per quintal will also raise to Rs. 43.328 if marketed to retailer markets and RS. 49.328 if linked to consumers directly. Though the marketing costs show a rise of Rs. 4.962 to the producer, it will give a rise of Rs.6.6 and RS. 15.03 income for retail markets and consumer market respectively per kg of produce. Ultimately, the increase in producer's net income from per acre per year of Tomato is Rs.80107.06 and Rs.198259.06 in case of retailer and consumer marketing respectively. The Producer's share in consumer's rupee will also be increased from **74.95 to 90% and 100%** respectively.

BRINJAL:

The packaging material suggested for brinjal is corrugated fibre board boxes. The cost incurred to the producer for selling one quintal of Brinjal in the existing practice is Rs. 4.997 and the net returns earned by him is 11.003. If the producer adopts the proposing plan, the cost of production per kg of brinjal produce will be increased to Rs.10.022 and the net returns per kg will also raise to Rs. 14.978 if marketed to retailer markets and RS. 19.978 if linked to consumers directly. Though the marketing costs show a rise of Rs. 5.025 to the producer, it will give a rise of Rs.3.975 and RS.8.975 income for retail markets and consumer market respectively per kg of produce. Ultimately, the increase in producer's net income from per acre per year of Brinjal is Rs. 88314 and Rs.176628 in case of retailer and consumer marketing respectively. The Producer's share in consumer's rupee will also be increased from **53.33 to 83.33% and 100% respectively.**

OKRA:

The packaging material suggested for okra is polythene lined jute bags. The cost incurred to the producer for selling one quintal of Okra in the existing practice is Rs. 9.137 and the net returns earned by him is 7.499. If the producer adopts the proposing plan, the cost of production per kg of okra produce will be increased to Rs.13.977 and the net returns per kg will also raise to Rs. 11.023 if marketed to retailer markets and RS. 16.023 if linked to consumers directly. Though the marketing costs show a rise of Rs. 4.84 to the producer, it will give a rise of Rs.3.26 and RS.8.26 income for retail markets and consumer market respectively per kg of produce. Ultimately, the increase in producer's net income from per acre per year of Okra is Rs. 25225.88 and Rs. 63915.88 in case of retailer and consumer marketing respectively. The Producer's share in consumer's rupee will also be increased from **56.33 to 83.33% and 100%** respectively.

The employment of Henry Garrett's Ranking technique to analyse the rankings given by the farmers to the problems listed by themselves implies that the most important problem that the farmers state their main reason that they need immediate payments for their produce and it is being met by regular and timely payments by market intermediaries. And also high demand for the produce in the local market. So they are not going for packaging and marketing to distance markets. But if they follow the proposed plan also, they'll get timely payments and also higher prices indeed. The next reason stated by them is high inclusion of packaging and marketing cots, but they tend to get more benefits if they follow the proposed plan. And the producers should be informed that more the bulkiness of the produce, the lesser will be the cost of packaging/marketing per unit. The farmers in fact stated that they are aware of packaging and procurement but they are not ready to follow them. The mindset of the producers should be changed in this regard.

Packaging plays a very crucial role in post-harvest management and if it is ignored, it results in major loss of the produce. The packaging loss % of Tomato is 17.09 which accounts for Rs. 92565 loss on the produce from one acre crop area. Similarly, the packaging loss % of Brinjal is 2.7 which causes Rs.6650 loss on one acre of crop area and packaging loss % of Okra is 3.36 % accounting for Rs.3275 loss on one acre crop area.

It is finally concluded that packaging of vegetable produce enables safe and easy handling of the produce and thus protects it from spoilage. A major part of postharvest losses can be reduced by following better packaging practices. This leads to the increase in the

availability of produce and reduction in the market prices. On the producer's part, all his produce will be sold with remunerative prices.

Policy Suggestions:

- Firstly, the current perspective of farmers towards packaging practices should be changed by explaining them its benefits clearly since the production of vegetables is running on a profitable basis in Ramabhadrapuram village.
- The packaging materials proposed through this study are plastic crates for tomatoes, corrugated fibre boxes for brinjal and jute bags for okra which are all spoilage reducing and cost-effective for the producers while handling in bulk.
- This study also suggested that farmers should follow better packaging practices for marketing their produce to nearby high demand areas/distance markets to reduce the packaging and post-harvest losses and to make an increase in their net profits.
- The possible solution to tackle this problem could be the establishment of producer co-operatives and FPOs to switch various activities in relation to packaging and marketing of major vegetables. It will not only help to reduce the packaging and post-harvest losses but also will increase the negotiating power of producers in marketing.
- Since FPOs link farmers directly to the residential areas of the city where the farmers are provided with a new platform for selling their own produce to the people of metropolitan cities directly without any intermediary such as retailers or wholesalers. it would enable a farmer to gain maximum possible share a consumer spends on purchasing the agricultural produce.
- Precooling of vegetables before packaging helps in increasing shelf life.
- Refrigerated container packaging is highly helpful for long distance transport.

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Annexure

Garrett's ranking table

Percentage	Score	Percentage	Score	Percentage	Score
0.09	99	20.93	66	80.61	33
0.2	98	22.32	65	81.99	32
0.32	97	23.88	64	83.31	31
0.45	96	25.48	63	84.56	30
0.61	95	27.15	62	85.75	29
0.78	94	28.86	61	86.89	28
0.97	93	30.61	60	87.96	27
1.18	92	32.42	59	88.97	26
1.42	91	34.25	58	89.94	25
1.68	90	36.15	57	90.83	24
1.96	89	38.06	56	91.67	23
2.28	88	40.01	55	92.45	22
2.63	87	41.97	54	93.19	21
3.01	86	43.97	53	93.86	20
3.43	85	45.97	52	94.49	19
3.89	84	47.98	51	95.08	18
4.38	83	50	50	95.62	17
4.92	82	52.02	49	96.11	16
5.51	81	54.03	48	96.57	15
6.14	80	56.03	47	96.99	14
6.81	79	58.03	46	97.37	13
7.55	78	59.99	45	98.72	12
8.33	77	61.94	44	98.04	11
9.17	76	63.85	43	98.32	10
10.16	75	65.75	42	98.58	9
11.03	74	67.48	41	99.82	8
12.04	73	69.39	40	99.30	7
13.11	72	71.14	39	99.22	6
14.25	71	72.85	38	99.39	5
15.44	70	74.52	37	99.55	4
18.69	69	76.12	36	99.68	3
18.01	68	77.68	35	99.80	2
19.39	67	79.12	34	99.91	1
				100	0

Source: E. Garrett's statistics in Psychology and Education, Feffer and Simans Private Limited, 21969, p.329.

QUESTIONNAIRE TO FARMERS

GENERAL PARTICULARS:

Q1. Name of the farmer: _____ Age: _____ Contact no: _____

Address: _____

Q2. Educational qualification:

- i. Below matric ii. Matric iii. Graduate iv. Others

Q3. Annual Household income (Gross in Rs.):

- i. <1.5 lakhs
- ii. 1.5-3 lakhs
- iii. 3-5 lakhs
- iv. >5 lakhs

Q4. Land Resources:

S.No	Land	Area(ac)			
		Owned	Leased in	Leased out	Total operated area
1.	Wet land				
2.	Garden land				
3.	Dry land				

Q5. Farming experience (in years): _____

Q6. Total no of members in the family: _____

Q7. Particulars of agricultural allied activities:

Particulars	Number	Total production	Total cost	Value of output	Net income
Poultry					
Dairy					
Goat					
Sheep					

Q8. Crop Details:

Crop 1:

Name of the crop:

Season:

Mode of marketing:

Particulars	2019	2018	2017
Area cultivated			
Total production			
Total cost of cultivation			
Price received for the produce (Rs./qntl)			
Packaging costs incurred by the farmer (Rs./qntl)			
Marketing cost incurred by the farmer			
Actual market price of the produce (Rs./qntl)			
MSP of the crop as announced (Rs./qntl)			
Gross revenue received from the crop			
Net revenue from the crop			

Crop 2:

Name of the crop:

Season:

Mode of marketing:

Particulars	2019	2018	2017
Area cultivated			
Total production			
Total cost of cultivation			
Price received for the produce (Rs./qntl)			
Packaging costs incurred by the farmer (Rs./qntl)			
Marketing cost incurred by the farmer			
Actual market price of the produce (Rs./qntl)			
MSP of the crop as announced (Rs./qntl)			
Gross revenue received from the crop			
Net revenue from the crop			

Crop 3:

Name of the crop:

Season

Mode of marketing:

Particulars	2019	2018	2017
Area cultivated			
Total production			
Total cost of cultivation			
Price received for the produce			

(Rs./qntl)			
Packaging costs incurred by the farmer (Rs./qntl)			
Marketing cost incurred by the farmer			
Actual market price of the produce (Rs./qntl)			
MSP of the crop as announced (Rs./qntl)			
Gross revenue received from the crop			
Net revenue from the crop			

Q9. Packaging details:

- i. What type of packaging material do you use?
 - ii. Is that packaging material freely available?
 - iii. If not, what is the cost of procurement?
 - iv. What are the sources of packaging materials?
 - v. What are the constraints do you face in procuring and usage of the packaging material?

Preferences and ranking of problems listed by farmers

6	Lack of storage							
7	Immediate need of money							
8	High demand in local market							

vi. What is the total cost of packaging involved (Rs./qntl)?

Q10. Transportation Details:

- i. What is the mode of transportation?
- ii. What is the total cost of transportation involved?
- iii. What is the cost of transportation per quintal?
- iv. What are the constraints do you face while transportation?

Q11. Marketing Details:

- i. What is the destination of the market?
Local market/Mandi/Distance markets?
 - ii. What is the distance of the market?
 - iii. Mode of Marketing:
Producer → Wholesaler → Retailer → Consumer
-

Producer  Retailer  Consumer

Producer  Consumer

iv. Whether marketing is direct/through middlemen?

If middlemen are involved, how much is the commission paid to them?

v. What is the total cost of marketing?

vi. Are you a member of any FPO?

If yes, what is the name of the FPO? Is it working actively?

If no, why? if required are you ready to join FPO?

vii. Are you aware of APMC act?

Q12. Value addition if any?

If doing, what is the process following?

What are the packaging techniques involved?

What are the costs involved?

Q13. Whether the current process is profitable?

If yes, what is the net income?

Q14. Suggest the ways to gain better income through alternative packaging and marketing techniques.

Questionnaire for wholesalers:

Name of the wholesaler:

Contact Number:

Place:

1. Packaging details:

vii. What type of packaging material do you use?

Plastic crates:

Plastic bags:

Gunny bag:

Wooden basket:

Cardboard box:

Wooden box:

viii. Is that packaging material freely available?

ix. If not, what is the cost of procurement?

Packing material	Cost per piece
Plastic crates	
Plastic bags	
Gunny bag	
Wooden basket	
Cardboard box	
Wooden box	

x. What are the sources of packaging materials?

xi. What are the constraints do you face in procuring the packaging material?

xii. What are the problems you face in the usage of packaging material?

xiii. What is the total cost of packaging involved (Rs./qntl)?

Vegetable	Cost(Rs./qntl)
Tomato	
Brinjal	
Bhendi	
Beans	

Q2. Transportation Details:

- v. What is the mode of transportation?
- vi. What is the total cost of transportation involved?

Vegetable	Cost (Rs. /qntl)
Tomato	
Brinjal	
Bhendi	
Beans	

- vii. What is the cost of transportation per quintal?

Vegetable	Cost (Rs. /qntl)
Tomato	
Brinjal	
Bhendi	
Beans	

- viii. What are the constraints do you face while transportation?

Q11. Marketing Details:

- viii. What is the destination of the market?
Local market/Mandi/Distance markets?

- ix. What is the distance of the market?

- x. Mode of Marketing:

Producer → Wholesaler → Retailer → Consumer

Producer → Retailer → Consumer

Producer → Consumer

- xi. Whether marketing is direct/through middlemen?

If middlemen are involved, how much is the commission paid to them?

xii. What is the total cost of marketing?

Cost particulars (Rs. /qntl)	Vegetables		
	Tomato	Brinjal	Bhendi
Packagjng			
Loading			
Transportation			
Unloading			
Miscellaneous			
Marketing			

RETAILERS:

Name:

Contact Number:

Are you using any packaging materials?

If yes, name them:

Vegetable	Purchase cost	Sale Cost	Difference/Gain
Tomato			
Brinjal			
Okra			

PHOTOS OF DATA COLLECTION



DATA COLLECTION FROM WHOLESALERS



SECONDARY DATA COLLECTION AND RETAILERS



**PACKAGING MATERIALS USED FOR MARKETING
OF VEGETABLE PRODUCE**

PLASTIC CRATES



CORRUGATED FIBRE BOARD BOXES





JUTE BAGS



PLASTIC BAGS



BAMBOO BASKET

