Critical Analysis of Supply Chain Management in Potato in Jammu:A Case Study of Narwal Mandi

By

PRIYANKA SHARMA
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Project submitted to Faculty of Post graduate Studies

In partial fulfilment of the requirements

For the degree of

MASTERS OF BUSINESS ADMINISTRATION

(AGRI-BUSINESS MANAGEMENT)

Division of Agricultural Economics and ABM
Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu Main Campus, Chatha, Jammu 180009
2019

Certificate -I

This is to certify that the project entitled **Critical Analysis of Supply Chain Management in Potato in Jammu: A Case Study of Narwal Mandi** submitted in partial fulfilment of the requirement for the degree of MBA (Agri-Business Management) to the faculty of Post- Graduate studies, **Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu** is a record of bonafide research carried out by **Ms Priyanka Sharma,** Registration No. **(J-17-M-40-ABM)** under my supervision and guidance. No part of the project has been submitted for any other degree or diploma. It is further certified that such help and assistance received during the course of investigation have been duly acknowledged.

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Place: Jammu

Date: 30-07-19

Endorsed

30.7.2019

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Date 30.7.2019

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Certificate-II

We, the members of advisory committee of **Ms. Priyanka Sharma,** Registration No. **J-17-M-40-ABM**, a candidate for the degree of **MBA (Agri-Business Management)** have gone through the manuscript of the project entitled **Critical Analysis of Supply Chain Management in Potato in Jammu: A Case Study of Narwal Mandi** and recommended that it may be submitted by the student in the partial fulfilment of the requirement for the degree.

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CERTIFICATE -III

This is to certify that the project entitled **"Critical Analysis of Supply Chain Management in Potato in Jammu: A Case Study of Narwal Mandi"** submitted by **Ms. Priyanka Sharma** Registration No. **J-17-M-40-ABM** to the faculty of Post- Graduate studies, Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu in partial fulfilment of the requirements for the degree of **MBA (Agri Business Management)** was examined and approved by the Advisory Committee and External Examiner(s) on .....07/11/19.

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ACKNOWLEDGEMENTS

Firstly I would like to thank God, who bestowed me with immense patience and favoured me strength to undertake my research work.

It is with the personal touch of emotions that I seize this opportunity to express my heartfelt and affectionate gratitude to my family. I am gratefully indebted to my Grand Father Late Sh. Om Prakash Sharma my Father Sh. Naveen Kumar Sharma who has always been an ideal and torch bearer for me. The external blessing and love of my Grand Mother Late Smt. Girija Devi and my Mother Smt. Seema Sharma inspired me to achieve the very best in life. Without their love, graceful sacrifice and constant inspiration this dream would not have materialized.

Words are not sufficient to express my inner feeling towards my brothers-Aatish, Sunil, Prashant Singh, Sisters-Anushka Sharma, for their affectionate, Immense, meticulous counseling and constructive criticism strengthened me to enable to complete most of my research work and who acted as a vital source of my mental strength and inspirations.

It is my privilege to offer sincere gratitude and regards to reverent chairman of my advisory committee, Dr. Jyoti Kachroo, Head & Professor, Division of Agricultural Economics and ABM, for his encouragement, advise, appreciable suggestions, constructive criticism and willing help throughout the course of investigation and preparation of this manuscript which led me on and on to achieve my destination successfully.

I also take pleasure of expressing my sincere thanks towards member of my advisory committee Mr Ashish kr Isher, Dr. P S. Slathia and Dr. A.K. Singh.

I owe a deep sense of gratitude to Dr. Sudhakar Dwivedi, Associate Professor (Division of AEABM) , Dr. S.P. Singh, Assistant Professor (Division of AEABM), Dr. Anil Bhat, Assistant Professor (Division of AEABM), Ms. Sabbey Sharma, Assistant Professor (Division of AEABM) and Ms. Mallika Sharma, Assistant Professor (Division of AEABM), for their cooperation and help when needed.

The cooperation and ever willing support of non-teaching staff of the division especially Mrs. Monika Sharma, Mrs Jyoti Devi, Mr. Ramesh Kumar and Mr. Manjeet Singh is really admirable and appreciable.

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With core of my heart, I extended my special thanks towards my seniors Rohit Manhas, Vrish Bhanu Sharma and Tanya Gupta and my friends Rahul Pratap, Pooja Uniyal, Nitasha Sharma, Aatish Kumar Sharma, Sakshi Sharma, Pratibha Ojasvi, Palak and Sneha for their indispensable help and moral support.

I specially thank to all my classmates Shubham Sharma, Sushmita Rangar, Shubham Rohela, Ishanka Gahlawat, Maninder Singh, Aqib, Shivani Gupta, Arya Zutshi, Gazal Gupta, Ankush Choudhary and Yasir.

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ABSTRACT

Title of Project	:	**"Critical Analysis of Supply Chain Management in Potato in Jammu: A Case Study of Narwal Mandi"**
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Abstract

The present study investigation entitled **"Critical Analysis of Supply Chain Management in Potato in Jammu: A Case Study of Narwal Mandi"** was carried out on the basis of primary as well as secondary data. The research was conducted with the help of questionnaire based on the information collected from the traders of Narwal Mandi Jammu. The sample used in this study were the traders of Narwal Mandi in Jammu. A sample of 25 traders was taken for the study. The data was collected through filling up the questionnaire from traders. The total sample size for the study was 25.

The food supply chain in India is continuous. The number of intermediaries in the chain is exceedingly high. But over the years a layer of intermediaries has grown most of which add little value to the produce but collectively they add significantly to the final cost. Marketing of agriculture produce is different and more challenging than many industrial products because of the perishability, seasonality and bulkiness. At the same instance, Indian customers need fresh fruits and vegetables. Thus SCM plays a crucial role in marketing of fruits and vegetables. Supply chain efficiency not only helps in increased production and consumption, but also contributes to economic development of the country. Efficient SCM in marketing, not only increases the profitability and efficiency of the retailers, but also adds value.

From the study it is revealed that the storage and transportation facilities in Narwal Mandi has been done on their own and the government do not provide any of those facilities.Traders in Narwal Mandi follow the traditional method of grading and packing of potato and lack of government initiatives is one of the major constraint in supply chain of potato in Narwal Mandi. In Narwal Mandi, there is a lack of information flow between the actors of supply chain which is also a main constraint.

Keywords: potato, marketing, traders, SCM.

Signature of Major Advisor

Signature of Student

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CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER-I

INTRODUCTION

CHAPTER-I

INTRODUCTION

1.1 Supply Chain Management:

Supply chain management (SCM) is the broad range activities required to plan, control and execute a product's flow, from acquiring raw materials and production through distribution to the final customer, in the most efficient and cost-effective way possible. Supply chains enfold everything from creation to product development to the information systems needed to straight these activities. In SCM, the supply chain manager controls the logistics of supply chain which consists of five parts: 1) the planning, 2) the sources of raw material 3) manufacturing 4) delivery and logistics, and 5) the arrival system (for defective, unwanted products). The supply chain manager tries to reduce shortages and keep costs down. The supply chain outlook the retailers to identify best suppliers that help them improve productivity, which bring the customers cost At the same time, market inventory help scheduling the infrastructure to gather up demand, then implement and scheming the physical stream of resources and final goods from point to origin to use, to satisfy customer demands and expectations at a profit.

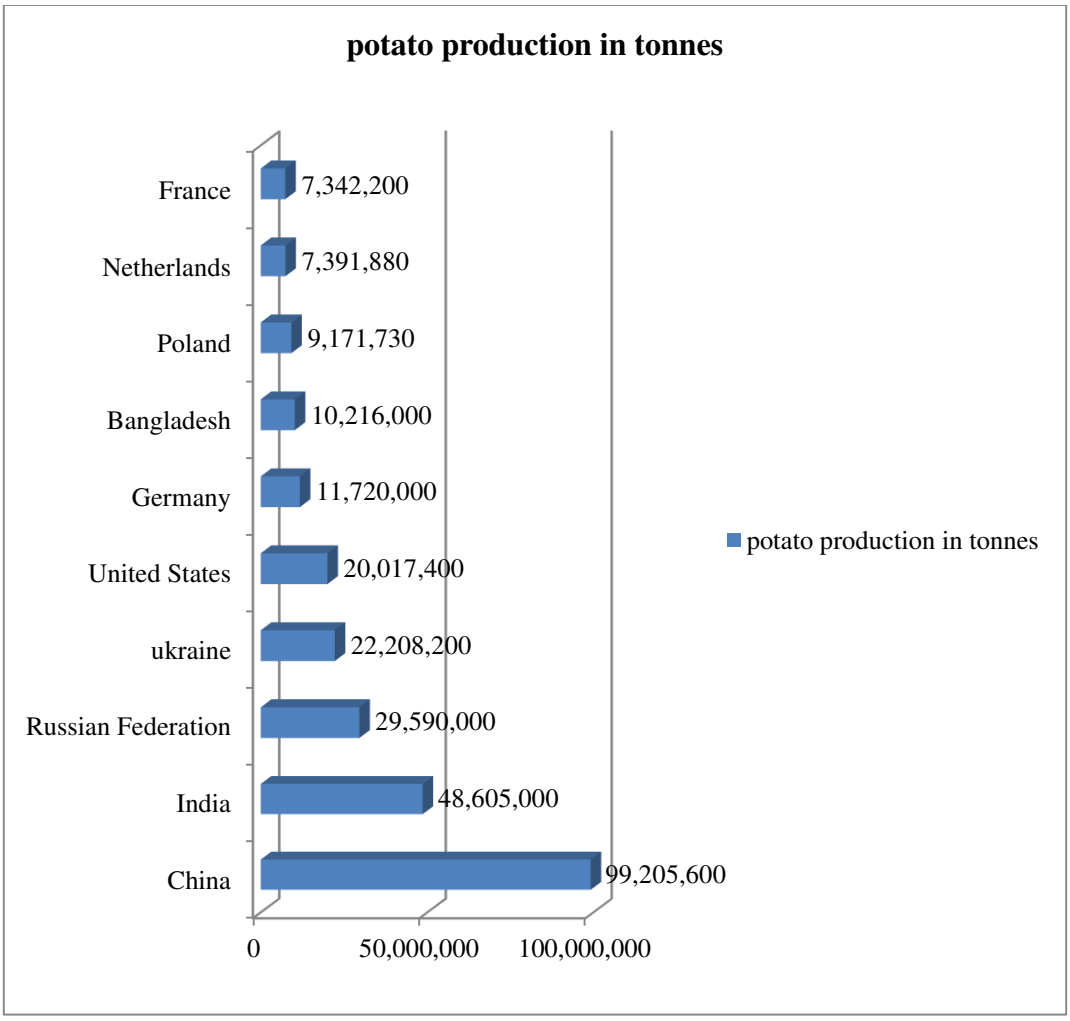
India has a huge opportunity to become a leading global food supplier if only it has the right marketing strategies, adaptive and efficient supply chain. The food supply chain is multifaceted with delicate goods and various small stakeholders. In India, the infrastructure which connects these partners is very pathetic. Each farmers, wholesalers, food manufacturers, retailers all work in silos, and demand forecasting is totally zero and the farmers try to drive what they produce in the market. Data integration, monetary flow management, supply demand matching, information sharing, are very well accomplished in high technology industries with massive benefits. The best practice should find their way in the food supply chains. Cold chain, supply chain should take leads of technology improvements in data capture and handing out, product tracking and tracing along the supply chain. Also, the supply chain needs to be built as a whole in an integrated method with the process of new product development order to delivery process well designed and well supported using various tools and software.

1.2 Global Scenario of Potato:

The whole world potato production was 388,191,000 tonnes in 2017 (Source: FAOSTAT, 2019). Until the early 1990s, potatoes were grown and consumed in Europe, North America and countries of the former Soviet Union. Since then, there has been a increase in potato production and demands and needs in Asia, Africa and Latin America, where output rise from less than 30 million tonnes in the early 1960s to more than 165 million tonnes in 2007.China is now the biggest potato producer, and almost a third of all potatoes is harvested in China and India.

Rank	Country	Potato production (2017 in tonnes)
1	China	99,205,600
2	India	48,605,000
3	Russian Federation	29,590,000
4	Ukraine	22,208,200
5	United States	20,017,400
6	Germany	11,720,000
7	Bangladesh	10,216,000
8	Poland	9,171,730
9	Netherlands	7,391,880
10	France	7,342,200

Sources: FAOSTAT (Retrieval Date: January 5, 2019



(Source FAOSTAT)

Fig 1.1: Shows that China having the largest production of potato containing 9,92,05,600 tones followed by India having 4,86,05,500 tonnes.

1.3 Indian status of supply chain management of fruits and vegetables:

India produces 146 million tons of vegetables and 75 million tons of fresh fruits per annum. Marketing of fruits and vegetables is more challenging than many industrial products because of the perish ability, seasonality and bulkiness. Diversified consumption patterns of the Indian consumers and poor Supply Chain infrastructure makes marketing for fruits and vegetables more complicated. This study attempts to identify various issues involved in managing supply chain in fruits and vegetables and analyze different strategies that can be applied to optimize the supply chain. Potato, cabbage, onion, tomato accounts for around 60% of the total vegetable production in terms of quantity.

India's annual fruit production is 75 million tonnes (NHB report 2011-18) and the total area under fruit cultivation is around 6.3 million hectare. The major Indian fruits are mango, guava, papaya, pineapple and grapes.

Fresh fruits and vegetables play a very important role in Indian background and their marketing works as an influencing force in the financial system. Though retailing of fresh fruits and vegetables is a low margin business, the market potential is very large in a country like India. This factor has attracted many corporate into this sector like big bazaar, reliance fresh etc. Marketing of agriculture produce is different and more challenging than many industrial products because of the perish ability, seasonality and bulkiness. The very nature of small size of land holdings by the farmers, varied climatic conditions, production spread over wide geographical area mainly in remote villages, diversified consumption habits of Indian consumers and poor supply chain infrastructure makes marketing of fruits and vegetables more complicated. At the same instance, Indian customers need fresh fruits and vegetables. Thus SCM plays a crucial role in marketing of fruits and vegetables. Supply chain efficiency not only helps in increased production and per capita consumption, but also contributes to economic development of the country. As a result supply chain throws both challenges and opportunities in marketing of fruits and vegetables. Efficient SCM in marketing, not only increases the profitability and efficiency of the retailers, but also adds value to the different stakeholders like farmers, consumers.

1.4 Current Status of Potato

214.16 lakh MT Potato (approximate) has been stored in cold storages of Uttar Pradesh, West Bengal, Bihar, Punjab and Gujarat against 233.48 lakh MT of the last year. 20-25% (approx.) potato released from the cold storages of different states for disposed of in different markets of the country. The production of Potato during the year 2017-18 was 3.5% higher as compared to the previous year. However as compared to past 5 years average production, it is 10.9% higher.

1.5 State wise potato production in the country

States	First year average (2012-2013 to 2016-2017)		2016-2017		2017-2018	
	Production	**Share%**	**Production**	**Share%**	**Production**	**Share%**
Uttar Pradesh	14502.63	31.96	15543.00	31.98	15555.53	30.91
West Bengal	10425.68	22.97	11052.60	22.74	12332.50	24.50
Bihar	6449.06	14.21	6377.71	13.12	6377.71	12.67
Gujarat	3015.68	6.64	3797.82	7.12	3537.49	7.62
Madhya Pradesh	2858.30	6.30	3461.09	7.12	3537.49	7.03
Punjab	2278.43	5.02	2423.00	4.99	2570.67	5.11
Haryana	769.17	1.69	896.95	1.85	1095.90	2.18
Assam	1039.31	2.29	777.83	1.60	1072.78	2.13
Jharkhand	653.61	1.44	668.66	1.38	688.77	1.37
Chhattisgarh	625.87	1.38	678.57	1.40	684.03	1.36
Karnataka	558.04	1.23	507.64	1.04	421.86	0.84
Uttarakhand	403.04	0.89	360.37	0.74	360.54	0.72
Odisha	260.13	0.57	302.22	0.62	298.06	0.59

Maharashtra	335.97	0.74	536.62	1.10	262.60	0.52
Rajasthan	166.93	0.34	234.55	0.48	235.00	0.41
Meghalaya	184.75	0.47	193.68	0.40	229.90	0.46
Himachal Pradesh	210.56	0.46	202.44	0.42	200.00	0.40
Tripura	146.88	0.32	143.58	0.32	144.46	0.29
Jammu & Kashmir	127.96	0.28	130.89	0.27	132.15	0.26
Sikkim	51.18	0.11	53.51	0.11	107.10	0.21
Nagaland	57.74	0.13	65.59	0.13	65.02	0.13
Andhra Pradesh	74.51	0.16	49.11	0.10	53.09	0.11
Tamil Nadu	103.25	0.23	92.73	0.19	42.67	0.08
Kerala	7.71	0.02	5.30	0.01	4.50	0.01
Mizoram	2.01	0.00	1.00	0.00	0.93	0.00
Teleangna	61.82	0.14	32.78	0.07	0.30	0.00
Arunachal Pradesh	1.13	0.00	NA	0.00	NA	0.00
Others	14.70	0.03	15.40	0.03	17.05	0.03
Total	45383.5	100	48609.57	100	50327.02	100

Source: State Departments of Horticulture & Agriculture (2011-2018)

1.6 All India monthly arrival of potato

The monthly all India five years (2012-2016) average arrivals of Potaro in different markets of the country and for the year 2017 and 2018 (till date) are shown below**:**

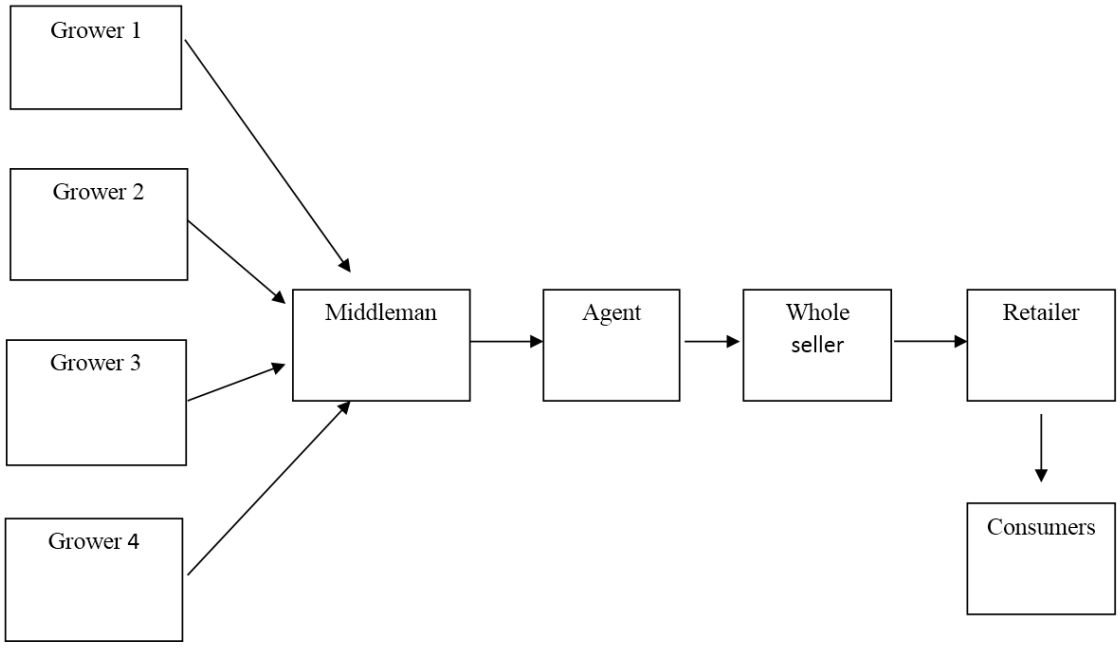
Arrival in '000 tonnes

Month	**All India arrival**		
	Five year avarage	**2017**	**2018**
January	1204.73	133.77	1260.88
February	1018.64	1145.00	1077.66
March	1217.75	1583.36	1774.63
April	941.69	1012.84	823.01
May	812.60	1010.82	801.90
June	707.05	1600.35	703.86
July	714.04	1004.44	679.61
August	732.04	996.40	N/A
September	768.35	981.54	N/A
October	753.00	1015.67	N/A
November	794.28	1040.70	N/A
December	1117.45	1194.35	N/A

Source: AGMARKNET

1.7 Traditional Model of Supply Chain in case of fruits and vegetables

Fig 1.2 shows the diagram of fruit and vegetable supply chain in India shows the number of intermediates involved in the traditional supply chain of fruit and vegetables in India. In India the majority of the trade occurs through traditional path. Generally the farmemrs sale fruits and vegetables to the middleman who collect them from various areas and sales to the commission agent or traders. Commission agents are the middleman who find various buyers for the local middleman and take some commission against the sales made. Then trader collects all small quantities and consolidates of large varieties and sale those to the wholesaler.



Source Global Journal of Management and Business Studies, 2013

Fig 1.2: Traditional model of fruits and vegetables

CHAPTER-II

THE PROJECT

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2.1 Title and statement of problem

The project work entitled **"Critical Analysis of Supply Chain Management in Potato In Jammu: A case study of Narwal Mandi"** was carried out in Narwal Mandi of Jammu district of J&K during the year 2019.

Potato known as 'The king of vegetables', has emerged as fourth most important crop in India after rice, wheat and maize. Indian vegetables basket is incomplete without potato. Potato is nutrionally superior vegetable due to its edible energy and edible protein. It has become an integral part of breakfast, lunch and dinner among larger population. Being a short duration crop, it produces more quantity of dry matter, edible energy and edible protein in lesser duration of time compared to cereals like rice and wheat. Hence, Potato is considered to be an important crop to achieve nutritional security of the nation. In India, Potato is cultivated in almost all states under diverse agro-climate conditions and bulk of the potatoes are grown in winter season under short day conditions and harvested from January to March. India has been exporting potatoes since 1970's. About 85 % of potatoes are cultivated in Indo-gangetic plains of North India. The states of Uttar Pradesh, West Bengal, Punjab, Bihar and Gujarat accounted for more than 80 % share in total production.

The food supply chain in India is highly fragmented. The number of intermediaries in the chain is exceedingly high. These intermediaries are important because they act as a substitute for infrastructure where none exists. But over the years a layer of intermediaries has grown most of which add little value to the produce but collectively they add significantly to the final cost. Marketing of agriculture produce is different and more challenging than many industrial products because of the perish ability, seasonality and bulkiness. The very nature of small size of land holdings by the farmers, varied climatic conditions, production spread over wide geographical area mainly in remote villages, diversified consumption habits of Indian consumers and poor supply chain infrastructure makes marketing of fruits and vegetables more complicated.

At the same instance, Indian customers needs fresh fruits and vegetables. Thus SCM plays a crucial role in marketing of fruits and vegetables. Supply chain efficiency not only helps in increased production and per capita consumption, but also contributes to economic development of the country. As a result supply chain throws both challenges and opportunities in marketing of fruits and vegetables. Efficient SCM in marketing, not only increases the profitability and efficiency of the retailers, but also adds value to the different stakeholders like farmers, consumers.

2.2 Objectives of the Study

- To study the arrival and prices of Potato in Narwal Mandi.
- To examine the supply chain model of Potatoes in Jammu.
- To study the main constraints in supply chain management of Potatoes in Jammu.

2.3 Scope of the study

The scope of the study is to analyze the arrival and prices of potato, supply chain model of potato that is being adopted in Narwal Mandi and to find out the constraints related to it. This study is based on primary and secondary data. The study is entirely focused towards its objectives. This study will help in improving the information flow in the supply chain of potato and will help in reducing the constraints which occurs in supply chain of potato in Narwal Mandi. Lastly, the study will also be a corner stone for improving ideas to bring u positive results in the smooth running of the produce through the process of supply chain.

2.4 Limitations of the study

- Personal bias of respondents was limitation to the study. Some of the respondents were not ready to give the responses.
- Some carrying/forwarding agents were not responding due to threat of publicizing their commission rate and market practices.
- Time constraint was another limitation of the study.

- Respondents ignorance to certain question also posed barrier towards certain responses.

CHAPTER-III

REVIEW OF LITERATURE

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REVIEW OF LITERATURE

It is always necessary to analyze the research work already done in a particular field for the systematic development of science. Therefore, it is necessary to retrospect the research work already done, related with the economics of broiler farming. To make the study more rational and useful a review of the research findings are given below:-

3.1 To study the arrival and prices of potato in Narwal Mandi

Khan, (2006) did a competitiveness analysis clearly indicates that potato production is nationally profitable for import substitution but are not profitable for export promotion. It further explained that all the three cropping zones cannot produce potato for export purpose under existing agro-climatic and topographic conditions of the area and policies; however this crop can be produced with comparative advantage for food self sufficiency/import substitution. The policy analysis shows that for import substitution regime for potatoes, the farmers are receiving less than the world prices and also farmers are taxed both in output and input markets. While, for export promotion, the farmers are receiving more than world reference prices and thus farmers are subsidized both in output and input markets. This implies that the current sets of agricultural and macro-economic policies are not consistent with competitiveness of potato production for both import substitution and export promotion regimes.

Erdal, *et al*. (2009) analyzed the association between prices and amount of potato produced and distributed under open market conditions in Turkey were studied using Koyck model of distributed break models. According to the results, potato production in Turkey has been influenced by the lag value of average price formed in the market. The most prominent result of the study is that the time required for the changes in the potato prices in Turkey to have a result on potato production is 12.33 years.

Thorne, F. S. (2012) analyzed the supply and demand factors affecting the farm level price for Irish potatoes. In terms of the factors affecting potato price, the estimation

resulted indicated that potato prices decrease with increasing volumes and increase with increasing consumption levels.

Soumya Kanta Dwibedy (2013) in his article entitled 'Estimation of Price Spread and Marketing Efficiency of Brinjal in Different Marketing Channels: A Case Study' highlighted Efficient marketing plays an important role in increasing the producer's share in consumer's rupee and maintains the tempo of increased production. In the present study, the cost of cultivation, profit, price spread and marketing efficiency in the marketing of Brinjal in Khurdha district of Odisha were examined during the period from 2011-2012. Primary data were collected from 80 farmers through personal interview method using a specially designed pre-tested schedule.

3.2 To examine the supply chain model of Potatoes in Jammu.

Bridge *et al*. (1996) studied the supply chain management for fresh vegetables in UK were concerned with the linkages in the supply chain, from primary producer to the final consumer. In practice, it seeks to break down the barriers which exist between each of the units in the supply chain in order to achieve higher levels of service and substantial savings in costs. Using the two examples of broccoli and crisping potatoes in the UK, the study concluded the six steps required for good supply chain management from the perspective of the primary producer: scale of operation, strategic alliances, production/storage flexibility, and continuity of supply, quality control and good communication.

Lin *et al.* (2001) concluded that potatoes were the most important vegetable crop in the United States, accounting for 16% of all vegetable and melon farm cash receipts in 1998. However, little is known about the allocation of potato consumption from corner to corner in different marketing sectors, geographic regions, or population groups. Using data from USDA's 1994-96 Continuing Survey of Food Intakes by Individuals, this study examined the consumption distribution of six potato products in the United States. The analysis indicated that fast-food establishments and restaurants dominated the French fries market. There were distinct regional variations in the use of potato. African Americans consumed more potato chips and French fries, on a per capita basis, than other

Americans. Senior Americans favored consumption of fresh and canned potatoes, while teenagers consumed more chips and French fries than others.

Kamal *et al.* (2001) carried out a survey to assess the market share status of different processed potato products in Meerut, Ghaziabad and Delhi, India. Results revealed that processed potato products constitute a sizeable portion of snack foods. Unorganized sector has got strong market presence in the market in the processed potato products category, particularly in case of potato chips where it shares equally with branded chips. However, 'lachha' and 'bhujia' market is still dominated by branded players. It is suggested that potato processing in unorganized sector has a great promise provided they get an assured supply of processing quality potatoes year round.

Manish and Ezekiel (2001) carried out a market survey in the urban and suburban areas of Kolkata, West Bengal, India, during February-March 2001, to collect information on the quantity and quality of the processed potato products available in the largest city of India. Results revealed that potato chips, 'lachha' and 'bhujia' were popular in the metropolitan. A local product called 'Sangra farari' was found to be very popular. Consumers preferred a package size of 500-1000gram for locally processed potato products.

Vasileiou and Morrris (2006) revealed that economic and related market factors associated with staying in business and maintaining competitive advantage were the dominant concern for all potato supply chain participants in the study area of Britain. Greater importance, however, is now given to social and environmental factors both as influences on decision making and as indicators of business performance. The social capital of the supply chain, as it describes relationships among participants, is an important moderator of business uncertainty, and confirms the relevance of sustainability criteria to measure and report supply chain performance.

Tuomisto (2007) studied the contract production of seed and food potato which reduces the market uncertainty and increases efficiency in the entire potato chain. Result indicated that no contract model provided seed potato producers with average optimistic net profits, for seed potato farms stayed under one and seed potato producers trading on

a fixed-price and pre-emptive market could sell their seed potato for 13 per cent less than on a transaction market, but with equal net profits. The supplementary consistent supply chain leads to less market insecurity. If the food potato producer was not party to the contract, there was no marked reduce in market uncertainty. With contract production the needs of contract parties could be controlled, but it will be up to the objectives of the party offering the contract, which party in the potato chain most benefits from the contract production.

Batt (2008) stated that contract farming is a direct mechanism for integrating small growers into the supply chain, the system is said to provide few advantages for growers. In particular, growers have showed concerns related to the equity of the contracts they sign with processors and their economic security after the cessation of the contract. This encouraged potato growers have to negotiate a better deal and to access public sector support.

Mishra (2008) studied the micro finance and livelihoods institution, BASIX, became involved with financing the potato value chain in Jharkhand, India in 2005. In the first years the contract resulted in increased yields and higher incomes for the farmers, in later years farmers broke the contract as they found their potatoes were discarded at the factory, and they found they could achieve better prices in the free market. More was needed than finance only - stronger farmers' organizations were necessary to make sure that contracts operate fairly.

Nalini *et al.* (2009 a) stated that contract farming was helpful in reducing the cost of production by providing technical guidance and arranging quality inputs for potato production. The marketing cost also reduced in modern supply chain by elimination of middlemen and integration of grading activity with farmers and providing training to laborers. Therefore, it can be concluded that contract farming should be adopted which increases the competitiveness of Indian potato in the international market.

Nalini *et al.* (2009 b) studied the marketing of potato in Bathinda district of Punjab and identified the following marking channels

Channel –I: Producer – Contractor/ processing firms

Channel- II: Producer- commission agent/ Wholesaler- Retailer- Consumer

Channel- III: Producer- Retailer- Consumer

Channel- IV: Producer- Cold storage- commission agent/ Wholesaler- Retailer Consumer

Channel- V: Producer- Cold storage- Consumer

Producer of processing varieties under contract farming generally followed the channel-I, producer with processing varieties and did not have contract followed the channel- II and IV. Mostly, channel- III and V were generally used for disposing of non processing varieties and seed potatoes in the study area.

John *et al*. (2009) analyzed a 3-stage principal-agent supply chain model involving producers, wholesalers, retailers, and a futures market and compared the situation with and without a futures market. The empirical results regarding the Dutch ware potato marketing channel during 1971 to 2003 revealed that, as a result of increase in incentives to producers and wholesalers, the coordination costs of the marketing channel decreased significantly, both with and without the informational (i.e., price discovery) role of futures markets. Harbir (2009) found that potato yield on contract farms were lower (about 13% in Merino model and about 30% in Pepsi Co model) than that of non- contract farms. This was on account of early harvest necessitated by keeping the tuber size medium, which is required to meet the processing standards (chips-grade potato). However, contract farmers got higher price than those selling in the open market. The net returns of the contract growers were about 14-24% higher than that of non-contract farmers under both the models.

Rajendran and Thamilmani (2009) studied the farmer market principles in central part of Tamil Nadu and concluded that the farmers- market is an arrangement of supply chain management. Development of such marketing system evidently strengthened the supply chain management. The system successfully integrated many producers with consumers, eliminated middlemen, cut maximum marketing cost, provided good market

infrastructure and environment, and maintained a good relationship between sellers and buyers. Bidirectional information flow increased the strength of the market. The supply chain could be strengthened by taking serious steps to spread the system of farmers market all over the country in order to sustain the production and marketing capacities of large number of small and marginal producers and fair marketing.

Sahadevan (2009) studied futures trading of potato market in India and stated that the trend showed that the spot prices have strengthened after the launch of futures trading. It was logical to expect that farmers were therefore indirectly benefited from the increased spot prices even if the local dealers did not pass the entire price benefits to them. The significant price difference between the spot and future markets which prevailed during the earlier seasons had further strengthened the findings. This indicated that the price discovery in futures helped strengthening of prices in spot market and price discovery and its dissemination helped farmers gain indirectly from futures markets.

Pandit (2009) studied the contract farming of potato in Bathinda district of Punjab, and showed that gross income from potato contract farming was about 18% higher than the non-contract farmers. The B:C ratio was also significantly higher in former category of farmers. The significance difference was mainly due to higher price of potato obtained by the contract farmer.

Abong *et al.* (2010) conducted study on potato crisps industry in Kenya, which is largely dominated by small scale processors who process potato crisps only as one of a diversity of other products. As pertains to create sales, 83% of the processors sell their products straight to supermarkets, 4.3% through wholesalers and 13% directly to individuals and shops. A large number of processors (70%) stored their raw potatoes for shorter periods of time ranges from 2 days to 3 weeks and few (30%) processing firms, stored potatoes for a month or longer.

Bertazzoli *et al.* (2011) focused on three food chains: potato, fruit, and Grana cheese of the Emilia Romagna region, North Italy. The analysis was carried out on 189 enterprises for the potato chain, 187 for the fruit chain, and 203 for the cheese chain. The number of enterprises was invariable over five years (2003-2007), leading to 2,900

financial statement analysis. In the potato and fruit chains 35% of value was created by distribution, whereas in the cheese chain it was 13.6% only. Over the five years, value decreased 5% in fruit and potato and 9% in cheese. The lack of adequate strategic food chain partnership allowed an increasing retail market power over the whole chain at the expense of the primary sector entailing expense a declining sustainability for all chain actors.

Jadav *et al*. (2011) studied the different approaches of supply chain of potato and analyzed their efficiency in middle Gujarat, India. The results revealed that, out of the total production of potato, the marketable surplus was 91.93% and about three-fourth of total quantum was dispatched to distant markets by the sample growers. The Producer - Wholesaler – Commission agent - Retailer- Consumer – is the major marketing channel as more than 60% of marketed excess move through this route. Reddy et al. (2012) studied that the long supply chain (village traders, cold storage owners, commission agents, traders, wholesaler, retailers) in potato markets in UP is identified as the potential source of exploitation of farmers which leads to the increase in cost to the consumers. The farmer gets only 25-40% of the price paid by the consumer. Further value loss of the produce is estimated to be 30-40 %.

Tufa (2013) conducted a study in Ethiopia to describe existing and potential seed potato supply chains, and to evaluate the performance of these chains. The findings showed that seed potato supply chains vary in their performance with respect to cost, seed quality, flexibility and responsiveness. Actors in the chains also varied with respect to their importance to improve seed potato supply chain performance sub-indicators. The results of the study indicated that seed quality and availability could be improved by improving economic and agronomic aspects of the seed systems in general and seed supply chains in particular.

Ugonna *et al.* (2013) examined the value chain analysis of Irish potato as an industrial raw material in Nigeria. Potatoes in Nigeria are cultivated mostly by small, rural farmers in minor areas of the country. The study draws notice to the three sub-chains identified within the Nigerian potato chain; viz the production of potato for instant consumption, the manufacturing of conventional products, potato production for

industrial processing and marketing of fresh potato. While all the three sub-chains can be used to get better income, the first two contribute greatly in the direction of the conservation of biological diversity and are suitable for small farmers. From the foregoing reviews it was clear that different studies conducted by various research workers in different places of the world give us that supply chain models varied from place to place and time to time.

3.3 To study the main constraints in supply chain management of Potatoes in Jammu.

Piazza (1999) reviewed on the state of the market sector for potatoes in Italy, advocated that two reforms were necessary to prevent a downturn in a very competitive situation made more complicated by reforms in official support: cooperatives and 'inter professional' agreements. The latter were described as agreements uniting producers, middlemen, food-processors, industrial users, transport firms, packers and distributors, and also a review of the current financial situation of the sector, aggravated by the fact that some regions, such as Bologna and the Veneto, were coming to market just at the time when prices were at their lowest.

Anil and Arora (1999) conducted study at hills of Uttar Pradesh, India. The results revealed that scientific grading is yet to come into existence for vegetables at grower's level, similarly packaging material which in turn influences the cost of packaging, has to be supplied at a reasonable price. Further cost of transportation of vegetables was very high in the region. An efficient transport system was the paramount need of the area. Finally Agricultural Extension system should be integrated with marketing extension system to transfer post harvest technology to the vegetable growers. If these issues are properly looked into by policy makers not only post harvest management at farm level will get optimized, the post harvest losses and overall cost will be substantially curtailed and this bowl of off season vegetables will receive its due from the emerging economic scenario in the country.

Scheer *et al.* (2000) suggested some new storing and handling methods to improve produce quality in the potato handling chain in his investigation. Compared to

bulk storage, box storage reduced the average weight loss by 16% and the average quality index of subcutaneous tissue discoloration by 30%. Reduction of qualitative and quantitative losses of table potatoes, stored in boxes, is worth mentioning. It was also investigated whether a box storage system for the potato handling chain was financially beneficial to encourage and stimulate participants to invest in innovative harvest and box-storage-filling systems. The total of indirect and direct costs of the harvest and store-filling systems was 3-37% higher for storing potatoes in boxes compared to the traditional systems of storing potatoes in bulk.

Manju and Ezekiel (2001) conducted a study at Shimla, Mohali, and Chandigarh, India, during February-March 2001. The results revealed that most of processors in unorganized sector apparently did not have an idea about the kind of indigenous machinery available in the market for small scale processing while indigenous processing equipments for small scale processors were available. They were not conscious about technical details like optimum slice thickness, frying temperature, oil quality and proper packaging. They were not aware of the processing quality of potatoes required for producing good quality potato chips. The quality of potato chips produced by unorganized sectors could be improved greatly by educating the processors about the quality requirements of potatoes for processing and the indigenous machinery available for potato processing.

Pandit *et al*. (2003) stated that potato marketing in India suffers from severe constrains like high marketing costs and margins, wide price fluctuations, existence of large number of middle men, storage and transportation bottle necks and lack of other marker infrastructures. The potato markets are imperfect, and are inefficiently performing the marketing functions and producers are deprived of the proper share in consumer's rupee due to existence of large number of middle men in the marketing channel.

Rana *et al.* (2003) studied the seasonal indices of prices and arrivals for important potato markets in India during 2001-02 and 2002-03. It was found that prices remained higher than average during the last three months of the calendar year and lower than average during the first three months. Arrival patterns are specific to the markets and not the months. The coexistence of high arrivals and high prices as well as low arrivals and

low prices during some months in some markets indicated imperfections in the Indian agricultural marketing system.

Pandey *et al.* (2003) in their study focused both on the marketing system and estimation of postharvest losses in terms of physical and economic in Nalanda district, the leading potato growing district in Bihar and the major terminal market of Patna in India. Two marketing channels i.e. (i) producer-cold store-wholesaler-retailerconsumer and (ii) producer-wholesaler's field agent/wholesaler-retailer-consumer accounted for 46.8% of potato disposal in Bihar Sharif block and 91.3% potato disposal in Noorsarai block respectively. The significant postharvest losses were found on weight basis at farm level (12.84%), wholesale level (12.40%) and retail level (9.45%) due to cuts, cracks and diseases. The postharvest losses on weight and number basis were observed to be 26.84%. Total economic loss was worked out to be only 5.67%.

Chang *et al*. (2008) found that sweet potato is the major staple food crop in PNG (Papua New Guinea), providing around two thirds of total dietary intake. Poor postharvest handling, storage and transportation result in a product with a short shelf life (3 weeks) and poor quality characteristics. Losses to distant markets were high, with 30-50% of product being unsalable on arrival in Lae or Port Moresby, due to rots and/or physical damage. The potential for marketing sweet potato to distant markets increased significantly in recent years due to increasing urbanization.

Nalini *et al.* (2008) stated that the potato crop was found to be remunerative in the study area (Banaskantha, Gujarath). More than 95 % of the total produce was being sold during the harvest period due to poor retention capacity of farmers. Lack of quality seed, inadequate irrigation facility, uncertainty in potato prices, costly potato inputs, shortage of labor and lack of latest know how of potato cultivation the major constraints were faced by farmers in potato cultivation.

Brijbala (2009) identified the constraints in cooperative market of vegetables in Himachal Pradesh as the shortages of funds coupled with complicated procedure for availing funds, poor efforts by office bearers and losses to the societies due to stiff competition in the market from private traders were some of the major bottle necks

affecting the smooth running and the overall success of cooperative marketing societies. Among the constraints hindering the emergence of new societies, unawareness among farmers, complicated procedure of formation of registration of the cooperative societies, lack of cooperation and leadership quality among farmers appeared to be the major obstacles.

Abong *et al*. (2010) conducted study on potato crisps industry in Kenya, About 4% identified the main constraints as lack of proper equipments and market, 64% complained of lack of potatoes and its poor quality, while 43% indicated lack of finances to increase volume of production and also industries faced with several constraints including raw potato price fluctuations, scarcity and poor value of potatoes, lack of facilities, information on raw potato storage space. The industry relies on one variety that is not always accessible for all the processors. This information is very important for potato breeders and postharvest technologists to advantage sufficient suitable potato cultivars for crisping.

Dixit *et al*. (2010) stated that off season potato (with respect to plain) with high benefit cost ratio was found to be a commercially viable enterprise in Pauri district of Garhwal region. The area is backward in stipulations of poor pre and post-harvest infrastructure, low agricultural productivity and week institutional linkages. These situations do not allow the farmers to take advantage of off season market opportunities. The learning finds that the potato growers are the fatality of situation, and the contractors coming from Haldwani, Ramnagar, Rudrapur and Kotdwar markets take the undue benefit. The scenario calls for concerted efforts of public-private sectors in a partnership mode for creation of basic infrastructure facilities, and Non Governmental Organizations (NGOs) should act as a facilitator and extension workers need to direct the farmers for access both technology and credit facilities.

Guenthner (2010) made some predictions as an overview of world potato markets based on the literature review and analysis of trends. First, the potato industry will get bigger until at least 2020. Secondly, growth will be most quick in less developed countries (LDC). Third, fresh and processed potato usage will boost while seed use declines. Fourth, the inelastic need for fresh potatoes will continue to cause price

volatility. Fifth, new technology including GM potatoes will eventually be accepted in global markets.

Mugisha *et al*. (2010) studied that the Potato value chain in Uganda was characterized by many scattered small farmers and buyers facing high transaction costs, resulting from lack of mutually beneficial linkages between actors in the chain and market coordination problems in terms of quantity, quality and varieties. These problems contributed to low adoption of improved production technologies and consequent low productivity, which, in turn, contribute to limited access to profitable markets and suggested the capacity building through degree training and creating a forum for involvement of value chain actors in interactive learning and knowledge sharing.

Jadav *et al.* (2011) recognized that the major marketing problem faced by the vegetable growers of middle Gujarat were higher price fluctuation, lack of marketing information and lack of transportation facilities. To solve the problems, provision of cold storage space facilities to the farmers at village level, sufficient transport facilities for the association of vegetables from the places of production to various market centers, dissemination of market information to the farmers, establishment of vegetable co-operative marketing societies and fixation of minimum/ maximum prices of vegetables were some of the means suggested to get better the competence of marketing of potato in the state.

Sharma *et al.* (2011) studied the post-harvest losses in vegetable supply chain in the Kumaon division of Uttarakhand. Twelve major vegetables were selected for the study. The maximum aggregate post-harvest losses were found in tomato, followed by potato, brinjal, chilly, French bean and pea. The study suggested that establishment of producer co-operatives to handle various activities relating to production and marketing of vegetables would help in reducing post-harvest losses. The above sited reviews revealed that majority of the problems in marketing of potato are post harvest losses, wide price fluctuations, more marketing costs and improper infrastructure facilities at market yard.

CHAPTER-IV

RESEARCH METHODOLOGY

CHAPTER-IV

RESEARCH METHODOLOGY

4.1 Research methodology

A methodology is usually a guideline system for solving a problem, with specific components such as phases, tasks, methods, techniques and tools. The main goal of this study is to analyse the supply chain management of Potatoes in Jammu. The present investigation entitled **Critical Analysis of Supply Chain Management in Potato In Jammu: A case study of Narwal Mandi** was carried out in 2019. The sampling structure and techniques adopted during the course of investigation have been described in this chapter.

4.2 Locale of study

Narwal Mandi was selected for the study as this market is the main market for fruit and vegetable in the Jammu district.

4.3 Sample size

The research was conducted with the help of schedule/questionnaire based on the information collected from 25 traders of Narwal Mandi, Jammu

4.4 Data collection

The data collection is to collect important information to keep on record for further use, to make important decisions about different issues, and to pass vital information to others. The present study will adopt both primary data as well as secondary data collection technique.

Primary Data: - It involves the first hand information collected through

- Schedule/ Questionnaire method
- Direct personal interview method

Secondary Data: - The data which has already been collected, complied and presented earlier by any agency may be used for purpose of investigation. The data will be collected through websites, journals related to brand and advertisement, newspapers, magazines etc.

4.5 Methods of analysing data

Descriptive statistics, Pie Chart, Bar Chart and other Statistical tools will be adopted for analysis purpose.

4.5.1 Compound annual growth rate (CAGR)

$$CAGR = \frac{\text{Final value}}{\text{Starting value}}^{1/N} - 1$$

$$CAGR = (FV/SV)^{1/N} - 1$$

Where:

FV = final value of an investment

SV = starting value of an investment

N = total number of investment periods (months, years etc.)

4.5.2 Henry garret ranking technique

In this technique, the percentage position of each rank obtained is converted into scores by referring to the table given by Henry Garret. Then for each factor the scores of individual respondents are added together and divided by the total number of respondents for whom the scores are added.

Formula:

Percentage position = $100(Rij-0.5)/n$

Where:

Rij is the rank

N = number of items.

CHAPTER-V

RESULTS

CHAPTER-V

RESULTS AND DISCUSSION

The results pertaining to the present study "Critical analysis of supply chain management in Potato in Jammu: A case study of Narwal Mandi" have been presented in this chapter along with appropriate tables and figures.

Demographics

Table 5.1: Business description of traders (potato)

Business description of traders	Retailer	Wholeseller	C&F Agents
Number of respondents	6	17	2
Per cent	24	68	8

The title of the study was 'Critical analysis of supply chain management in Potato in Jammu: A case study of Narwal Mandi. 25 traders has been selected for carrying out the research as the sampling unit and out of them, 68 per cent of traders were wholesellers while 24 per cent were retailers and remaining 8 per cent were carrying and forwarding agents.

Table 5.2: Monthly income of the traders (₹) from potato business only

Monthly income	Below ₹ 10000	₹ 10000-20000	₹ 20000-30000	₹ 30000-40000	₹ 40000 and above
No. of respondents	1	4	2	13	5
Per cent	4	16	8	52	20

Table 5.2 and figure 5.2 revealed that out of 25 traders, 13 traders lies between the monthly income of ₹ 30000 to 40000. 5 traders were having the monthly income of ₹

40000 and above whereas 2 traders were having the monthly income from potato business i.e. between ₹20000-30000. 4 traders lies between the monthly income ₹10000-20000 while only 1 trader was the having the monthly income generated from potato below ₹10000.

Table 5.3: Experience in the business of potato

Experience	**Less than 1 year**	**1-5 years**	**5-10 years**	**10-15 years**	**15-20 years**	**More than 20 years**
Number of respondents	0	2	2	1	4	16
Per cent	0	8	8	4	16	64

Fig 5.3 and table 5.3 is showing that 64 per cent of traders were having more than 20 years of experience in the business of potato while 16 per cent of traders were having 15-20 years of experience in the business of potato. It has been found that 4 per cent of traders were having 10-15 years of experience in the business of potato whereas 8 per cent of traders were having 5-10 years of experience in potato business. Another 8 per cent of traders were having 1-5 years of experience in potato business.

To study the arrival and prices of potato in Narwal Mandi in Jammu

Table 5.4: Shows the annual arrival of potato (in tonnes) in Narwal Mandi Jammu

Year	Arrival (in tonnes)
2009	25343.40
2010	27430.80
2011	22968.00
2012	31009.60
2013	33816.00
2014	25263.00
2015	44215.00
2016	31977.00
2017	38672.00
2018	27296.00
Total	**307990.08**

Table 5.4 is showing the annual arrival of potato (in tonnes) in Narwal Mandi Jammu. In the year 2009, the annual arrival of potato was 25343.40 tonnes whereas in the year 2010, the arrival was 27430.80 tonnes. In the year 2011, the annual arrival of potato was 22968.00 tonnes and in the year 2012, it was 31009.06 tonnes. In the year 2013, the annual arrival of potato in Narwal Mandi was 33816.00 tonnes whereas in 2014, it was 25263.00 tonnes. In the year 2015 the annual arrival of potato was 44215.00 tonnes while in 2016, it was 31977.00 tonnes. In the year 2017, the annual arrival of potato was 38672.00 tonnes whereas in 2018 it was 27296.00 tonnes. From the table it can be clearly seen that, in 2015 the arrival of potato was highest.

Table 5.5: The monthly prices of potato (₹/Qtl.) from the year 2009-2018 in Narwal Mandi.

YEAR / MONTH	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
January	312.50	598.33	419.31	438.75	555.95	1100.00	714.31	547.22	593.75	554.54
February	351.50	510.50	405.26	411.84	578.75	983.33	647.36	613.09	575	566.66
March	421.00	470.50	473.86	621.42	581.57	1077.77	650.00	675.00	494.44	833.33
April	719.00	546.22	456.57	1002.38	700.00	1407.14	457.35	777.27	600.00	990.00
May	798.75	545.50	507.29	1102.5	790.74	1515.21	477.27	1227.94	600.00	1206.66
June	919.80	554.00	562.50	1005.55	766.66	1746.00	640.78	1267.85	564.28	1278.57
July	926.00	618.00	NA	1122.72	779.16	2090.90	627.63	1335.00	550.00	1100.00
August	884.00	501.20	NA	1201.31	779.16	2283.33	785.29	1353.12	550.00	886.36
September	989.00	1097.50	NA	1004.76	1067.39	2201.08	957.5	1370.00	676.38	868.18
October	1284.00	1439.00	NA	885.71	1580	2294.73	1179.16	1272.22	606.25	1422.22
November	888.00	1397.00	370.45	754.54	1632.5	2017.39	1242.5	802.77	817.85	1123.07
December	750.00	622.66	325.00	633.33	1131.81	997.05	721.42	643.75	1035.71	766.66
Average total	770.29	741.70	440.05	848.73	911.97	1642.82	758.38	990.43	638.63	966.35

(Source: AGMARKNET)

`Table 5.5 is showing the monthly prices of potato from the year 2009- 2018. In 2009, the maximum prices of potato was in the month of October i.e. ₹ 1284/qtl and the minimum prices was in the month of January i.e. ₹ 312.50/qtl. In the year 2010, the highest prices of potato was in the month of October i.e., ₹ 1439/qtl and the lowest prices arrived in the month of March i.e., ₹ 470.50/qtl. In 2011 the highest prices of potato arrives in the month of June i.e. ₹ 562.5/qtl and the lowest prices was in the month of December i.e. ₹ 325/qtl. In 2012, the highest prices was in August ie. Ì 1201.31/qtl and the lowest was in the month of February i.e. ₹ 411.84/qtl. In the year 2013, the highest prices of potato was in the month of November i.e. ₹ 1632. /qtl and the lowest price was in the month of January i.e. ₹ 55.35/qtl. In year 2014, the maximum prices of potato was in the month of October i.e. ₹ 2294.73/qtl. and the minimum was in the month of February i.e. ₹ 983.33/qtl. Year 2015 shows that the highest prices of potato came in the month of November i.e. ₹ 1242.5/qtl. and the lowest came in the month of April i.e. ₹ 457.35/qtl. Year 2016 shows that the highest prices of potato came in the month of August i.e. ₹ 1353.12 /qtl and the lowest prices came in the month of March i.e. ₹ 675/qtl. In the year 2017, the maximum prices of potato was in the month of December i.e. ₹ 1035.71/qtl and the minimum prices in the month March ₹ 494.44/qtl. In the year 2018, the highest prices of potato was in the month of October i.e., 1422.22 ₹ /qtl. and the lowest prices came in the month of January i.e. ₹ 554.44/qtl. From the table 5.5 it can be analyzed that September and October are the months with highest prices of potato as compared to other months of the year.

Fig 5.5 is depicting the average annual prices of potato (₹/qtl) in Narwal Mandi. The highest average annual price of potato came in the year 2014 i.e., ₹1642.82 /qtl whereas the lowest average annual price was in the year 2011 i.e., ₹440.2 /qtl.

Fig 5.6 is showing the compound annual growth rate (CAGR) of price of potato from 2009 to 2018. It can clearly analysed from the figure that CAGR for the price of potato was highest in 2009 i.e. 7.57. From 2011 to 2013, it showed an increasing trend with a highest CAGR of 6.10 in 2013 and then dipped to 0.50 in 2015. In 2016 and 2017, it again showed an increasing trend.

To examine the supply chain model of Potatoes in Jammu.

Table 5.6: Marketing facilities (transportation) in Narwal Mandi

Transportation facilities	Self	Private	Government/ cooperatives
Number of respondents	14	11	0
Per cent	56	44	0

Fig 5.7 and table 5.6 is showing that government is not supporting for the facilities like transportation and the result depicted that 56 per cent of traders were having their self-mode of transportation whereas 44 per cent of traders hire the vehicle on private basis.

Table 5.7: Marketing facilities (storage) in Narwal Mandi

Storage facilties	Self	Private	Government/cooperatives
Number of respondents	25	0	0
Per cent	100	0	0

Table 5.7 and fig 5.8 revealed that 100 per cent of traders were having storage facilities for potato on their own. Government has not provided storage facilities for any fruits and vegetables in Narwal Mandi. Having proper storage facilities is very crucial in marketing of fresh fruits and vegetables as they are highly perishable in nature.

Table 5.8: Storage capacity of self made warehouses for potato in Narwal Mandi (in tonnes)

Storage capacity	Below 2 tonnes	2-4tonnes	4-6tonn	6-8tonnes	8-10tonnes
No of respondents	4	2	3	13	3
Per cent	16	8	12	52	12

During the study in Narwal Mandi, it was found that traders were having different storage capacity for storing the potatoes. Table 5.8 is depicting that 52 per cent of traders were having the storage capacity for potato was 6-8 tonnes while 16 per cent of traders were having the capacity below 2 tonnes for storing the potato. Among 25 traders, 12 per cent stated that they were having 4-10 tonnes for storing potatoes with themselves where as 8 per cent of traders said that they store potatoes with in 2-4 tonnes of capacity.

Table 5.9: Methods of grading and packing for potatoes in Narwal Mandi

Methods of packing	Not doing	Traditional	Modern
No. of respondents	0	25	0
Per cent	0	100	0

Grading and packaging especially in the case of perishable products like fruits and vegetables is very important for increasing the shelf life, although the shelf life of potato is more as compared to other vegetables but factors like moisture, rodents can destroy the product. Hence, grading and packaging should be effective. From the table and figure 5.10, it has been observed that traders were not doing any grading methods for potatoes but all the traders said that they are following the traditional methods for packaging the potatoes. They pack potatoes in normal sacks which can be considered as the major limitation.

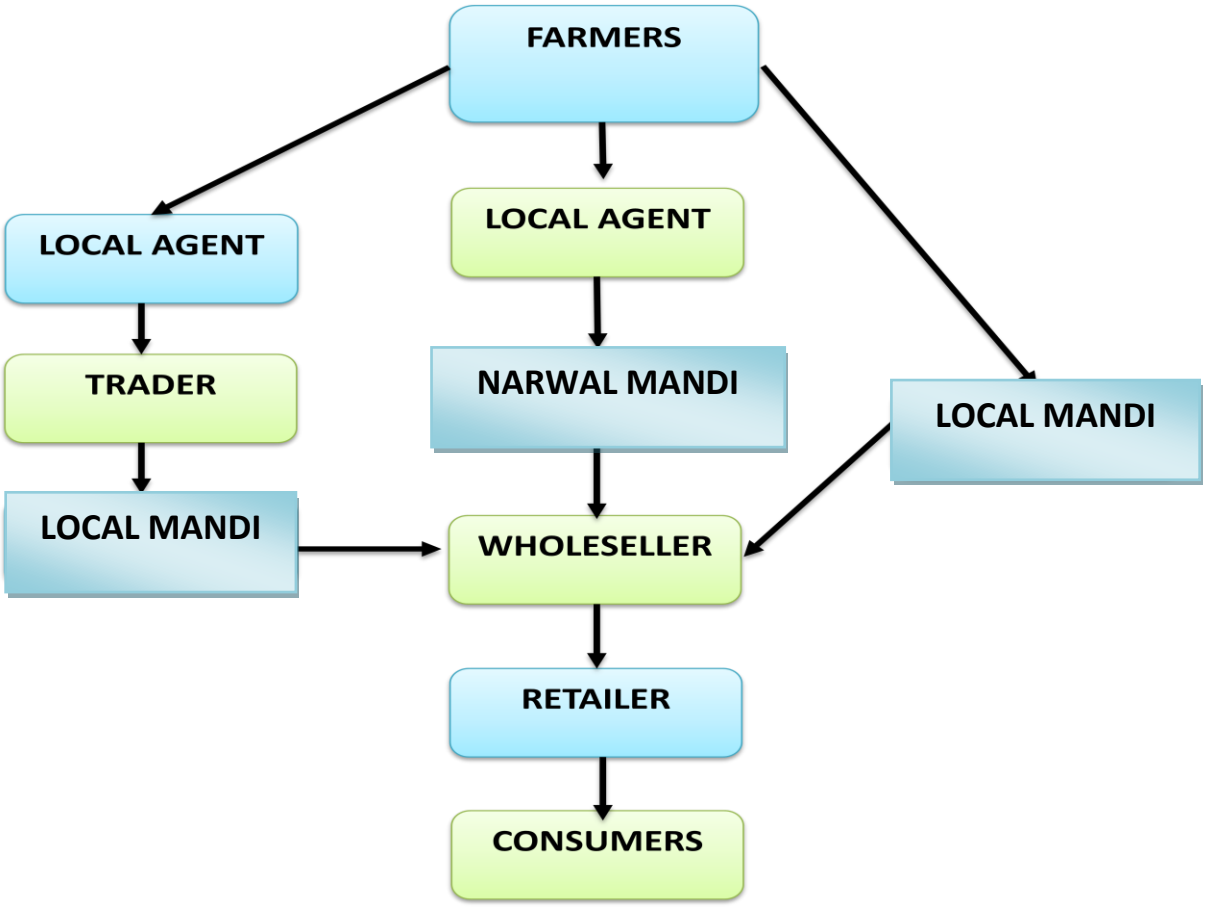
Table 5.10: Facilities provided in Narwal Mandi

Facilities	Cold storage		Credit		Transportation	
	Govt.	Self	Govt.	Self	Govt.	Self
No of respondents	0	25	0	25	0	25
Per cent	0.00	100	0.00	100	0.00	100

From the above table and fig it can be concluded that can be concluded that government is not providing the major facilities viz, cold storage, credit facilities, and transportation to the traders for potatoes, hence they are doing it from their very own. Table 5.3.5 shows that 100 per cent of traders are arranging the facilities from self.

Supply chain model for potato that is being followed in Narwal Mandi

Model 1:



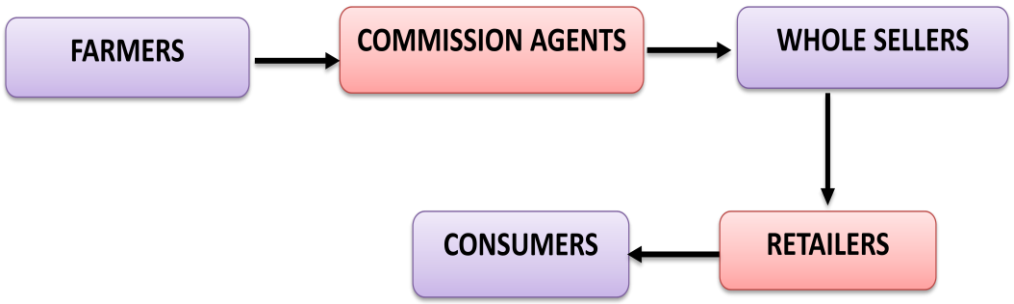
It involves the active reorganization of a business's supply-side actions to maximize customer value and gain a competitive advantage in the marketplace. SCM represents an effort by suppliers to develop and execute supply chains that are efficient and effective. Supply chains cover everything from production to product growth to the information systems needed to direct these undertakings. Two supply chain models were adapted in Narwal Mandi for potato that is represented above. Model 1 has three channels i.e.

Channel 1 is from farmers- local agents- mandi- whole sellers- retailers- consumers.

Channel 2 is from farmers- local agents- mandi- whole sellers- retailers- consumers.

Channel 3 is from farmers- mandi- whole sellers- retailers- consumers.

Model 2:



Supply chain should be very effective and efficient and the information flow between the actors of supply chain should be very good, the actors in this model of supply chain are farmers- commission agents- whole sellers- retailers- consumers. During the research it can be observed that there are many intermediaries in the supply chain and farmers have to dependent on those intermediaries for their produce. They do not know much about the market established, how and where to sell the produce, and they have to rely upon the commission agents for the produce to sell which acts as a constraint in supply chain. Hence government should take initiatives to reduce those intermediaries from the supply chain of fruits and vegetables.

Table 5.11: Marketing cost of traders

S.No	Function	Price(per bag 1 Q)
1.	Grading and packing	10.00
2.	Cost of gunny bag	7.00
3.	Labour charges	7.50
4.	Market fee	0.00
5.	Transportation	0.00
6.	Commission charges	19.50
7.	Octroi	0.00
8.	Other expenses	12.50
9.	Purchasing price	390.00
10.	Total	**446.50**

Table and fig 5.11 depicts that the purchasing price of potato by traders from farmers were ₹ 390.00 per quintal. After purchasing the potato grading is done by traditional method and the cost incurred by the traders for the same was ₹ 10.00 per quintal. The cost of the gunny bag for packing potato was ₹ 7.0 per quintal. The labour charges paid by the traders was ₹ 7.5 per quintal, other miscellaneous expenses such as market fee, transportation, commission charges, octroi is 32.00 per quintal. So we can assume that net average price for traders was ₹ 446.5/quintal.

Table 5.12: Response of traders towards different aspects of supply chain process (per cent)

S.No.		1 Extremely worse	2 Worse	3 Average	4 Neutral	5 Good	6 Better	7 Extremely better
Supply Chain Integration								
1.	Firms/Traders in our supply chain establish more frequent contact with each other. Frequent contact of traders with each other by a SCM	36	12	36	16	0	0	0
2.	Traders in our supply chain create a compatible communication and information system.	60	20	12	4	4	0	0
Supply chain Flexibility Performance								
1.	Response to demand variations such as seasonality	0	0	0	0	0	36	64

2.	Response to poor supplier Performance.	0	0	8	16	20	16	40
3.	Response to poor delivery performance	0	0	0	0	0	16	84
Supply Chain Resource Performance								
1.	Total cost of resources used.viz infrastructure	48	0	0	0	24	28	0
2.	Total cost of distribution, including transportation and handling cost.	0	0	0	0	4	4	92
3.	Cost associated with held inventory.	0	0	20	36	12	24	8
Supply Chain Output Performance								
1.	Sales	0	0	0	0	32	36	32
2.	On time delivery	0	0	0	0	0	0	100

Table 5.12 represents the response of various supply chain actors towards different aspects of supply chain process. Regarding (traders maintain frequent contact with each other) out of 25 respondents, 8 respondents i.e. (36 per cent) said that it is extremely worse, followed by 3 respondents i.e. (12.00 per cent) who said that it is worse, followed by 9 respondents i.e. (36.00 per cent), who said that it is average. Regarding (traders create compatible communication system) out of 25 respondents, the 15 respondent i.e. (60 per cent) said that it is extremely worse, again followed by only 5 respondent i.e. (20 per cent) who said it is worse, followed by 3 respondents i.e. (12 per cent), who said that it is average , followed by 1 respondents i.e. (4 per cent), who said that they do not have any opinion regarding it, followed by 1 respondent i.e. (4 per cent) who said that it is good. Regarding (demand variations) out of 25 respondents, the 9 respondents i.e. (36 per cent) said that it is better, followed by 16 respondents i.e. (64 per cent) who said that it is extremely better. Regarding (poor performance of supplier), out of 25 respondents, i.e. (8 per cent) said that it is average, followed by 4 respondents i.e.(16 per cent), who said that they do not have any opinion regarding it, followed by 5 respondents i.e. (20 per cent) who said that it is good and (40 per cent) said that it is extremely better. Regarding (poor delivery performance), all of the 25 respondents, 21 respondents i.e.(84 per cent) said that it is extremely better and 4 respondents (16 per cent) said that it is better. Regarding (total cost of resources) out of 25 respondents, none of the respondents,12 respondents i.e. (48 per cent) said that it is extremely worse , followed by 6 respondents i.e. (24 per cent), who said that it is good, followed by 7 respondents i.e. (28 per cent), who said that it is better,. Regarding (distribution cost), out of 25 respondents, none of the respondents i.e. (92 per cent) said that it is extremely better, followed by 1 respondent i.e. (4 per cent), who said that it is good, again followed by 1 respondent i.e. (4 per cent), who said that it is better. Regarding (on time delivery) 100 per cent of respondents said that it is extremely better. Regarding (sales) (32 per cent) said that it is extremely better followed by (36 per cent) said that sales is good.

To study the main constraints in supply chain management of Potatoes in Jammu.

Table 5.13: Shows the major constraints (in per cent) that came in supply chain management of potatoes in Narwal Mandi Jammu.

		1 Strongly disagree	2 disagree	3 neutral	4 agree	5 Strongly agree
Constraint in supply chain						
1	Transportation	0	12	20	16	52
2.	Storage facilities	16	18	20	8	38
3.	Lack of govt. initiatives	0	8	24	32	36
4.	Packaging issues	0	20	20	30	30
5.	Marketing facilities	8	0	32	20	40
6.	Lack of information flow	0	0	0	40	60

1. Transportation: Transportation plays a very important role in the supply chain. Without proper transportation the goods can't be delivered to the customer in a right time and in a right quality. It plays even a more important role in perishable food like potato because of short shelf life, high perishable. Transportation related challenges are very high in the India because of unavailability of well transportation mode, high cost of transportation. Table 5.13 shows that 52 per cent of the traders believe that transportation are the major constraint in the supply chain of potato; govt. is not providing them the mode of transportation for transferring the produce from one place to another. They either are having self mode of transportation or hiring the vehicles on private basis.

2. Storage facilities: The facilities for storage is must for any produce in supply chain, it is really important to protect the fruits and vegetables because of its nature of high perish ability and short shelf life. Table 5.13 is depicting that 38 per cent of the traders still believes that they do not have the adequate storage facilities for keeping the produce, especially in the case of potato. They are not

having proper storage facility and also government is not helping them providing the adequate storage facilities in Narwal Mandi Jammu.

3. Lack of government initiatives: Table 5.13 is showing that 36 per cent of the traders believe that there is lack of govt. Initiatives for the betterment of supply chain in Narwal Mandi. There is no proper infrastructural facilities, storage facilities, transportation facilities available for potato in Narwal Mandi, and govt. in not supporting them at all. 32 per cent of traders agreed that govt. should help the traders for improving the supply chain of potato in Narwal Mandi.

4. Packaging issues: Packaging is very important for fruits and vegetables as they are highly perishable goods and it requires proper packaging for the handling of these fresh produce. Without appropriate packaging it is very hard to maintain their shelf life. Cost is very essential factor for this issue. High cost of packaging material makes complicated for the traders to do suitable packaging of their goods. Table 5.13 shows that 30 per cent of traders strongly agree that there are packaging issues for potato. They pack potatoes in normal sacks and hence there is no proper packaging is done. Another 30 per cent of traders believe that this issue should be sorted out for the betterment of supply chain of potatoes in Narwal Mandi Jammu.

5. Marketing facilities: Marketing facilities is the basis of efficient supply chain. Without proper marketing facilities the supply chain cannot run successfully. In India, farmers have lack of information regarding the existing market, prices in the market, demand, food processing units etc. Poor information leads to poor realization of prices, high amount of losses, late delivery of goods in the market place etc. Table 5.13 shows that 40 per cent of the traders believe that there is less marketing facilities for the potato, farmers do not know about how and where to sell the produce. They do not have much idea about existing marketing channels and therefore marketing facilities is also a major constraint.

6. Lack of information flow: There should be smooth information flow between the actors in supply chain for its smooth run. But here in Narwal Mandi 60 per cent of

traders believe that there is a lack of information flow between the actors in supply chain which acts as a major constraint

Table 5.14: Shows the Garret ranking of major constraints occurs in supply chain of potato in Narwal Mandi Jammu.

Factors	Total	Average score	Rank
Transportation	1163/25	46.52	V
Storage facilities	1391/25	55.64	I
Lack of govt. Initiatives	1178/25	47.12	IV
Packaging issues	1227/25	49.08	III
Marketing facilities	1331/25	53.24	II
Lack of information flow	1060/25	42.4	VI

Garrett's ranking technique was used to rank the constraints identified in supply chain of potato in Narwal Mandi. By using Garrett's formula, the rank was obtained. These were converted into scores by relating to Garrett's table. According to table 5.14 by using Garrett ranking the major constraint is storage facilities which are given rank 1 followed by marketing facilities rank 2 and packaging issues rank 3. Lack of government initiatives is given rank 4 followed by transportation and lack of information flow (rank 5 and 6).

CHAPTER-VI

SUMMARY AND CONCLUSION

CHAPTER-VI

SUMMARY AND CONCLUSION

6.1 Summary

The project entitled **"Critical Analysis of Supply Chain Management in Potato In Jammu: A case study of Narwal Mandi"** was carried out in Narwal Mandi, Jammu region in 2019. A total of 25 sample respondents(traders) were selected from the sample area. The information was collected from the sample area. The data collected was subject to analysis for examining the objectives of investigation. The finding of the present investigation has been briefly summarized in this chapter.

6.1.1 To study the prices and arrival of potato in Narwal Mandi in Jammu

Narwal Mandi Jammu is one of the greatest place for fruits and vegetables. Under this objective many variations can be seen in the arrival and prices of potato from last 10 years. In the case of arrival it can be observed that the highest arrival of potato in Narwal Mandi came in the year 2015 i.e. 44215 tonnes whereas the lowest arrival of potato came in the year 2011 i.e. 22968 tonnes. The annual arrival of potato was 307990 tonnes from year 2009 to 2018. In the case of prices of potato the highest potato price came in the year 2014 i.e. in the month of October with ₹ 2294.73/qtl whereas the lowest prices arrives in the year 2011 in the month of December having ₹ 325/qtl. The compound annual growth rate of potato is also depicting that there is an increase in the CAGR in the year 2009 and it start decreasing in the year 2010 and 2011. It can be seen that CAGR started increasing from year 2012 to 2014 and again decreasing in the year 2015. From the year 2016 it increases rapidly till year 2018.

6.1.2 To examine the supply chain model of Potatoes in Jammu

Supply chain is the chain between farmers till end consumers. Indian customers need fresh fruits and vegetables. Thus SCM plays a crucial role in marketing of fruits and vegetables. Supply chain efficiency not only helps in increased production and consumption, but also contributes to economic development of the country. There are two

models that are being identified in the supply chain of potato in Narwal Mandi. Model 1 comprises of three channels.

Channel 1: farmers- local agents- mandi- whole sellers- retailers- consumers.

Channel 2: farmers- local agents- mandi- whole sellers- retailers- consumers.

Channel 3: farmers- mandi- whole sellers- retailers- consumers.

Model 2 comprises of farmers- commission agents- whole sellers- retailers- consumers.

It was found that potato is supplied through different channel, many intermediaries like local agents, whole sellers, retailers are comprises the supply chain model of potato. Local agents are the most important intermediaries in the supply chain that are controlling the price of potato.

6.1.3 To study the main constraints in supply chain management of Potatoes in Jammu

Sometimes the constraints act as a bottleneck in the supply chain of fruits and vegetables. During the study it was found that there are many constraints in the supply chain of potato like transportation, storage facilities, lack of government initiatives, packaging issues, marketing facilities, lack of information flow. Out of these constraints storage facility was the major problem that occurred in the supply chain of potato in Narwal Mandi.

6.2 Conclusion

Supply chain plays a very crucial role in the supply of produce from farmers to its end consumers. Supply chain of fruits and vegetables should be very efficient and effective. The present study was carried out with the aim to study the prices and arrival of potato in Narwal Mandi. The main aim of the study was to know the supply chain models adopted in Narwal Mandi and to know the major constraints in supply chain of potato. The study revealed:

- The storage and transportation facilities in Narwal Mandi have been done on their own and the government do not provide any of those facilities.
- 100per cent traders in Narwal Mandi follow the traditional method of grading and packing of potato.
- Lack of government initiatives is one of the constraints in supply chain of potato in Narwal Mandi.
- In Narwal Mandi, there is a lack of information flow between the actors of supply chain which is also a constraint.
- In Narwal Mandi, storage facilities for fruits and vegetables is one of the major constraints.

6.3 Recommendation

- There should be a smooth flow of information between the actors in supply chain in Narwal Mandi.
- Government should give proper support such as infrastructure and marketing facilities to traders . The research revealed that there is no proper parking facilities in the Narwal Mandi. Therefore government should also look into this problem.
- Proper storage facility is one of the crucial elements of supply chain of fruit and vegetables which is lacking in Narwal Mandi. Therefore having an effective storage facility can help to develop an efficient supply chain model in the Narwal Mandi.

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REFERENCES

Division of Agricultural Economic and Agri-Business Management
Sher-e-Kashmir University of Agricultural Sciences and Technology, Jammu

SCHEDULE/QUESTIONAIRE

Demographics;

Name	
Age	
Address	
Gender	

1. Business description of company:
   a) Retailer
   b) Wholesaler
   c) C&F agents

2. What is your income/monthly?
   a) Below 10,000
   b) 10,000 to 20,000
   c) 20,000 to 30,000
   d) 30,000 to 40,000
   e) 50,000 and above

3. Years of experience
   a) Less than 1 year
   b) 1-5 years
   c) 5-10 years
   d) 10-15 years
   e) 15- 20 years
   f) More than 20 years

4. Marketing channel

a) Producer – commission agent – retailer –consumers _____

b) Producer – commission agent – whole seller – retailer – consumers _____

c) Producers – village traders – whole sellers – retailers – consumers _____

d) Producers – pre harvest contractors – commission agents – whole sellers – retailers –consumers _____

e) Producers – consumers _____

5. Marketing facilities available

Storage	*adequate*	*non adequate*
a) Self	_____	_____
b) Private	_____	_____
c) Govt. /cooperative	_____	_____

6. What is Capacity of storage available?

.....

7. Grading / Packing

a) Not doing

b) Traditional

c) Modern

8. Transportation

a) Self b) local c) Govt./ cooperative

9. Facilities provided by the Govt.

a) cold storage b) credit c) transportation

10. Marketing cost of whole seller

S. no.	Functions	Vegetable(Potato)
a.	Grading and packing	
b.	Cost of gunny bag	
c.	Labour charges	
d.	Market fee	
e.	Transportation	
f.	Commission charges	
g.	Octroi	
h.	Other expenses	
	Sub total	
	Purchasing price	
	Selling price	

11. Marketing cost of retailer

S. no.	Functions	Vegetable(Potato)
a.	Loading and unloading charges	
b.	Transportation	
c.	Commission	
d.	Octroi	
e.	Other expenses	
f.	Market fee	
g.	Purchasing price	

Please indicate the level of agreement on the following statements based on your experience working. The rating is from 1= Extremely Worse to 7= Extremely Better								
S.No.		**1 Extremely worse**	**2 Worse**	**3 Average**	**4 Neutral**	**5 Good**	**6 Better**	**7 Extremely better**
Supply Chain Integration								
1.	Firms/Traders in our supply chain establish more frequent contact with each other. Frequent contact of traders with each other by a SCM							
2.	Traders in our supply chain create a compatible communication and information system.							
Supply chain Flexibility Performance								
1.	Response to demand variations such as seasonality							

2.	Response to poor supplier Performance.							
3.	Response to poor delivery performance							
Supply Chain Resource Performance								
1.	Total cost of resources used.viz infrastructure							
2.	Total cost of distribution, including transportation and handling cost.							
3.	Cost associated with held inventory.							
Supply Chain Output Performance								
1.	Sales							
2.	On time delivery							

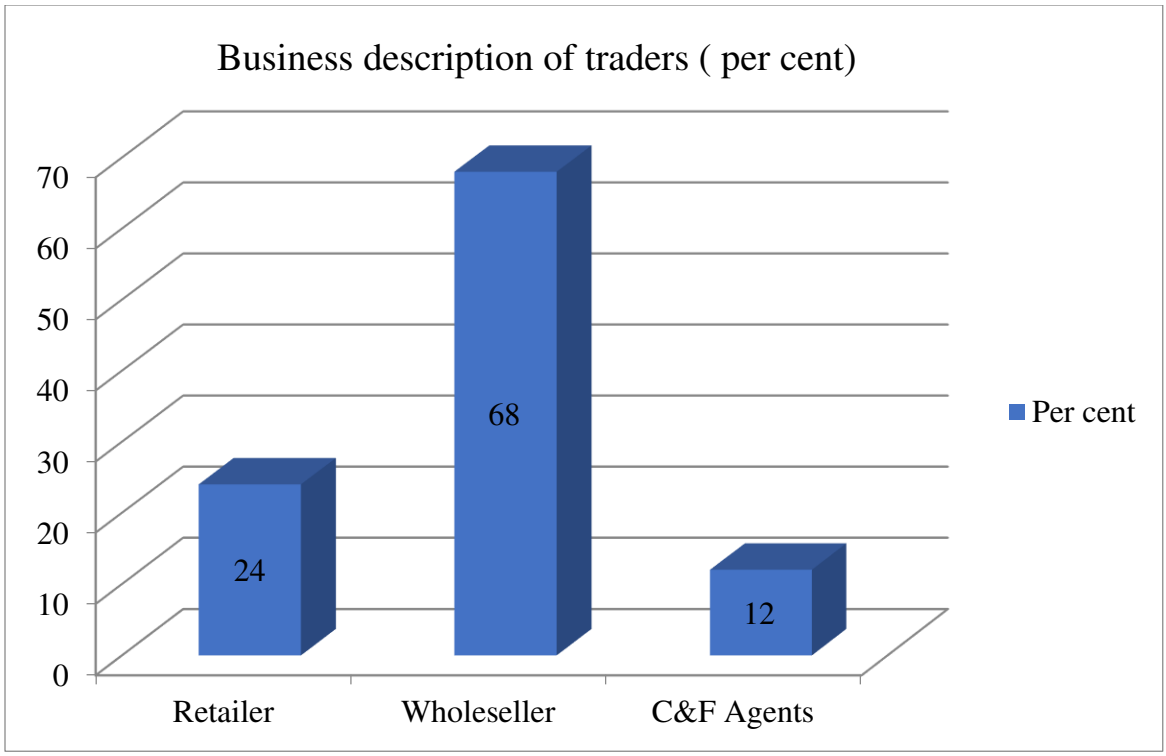

Fig 5.1: Business description of traders (per cent)

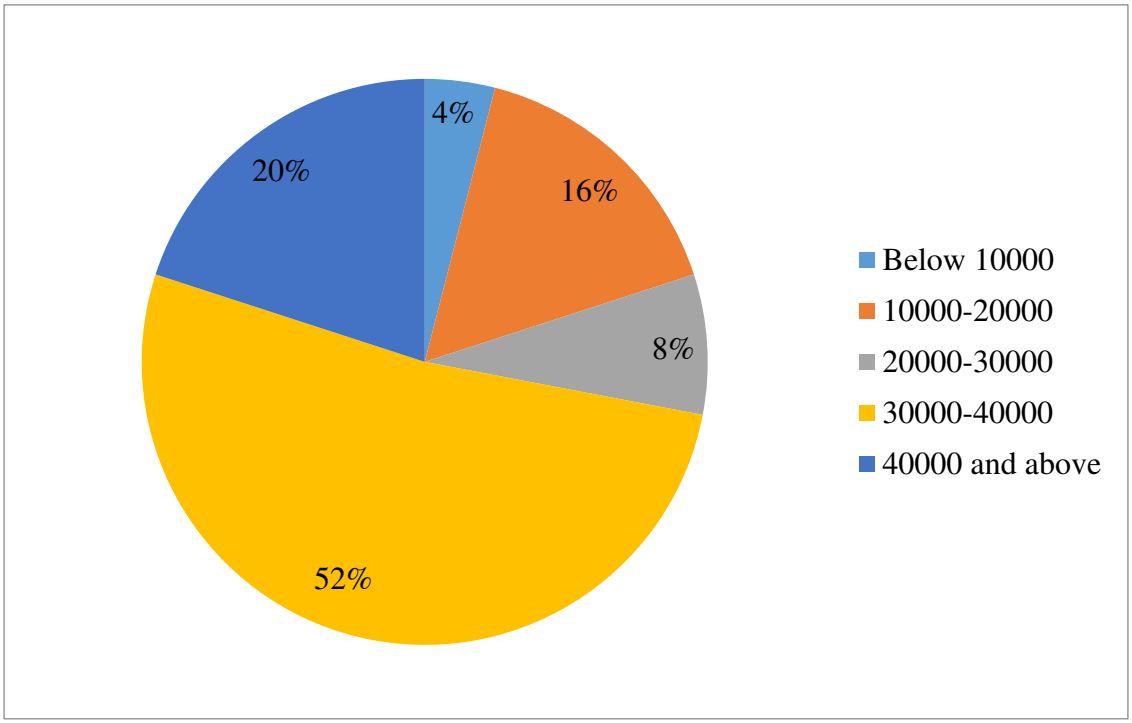

Fig 5.2: Monthly income of traders from potato business only (per cent)

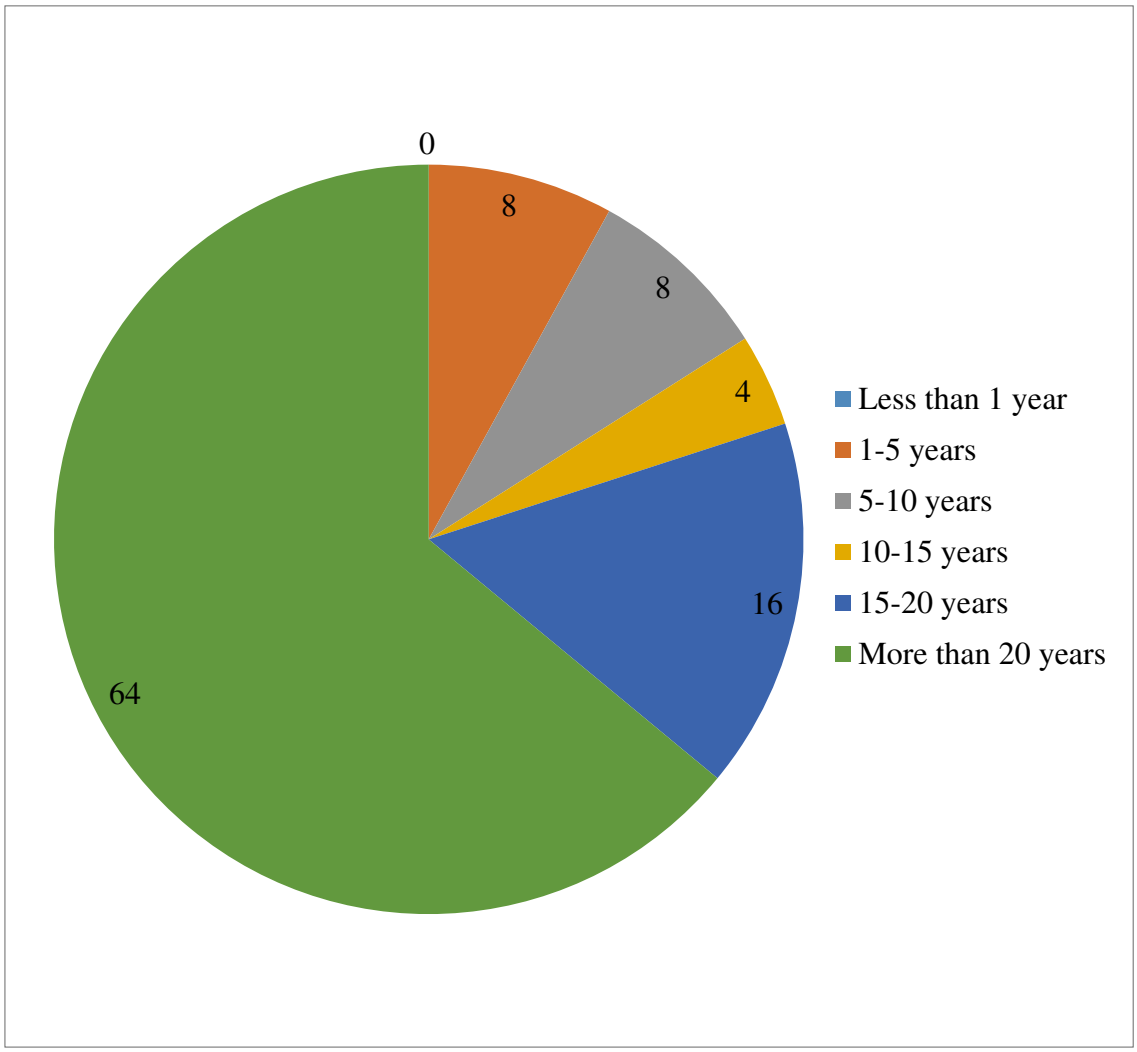

Fig 5.3: Experience in the business of potato (Per cent)

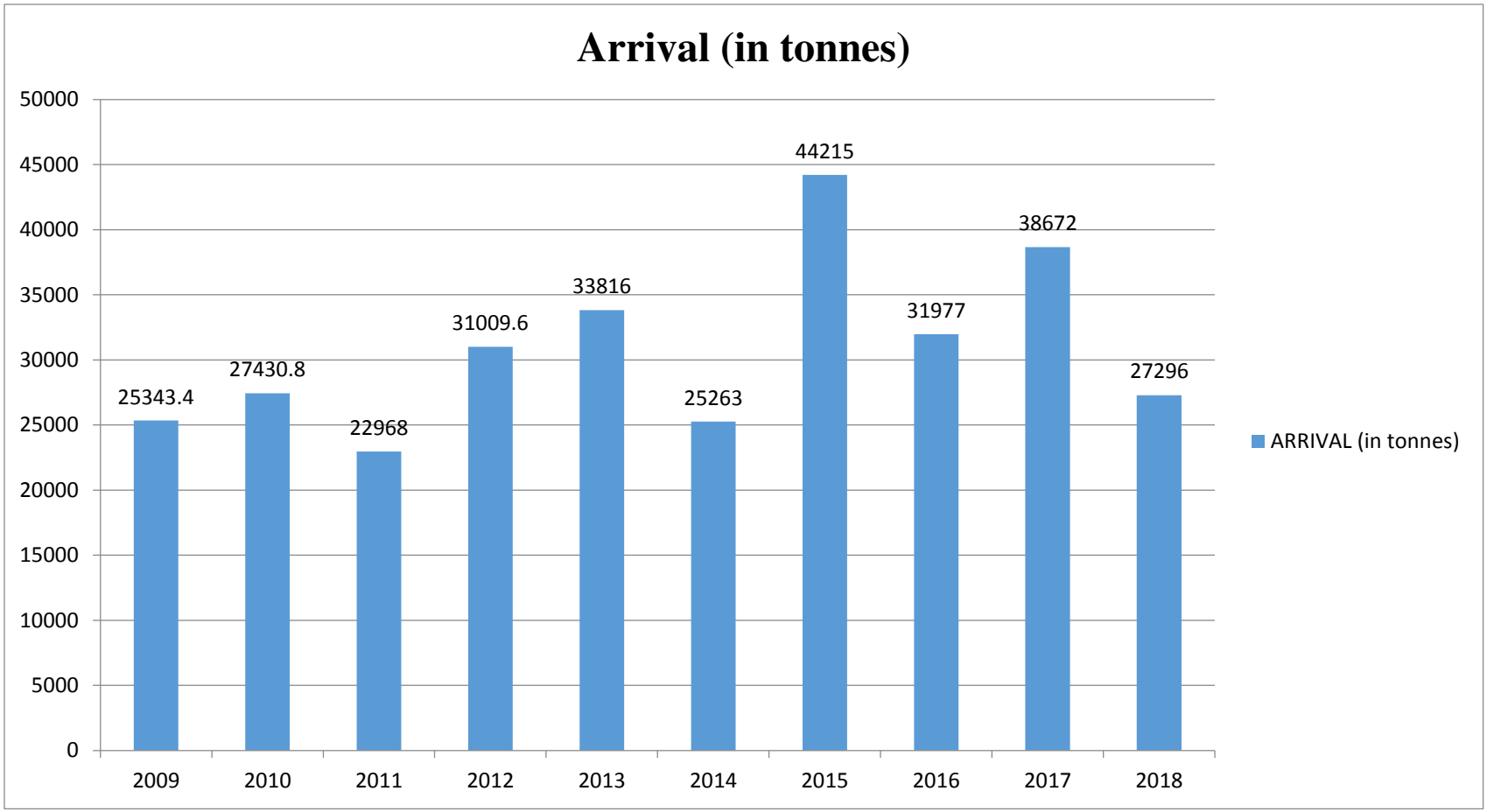

Fig 5.4: Depicting the annual arrival of potato (in tonnes) in Narwal Mandi Jammu

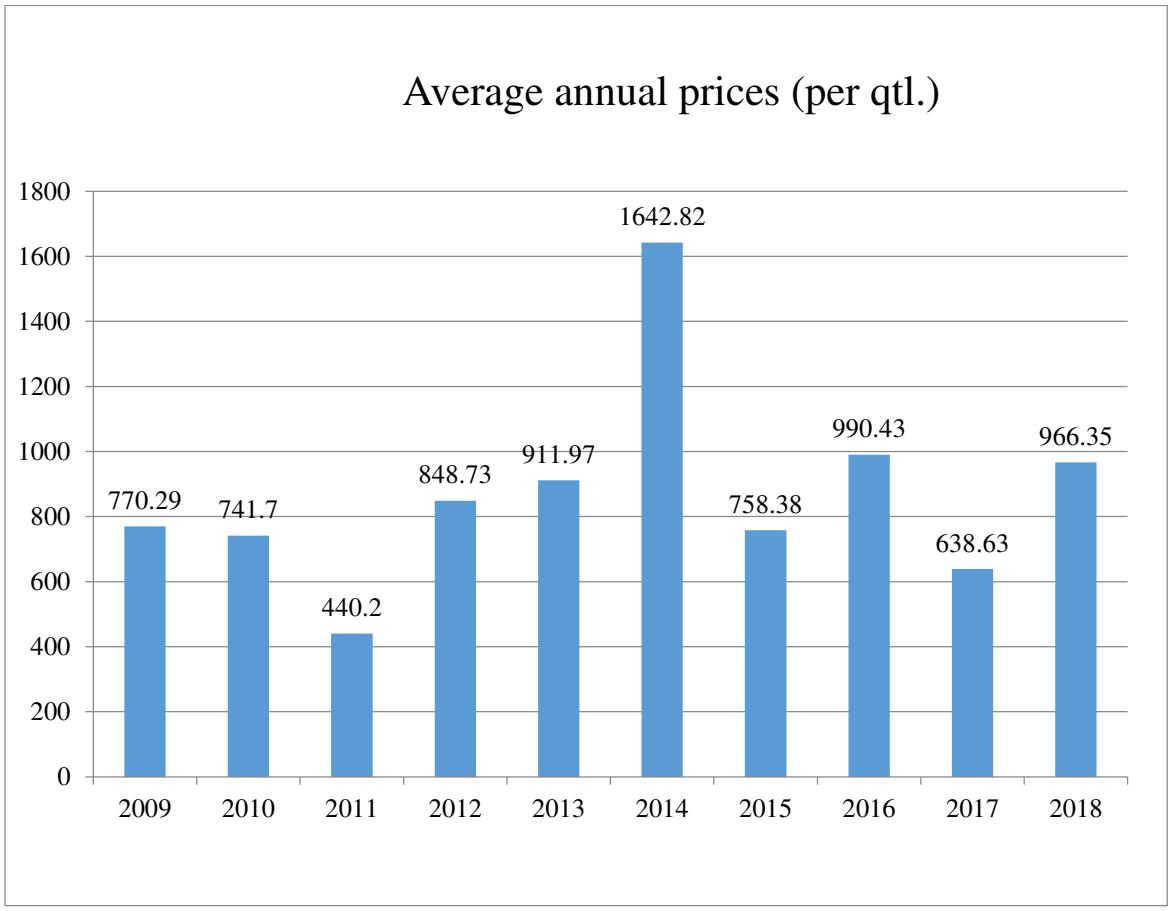

Fig 5.5: Average annual prices of potato in Narwal Mandi from year (2009-2018)

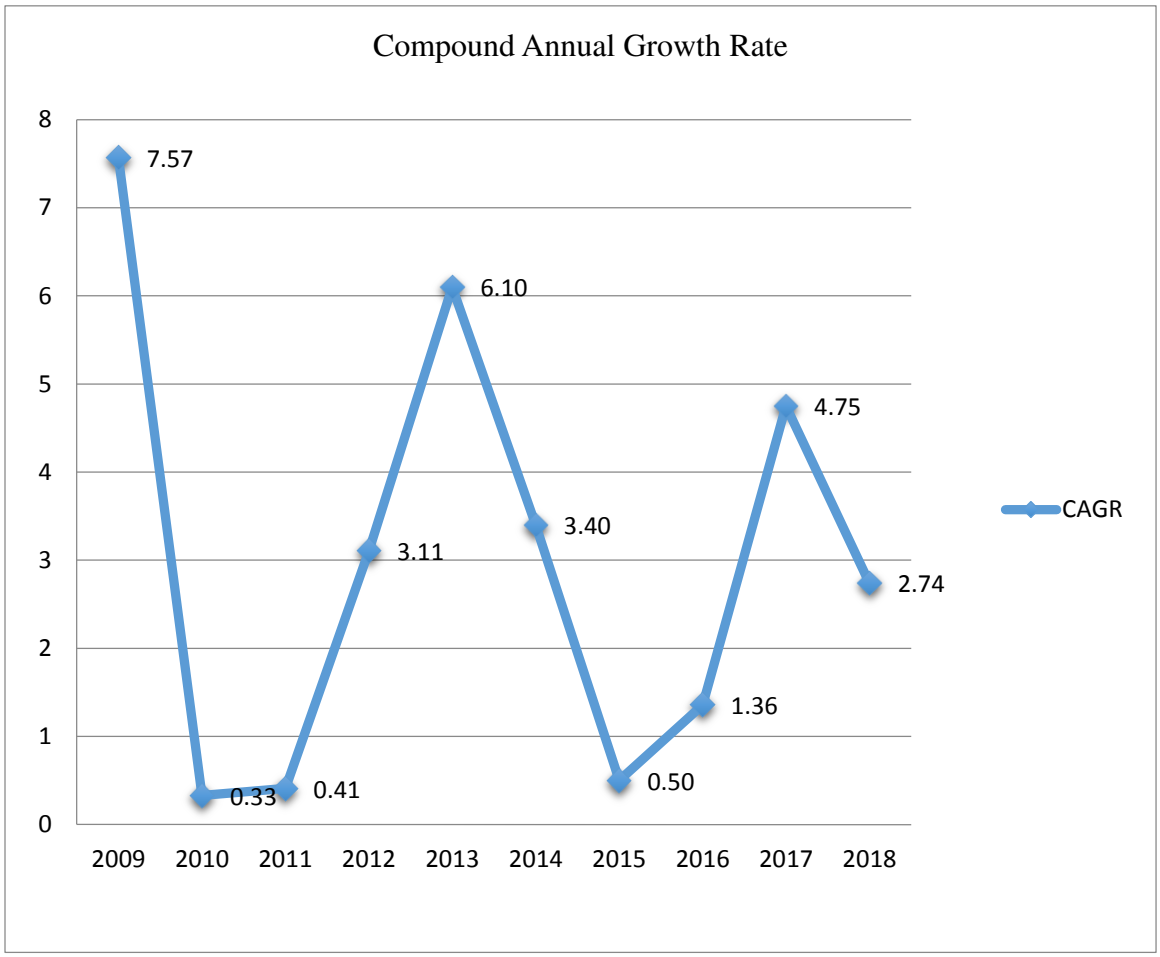

Fig 5.6: Compound annual growth rate of price of potato from 2009-2018.

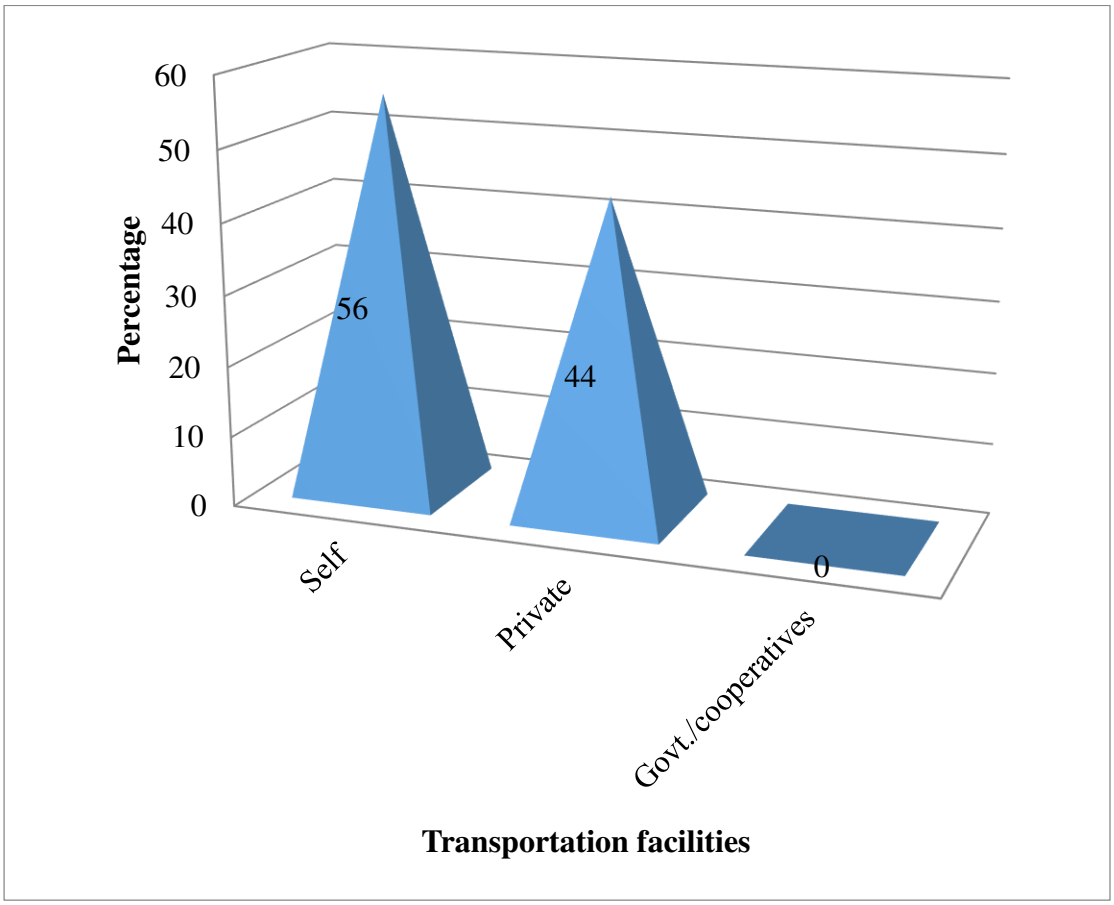

Fig 5.7: Mode of transportation for potato in Narwal Mandi Jammu

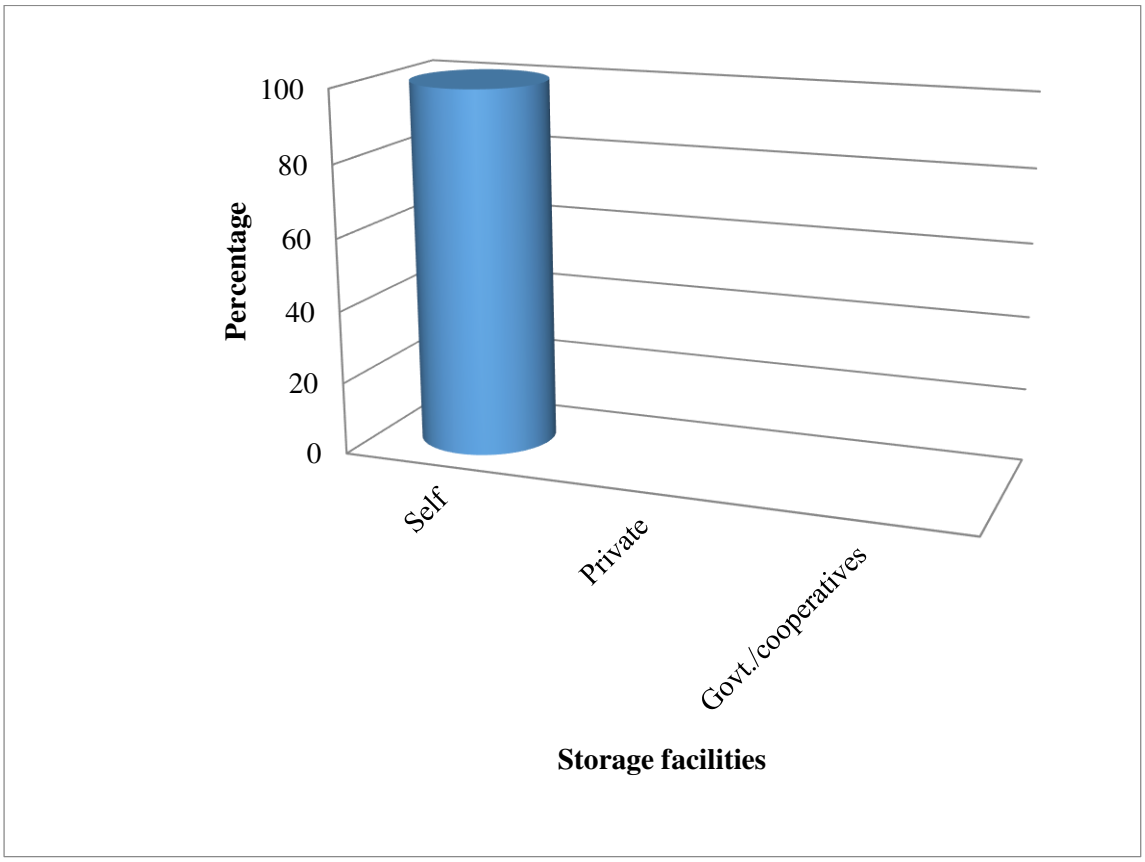

Fig 5.8: Storage facilities for potato in Narwal Mandi

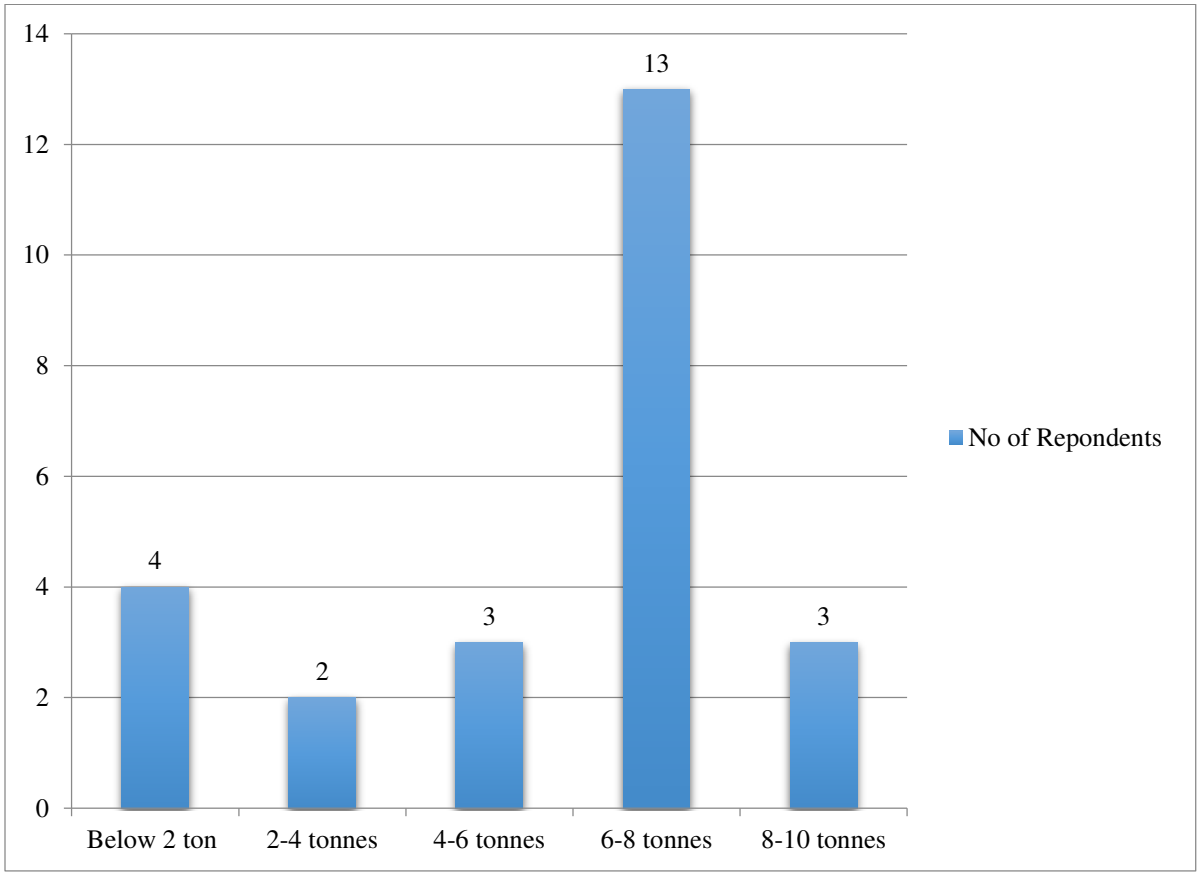

Fig 5.9 storage capacity of self made warehouses for potato in Narwal Mandi

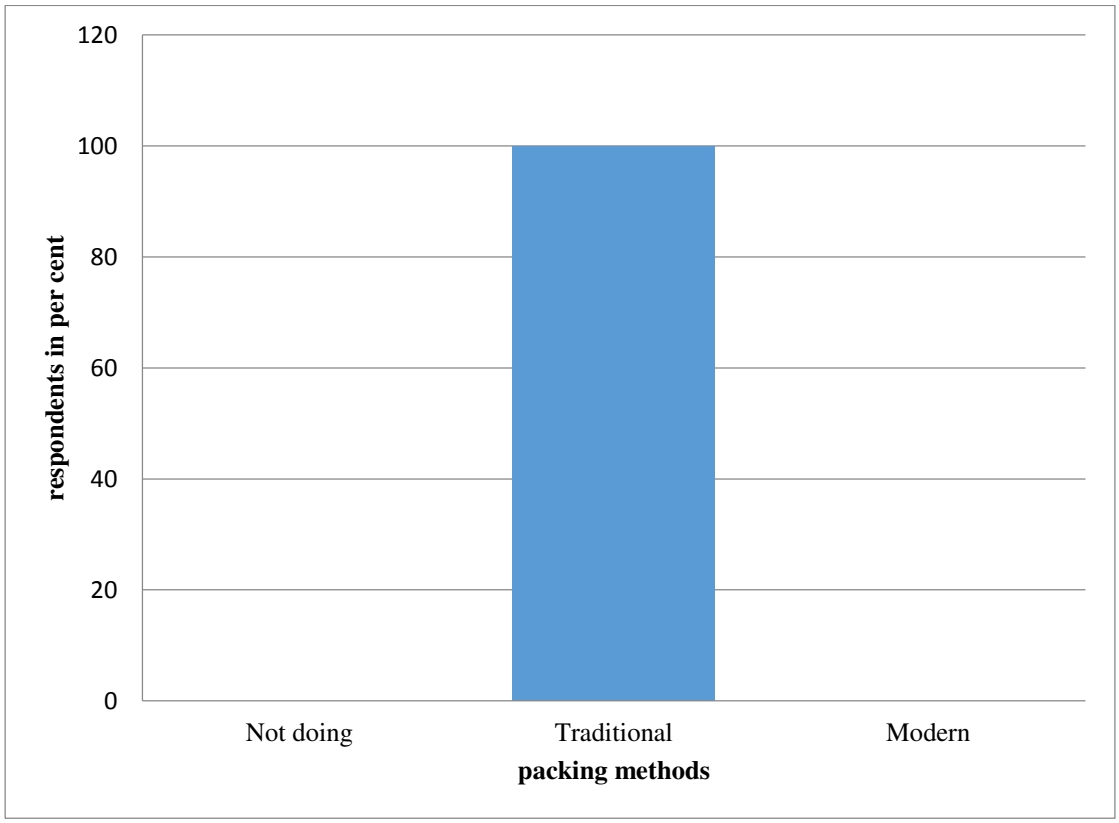

Fig 5.10: Grading methods for potato in Narwal Mandi (per cent)

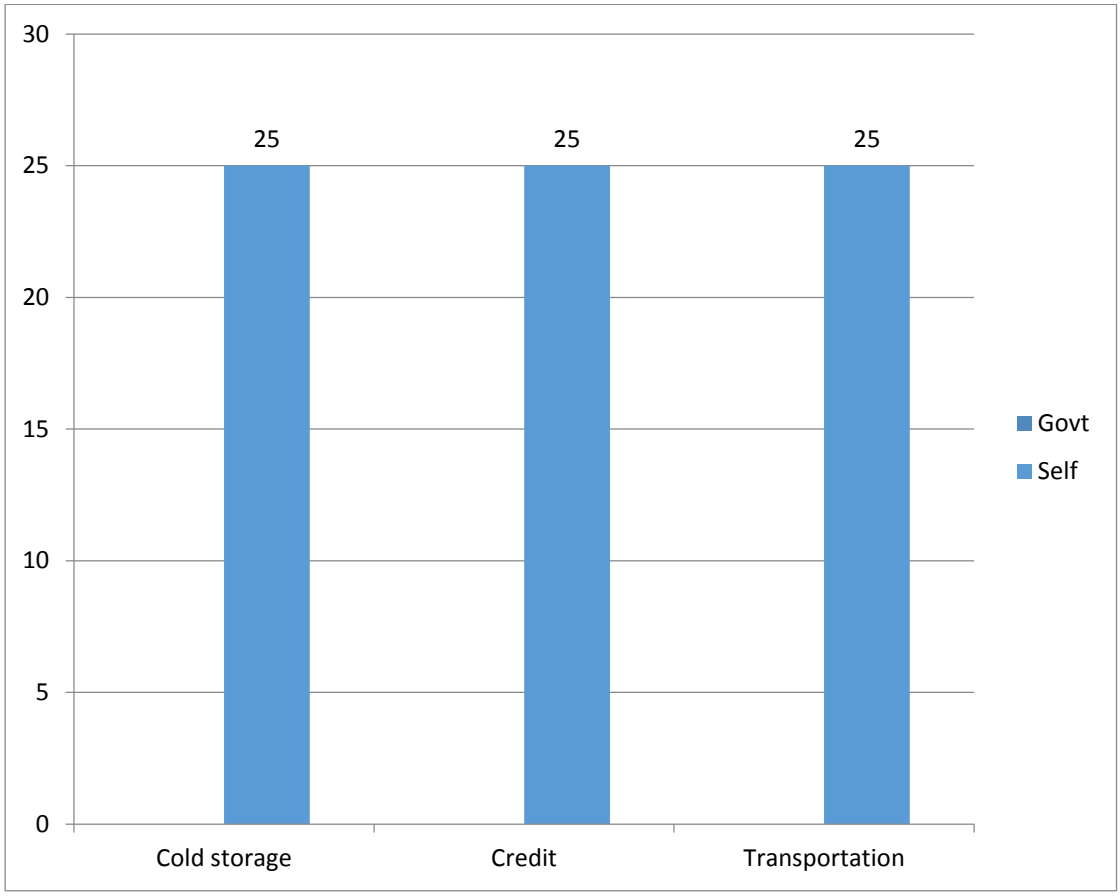

Fig 5.11: Facilities provided in Narwal Mandi

Certificate- IV

Certified that all the necessary corrections as suggested by the external examiner and the Advisory Committee have been duly incorporated in the project **Critical Analysis of Supply Chain Management in Potato in Jammu: A Case Study of Narwal Mandi** submitted by **Ms. Priyanka Sharma,** Registration No. **J-17-M-40-ABM.**

Dr. Jyoti Kachroo
Major Advisor & Chairman
Advisory Committee

Place: Jammu
Date: 14.11.19

Head
Division of Agricultural Economics and ABM

14/11/19

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VITA

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University and Year of Award	**:**	Shri Dev Suman University Tehri Garhwal.
Percentage	**:**	84.5%
Masters Degree	**:**	MBA (ABM)
University and year of award	**:**	SKUAST - Jammu (2019)
OGP	**:**	8.75/10