An Integrated Report
On

The collaborative study of Eight Agricultural Value Chains

In the Tribal District of Chhotaudepur, Gujarat

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Preface

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Centre for Social Entrepreneurship and Enterprises (CSEE) of Institute of Rural Management Anand (IRMA) in collaboration with Shroffs Foundation Trust(SFT) had conducted value chain study of 8 crops in the most backward district Chhotaudepur which was predominantly a tribal population. As value chain for each crop consists of many activity players, it is important to prepare a report which will be shared to all such activity players and also to other players who can influence an impact on some important activity players through technological and other interventions. To achieve the same some innovations too can takes place for the obtaining social and monetary benefits to some stakeholders. This report is developed to help researchers and other organizations that are in the field of agricultural extension services and interventions

I hope this report would be useful for academicians and practitioners in agricultural/agribusiness field.

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Acknowledgement & Research Team

SFT has worked with Tribals of Chhotaudepur for strengthening their agriculture based livelihood focusing on scientific agriculture practices, balanced use of inputs from sowing to harvesting and post harvesting management. The journey has reached to take it forward to market and value addition. In this context it became imperative to understand the potential of value chain of major crops of the area. The experience of institute like IRMA having national repute and exposure would add value to the outcome to make the study findings applicable. With this noble intension SFT and IRMA jointly agreed to carry-out this study.

It was with their valuable guidance, inputs and agreement to share the financial costs for conducting this study that made it possible for SFT to decide upon actually implementing this research study on ground. The positive support from IRMA Project team in Prof.M.V.Durga Prasad (CSEE Member) & Prof. Shambhu Prasad Chebrolu (CSEE Coordinator) and kind approval from IRMA director set the motion for carrying this study forward.

SFT management, particularly the Management Trustee Smt. Shrutiben Shroffs took personal interest to make this study happen despite her fragile health and that proved to be a motivating factor for the team at SFT to complete this study which was otherwise a highly disjointed exercise for several reasons.

The support from the Faculty of Social Work, M.S.University, Vadodara and Agriculture College at Jabugam in Chhotaudepur is so valuable that the project team can't think of this study without their contribution in carrying out the survey so essential for the study.

The research team of SR&D Cell at SFT Research Team all the villagers who gave their invaluable time and information) supported by SFT staff at Vadodara as well as Chhotaudepur and Jetpur-pavi made it possible to actually take this study to its logical conclusion.

Acknowledgement is also due to the officials of TAL at Chhotaudepur, APMC officials at Chhotaudepur, Jetpur-pavi, members of Rangpur cooperative and those at Tejgadh cooperative and several others whom we met in due course of the study and benefitted from their experience and insights in the field of agriculture in the study area. We also acknowledge the contribution of all concerned whom we might have missed to mention here.

Social Research and Development (SR&D) Cell
Shroffs Foundation Trust (SFT), Vadodara

Executive Summary

IRMA & SFT have agreed to conduct a value chain study of 8 agricultural crops namely paddy, maize, black gram, gram, 2 vegetables (okra and brinjal) and a fruit (mango). The Centre for Social Entrepreneurship and Enterprises (CSEE) at Institute of Rural Management, Anand (IRMA) aims at undertaking research focused towards inception, growth, issues and impediments to social entrepreneurship and enterprises and promotes efforts of individuals, and organizations towards establishing sustainable organizations with a primary objective of creating social surplus more than organizational and individual surplus. It would promote entrepreneurship among IRMAns and support them through networking with other organizations to create viable organizations oriented towards overall mission of IRMA, as also seek interfaces with Government programs to promote social entrepreneurship and enterprises.

The Social Research & Development (SR&D) Cell at Shroffs Foundation Trust (SFT) will strive to combine the cutting-edge knowledge from various scientific fields for devising development interventions and converting them into practices which ultimately benefit the communities. This union of field level expertise (or experience) of SFT with the forces of specialized research knowledge (institutes and Universities) will be aimed at promoting sustainable development that leads to blending of scientific knowledge with the social and ecological context in such a way that can quickly be put into practice so that the learning can be made available for larger public interest.

Main objective of this study is to understand the role and activities of all players in the entire value chain of 8 study crops, impact of interventions taken up by SFT and feasibility of developing some entrepreneurship programs for enhancing better livelihoods for the producers. Purposive sampling was employed to sample 10 villages in both Chhotaudepur and Jetpur-pavi talukas of Chhotaudepur district.

To achieve the above mentioned objectives, interactions with major activity players were conducted in the form of interviews with structured questionnaires and focused group discussions with producer groups. Research methods like regression and discriminant analysis were used to study and analyse the data. SFT's technological and entrepreneurial interventions were studied and analysed with sustainability and social impact.It was observed that majority of farmers use hybrid seeds for all the crops except for pulses where they use local seeds. Maize and vegetables are produced throughout the year. In the kharif season nearly two thirds of the land utilized for growing paddy and maize. During the study it was felt by farmers that input

services play an important role in achieving the objective of maximizing the productivity. Majority of the farmers felt that input services should be strengthened. Decision making by farmers in terms of crop selection and right inputs can be improved if Information related to market and other areas are available to them at right time. However training and other services provided to the farmer community have been utilized in an optimal way.

Similarly other Suggestions and improvements in the respective interventions were developed. In this study it was observed that forward linkages have to establish for all the crops even though certain innovations and interventions have been done by SFT. It needs to explore organizations that can do marketing interventions, technological interventions/ innovations for some crops. Option of forming farmer producer organization was also suggested for improvement.

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List of Abbreviations

APMC	Agriculture Produce Marketing Committee
APY	Area-Production-Yield
DPAP	Drought Prone Area Program
DST	Direct Subsidy Transfer
ECGF	Enhanced Credit Guarantee Fund
EMI	Equated Monthly Installments
FGD	Focused Group Discussion
FPO	Farmer Producer Organisation
GCA	Gross Cropped Area
GIA	Gross Irrigated Area
INM	Integrated Nutrition Management
IPM	Integrated Pest Management
KVK	KrishiVigyan Kendra
MSP	Minimum Support Price
NABARD	National Bank For Agriculture And Rural Development
NCA	Net Cropped Area
NFSM	National Food Security Mission
NPM	No Pesticides Managed
NPP	Non-Pesticides Pulses
PES	Payment for Environment Services
SFAC	Small Farmers' Agri-Business Consortium
SFT	Shroffs Foundation Trust
SWOT	Strength-Weakness-Opportunities-Threats

Chapter – 1 Context to the Value Chain Study

1.0 Introduction

Indian agriculture is a story in transition. The planned economy of India functioning through Five years Plans regulated this sector since the first Five Year Plan (1951-56) of India. Since 1991, India has chosen the path of liberalization in order to benefit from the process of economic globalization. This process of integrating the Indian economy into larger global economy has been constantly debated and contested through close scrutiny of its performance on various parameters. One of the most important parameter for which this process has been evaluated most is its impact on the poor as these processes influence the agricultural sector immensely which is still the key sector in terms of providing the employment and livelihood to the rural poor in India.

The agriculture sector is immensely affected by government policies, programmes and the role of private sector in terms of trade, availability and cost of inputs, and new investments in the agribusiness sector, including the latest in form of food retail in India. The role and influence of initiatives in food production and trade determine the exact impact of government actions as well as those of globalization on the poor producers and workers.

In order to understand the above mentioned impact or the status of producers and workers in the agriculture sector, it is important to understand the situation of various agricultural Value Chains in rural India as actual actions and the dynamics play out there leading to an outcome that affects the agriculture based economics and the rural poor.

Tribal regions of India constitute some of the poorest demography of the country. These regions are yet to catch up with the globally acclaimed Indian success story. Tribal communities across the country are mostly dependent on the forest and agriculture based livelihoods except a very few areas which are exposed to heavy industrialization and urbanization. Given the legal barriers on the utilization of forests for human use, it is the agriculture which becomes the mainstay of day to day livelihood security for tribal communities in the country.

Hence, it is important to understand various facets of the agricultural Value Chains of these areas in order to identify the areas of improvement necessary for the betterment of overall socio-economic environment of such areas.

It is in this context, a collaborative research project was conceived and implemented beginning June, 2016 by Social Research & Development (SR&D) Cell of Shroffs Foundation Trust (SFT) at Vadodara and Centre for Social Entrepreneurship and Enterprises of Institute of Rural Management (IRMA) at Anand. Thematic area of this research project focused on development of women farmer entrepreneurship based on the agricultural Value Chains of 8 key crops in the tribal district of Chhotaudepur in Gujarat.

1.1 About Collaborative Partners: A brief profile of both the project partners is given as follows:

About IRMA

The Institute of Rural Management Anand (IRMA), established in 1979, is the pioneering academic institution in rural management education and research. It is committed to pursuing excellence along with creativity and integrity. The unique strength of IRMA lies in its ability to integrate development and management in all its endeavors and activities. This sets IRMA apart from other management and rural development institutions, which are largely concerned with either management or development, but not with both. Today, IRMA is recognized not only as an institution of excellence in teaching and research, but also acknowledged for having successfully created the new discipline of rural management. This path-breaking approach of IRMA is being emulated by other institutions in India and abroad.

IRMA's mission is to promote the sustainable, eco-friendly, and equitable socio-economic development of rural people through professional management. The core of IRMA's operating philosophy is to build and sustain a partnership between rural people and committed professional managers. Through this, IRMA strives to contribute to the promotion of sustainable development and social justice in India's rural society. IRMA strives to achieve this mission by

- Educating a new breed of professional rural managers having the appropriate values and ethos for helping rural organisations and institutions in professionalizing their management and empowering rural people through self-sustaining processes;
- training policy makers, directors, general managers, and those in charge of specific managerial functions in such enterprises and projects;
- building new rural management knowledge and theories through action-oriented and problem-solving research and consultancy; and
- Influencing public policies through policy-oriented research and consultancy.

IRMA has sprawling 60 acres of lush green campus with state-of-the-art infrastructure with fully computerized activities, excellent library, 24 hours Internet connectivity and all the modern teaching aids providing tranquil ambience for learning.

Academic Programmes of IRMA

As a premier academic institution in the field of rural management, IRMA has evolved unique curricula for its various programmes and activities of IRMA are described below.

Postgraduate Programme in Rural Management (PRM) for those who wish to take on challenging managerial responsibilities in institutions working in the rural sector. PRM is recognized as a Master's degree by the Association of Indian Universities (AIU) and is also approved by the All India Council for Technical Education (AICTE).

Doctoral Programme titled Fellow Programme in Rural Management (FPRM) for participants and professionals seeking careers in research, teaching, and specialized knowledge-based positions in rural management institutions. FPRM is approved by the AICTE as a doctoral programme in rural management.

Management Development Programmes (MDPs) are meant for middle and senior-level in-service managers and officers of the union government, state governments, NGOs, and cooperatives working in the area of rural development. IRMA conducts many MDPs on various themes of development and management, ranging in duration from one week to six weeks. IRMA has conducted over 800 training programmes with an enrolment exceeding over 16000 professionals.

Research and Consultancy services are a means of enriching the quality and content of teaching and training. This continuous up gradation puts us in an enviable position of serving our clientele more efficiently by helping them identify and resolve their critical management problems. The union government, state governments, NGOs, cooperatives, and national and international donor agencies are major clients of IRMA. Over the years, faculty members of IRMA have completed a large number of research and consultancy studies and assignments. Over the years, faculty members of IRMA have completed over 700 research and consultancy studies and assignments.

Centre for Social Entrepreneurship and Enterprises, IRMA, Anand

This Centre aims at undertaking research focused towards inception, growth, issues and impediments to social entrepreneurship and enterprises and promotes efforts of individuals, and organizations towards establishing sustainable organizations with a primary objective of creating social surplus more than organizational and individual surplus. It would promote entrepreneurship among IRMAns and support them through networking with other organizations to create viable organizations oriented towards overall mission of IRMA, as also seek interfaces with Government programs to promote social entrepreneurship and enterprises.

Shroffs Foundation Trust (SFT), Vadodara

- Chhotaudepur district is one of the most under developed areas of Gujarat. It has predominantly a tribal population dependent on rain-fed agriculture on their small and marginal land holdings. Thirty years back the area was marred by very low levels of literacy, lack of infrastructure and communication facilities and hence almost untouched by development. Most farmers in the area were ignorant about the latest development and technology in the field of agriculture hence prone to drudgery. Lack of awareness about the government schemes for their benefit and absence of market linkages only added to their woes. Farmers had to travel almost 40 km. to procure their inputs and the concept of (Agriculture Produce Marketing Committee) APMC was a distant reality.
- Shroffs Foundation Trust (SFT), an NGO of national repute began its journey of social development in the year 1987 and entered this area in this erstwhile Chhotaudepur block of Vadodara district in the year 1995 and in the adjacent Jetpur-pavi block in 2009. The philosophy (*SEVA, SADBHAVNA and VIKAS)* of the organisation has been driving this process in order to achieve *GaribiMukt, PradushanMukt, ShoshanMukt, PoshanYukt, and NyayYukt Society*. Broadly SFT adopted 'Man-making' as an approach for social transformation and 'Total Area Treatment' as an approach for economic transformation.
- Community development programmes have been at the heart of the SFT. Beginning its journey from a cluster of 7 villages around Kalali village in Vadodara; today the scope of SFT's activities has expanded to more than 400 villages of Gujarat. As SFT evolved as an institution, all the

dimensions necessary for the sustainability of its programmes were gradually interwoven in the management practices and its programmes.

- Geographically, it covers two extreme ends - vulnerable tribal belt of Chhotaudepur bordering Madhya Pradesh in the east and ecologically fragile areas of Kutch on International border in the West. This journey impacted almost every aspect of the marginalized communities from these areas which included Agriculture, Animal Husbandry, Livelihood, Land and Water Management (Natural Resource Management), along with Health and Quality Education. Today the influence zone of SFT initiatives is much wider as its educational and vocational training initiatives benefit the populations beyond the geographical boundaries of the above mentioned project areas.
- SFT's journey over three decades has been to empower those at the bottom of the pyramid through capacity building to enable them to rise from poverty and deprivation to prosperity. SFT began its developmental journey by focusing on women along with the total development of the area through watershed development activities, agriculture development activities, literacy campaigns, drudgery reduction through agriculture mechanization, providing drinking water facilities, formation and strengthening of Self Help Groups (SHG) of tribal women which were further linked with various income generation programs.

- SFT chose a path of value based social and economic empowerment of local tribal population. This also meant creation of sustainable social enterprises with central focus on Human Development- simply defined as a process of enlarging choices by increasing both capabilities and opportunities. SFT recognized this fact and built in economic growth as one of the important means of developmental planning in its projects. The persistent efforts of SFT through several such initiatives attempted to ensure that this achieved income makes an important contribution to human well-being translated into more fulfilled human lives.
- SFT operationlizes its developmental interventions through four divisions namely: Development, Medical and Public Health, Education and Training; and Livelihood function through Shardadevi Gramudyog Utpadak Sahkari Mandli" (SGS). SGS is an enabling platform for empowering the tribal women from this area and operates in 36 villages with 162 SHGS and 1534 tribal women as primary members – owners of the society.

1.2 About Collaborative Research on 8 agricultural Value Chains in the tribal district of Chhotaudepur in Gujarat

Given the complementary goals of the above mentioned organizations, it would be prudent to identify common areas of research interests catering to the ultimate objectives of both the institutions. The Centre at IRMA was interested in conducting a collaborative research project on agriculture based entrepreneurship development with an organization which is strongly grounded in implementing the community based entrepreneurship development programmes. This required studying Value Chains of key crops as a backdrop to their main focus on entrepreneurship.

The Cell at SFT was about to initiate a study for conducting an enquiry into the Value Chain of five major crops (Maize, Paddy, Wheat, Black Gram and Gram), two vegetables (Brinjal and Lady Finger or Okra) and a fruit (Mango). These crops have been introduced as part of SFT's initiatives for sustainable agriculture

in two tribal blocks (Chhotaudepur& Jetpur-Pavi) of recently created new district of Chhotaudepur near Vadodara.

It seemed to be an ideal opportunity where both these institutions could jointly conduct the proposed study where IRMA's academic strength complemented the rich grass-root experience of SFT. This study aims at producing a quality research output that can help in understanding the Value Chain of 8 crops mentioned above and also develop insights on entrepreneurship development experience with respect to these crops in the study area.

Expected Outputs

- A jointly published research paper on agriculture Value Chain based entrepreneurship development in the tribal regions of Gujarat.
- An integrated report on Value Chain study of five major crops (Maize, Paddy, Wheat, Black Gram and Gram), two vegetables (Brinjal and Lady Finger or Okra) and a fruit (Mango) or in different words the Value Chains of these crops were supposed to be part of this study.

Role of associated Organization

Centre for Social Entrepreneurship and Enterprises, IRMA, played role of knowledge management by associating their faculty (2 Professors) focusing on identification of scope of entrepreneurship and Value Chain of the above mentioned crops.

SFT research team worked in close coordination with IRMA team focusing mainly on facilitating the fieldwork, local contacts and local hospitality in addition to jointly working on the technical aspects of the study.

Chapter – 2 Rationale for the Value Chain Study

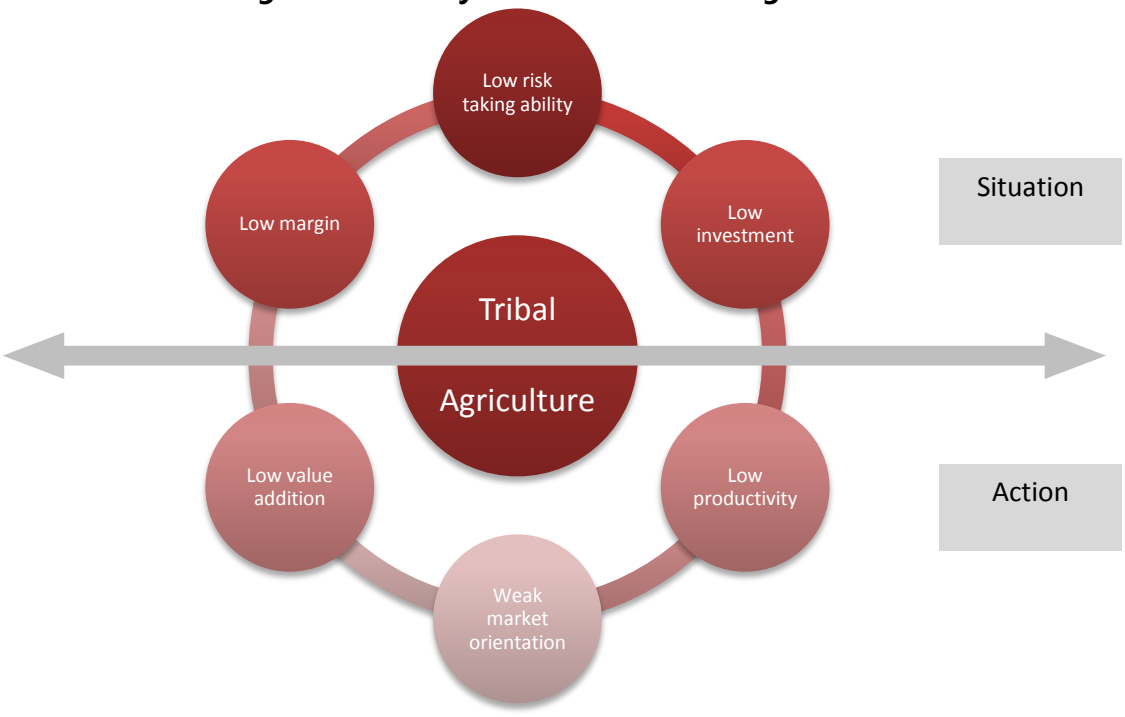
2. Story of the Tribal Agri-producers

The tribal agriculture producers face challenges from the beginning of the crop production. Their constraints may be understood by understanding the socio-political & economic background under which they perform their livelihood activities. The functioning of value chain in present situation can be better understood in context of the following root causes.

- Most of them are small (1.5 ha average holding) …they do not have bargaining power
- All of them live in hinterlands (remote villages) …they do not have access to real time information (prices, weather)
- They are originally forest dwellers.....agriculture is relatively new occupation for them
- Most of them are living below poverty line (BPL) condition.....high dependence on credit, have poor risk taking abilities and scope for innovations
- Before few generations their needs were limited and getting satisfied from local resources.....they are learning concepts of selling/buying and interacting with markets.
- They are illiterate or less educated.....they do not able to use available information, understand scientific terminologies, take benefits of Govt. programmes.
- Compounded by weak infrastructure- Physical, Social, Institutional

The resultant situation of the root cause translates in to following vicious cycle for tribal agriculture. As shown in Fig-2.1 the low risk taking abilities leading to low investment and low margin are known situation, which can be changed by addressing the three situations depicted below the horizontal arrow.

Fig-2.1 Vicious cycle of Tribal farmer agriculture



2.1 Profile of the Study Area

Chhotaudepur is predominantly a tribal district recently carved out from the erstwhile Vadodara district. The district has an agrarian economy. According to 2011 census, it has a population of 1056756 from 1.66 lakh families and 95 % of them reside in rural areas. The population density is 312 persons / sq. Km. The tribal community comprising of Rathwas, Bhils, Naykas, Tadvis and Vasavas constitute almost 66% of the total population in the district. The gender ratio at 956 is much better than the state. Around 30 years back this area was marred by several evils. The literacy rate was very low, especially among women. Mass migration and parents' apathy accounted for a high rate of school dropouts. Lack of awareness about health services and illiteracy made them to seek treatment from '*Bhua*' – the traditional healers and '*dais*'- the traditional birth attendants.

Agriculture in the area was nomadic / primitive in nature. Population in the area simply spread the seeds on open plots and whatever was produced at the end of season was their harvest! Modern agricultural practices since then have been gradually seeping in with the entry of various other stakeholders. Absence of scientific animal husbandry prevented them from developing it as an alternate livelihood. Unfortunately people in this area could not identify issues affecting their lives and hence never thought to overcome the situation. Government, NGOs like SFT and other social welfare organizations intervened in this area to address these issues.

Total geographical area of the district is 343616 hectares of which around 72% is under cultivation. The forest cover of the district is 21% hectares. Of the total agriculture land use in this area, the net sown area is 248664 hectares. Total 21% of the agriculture land is having irrigation facilities. The sources of irrigation are canals (Narmda and Sukhi dam), open dug wells, ponds, bore wells, open wells, farm ponds and lift irrigation schemes. Predominantly kharif crops are grown in the district but rabi crops are also cultivated. The principal kharif crops are maize, paddy and tuar. Other kharif crops include cotton, black gram and vegetables. The principal rabi crops are Maize, ground nut, wheat and vegetables. The Chhotaudepur and Jetpur-pavi blocks covered under this study are rated as one of the most under developed areas of Gujarat. Hence, majority of the villages in this area were covered under Drought Prone Area Program (DPAP) category and villages adopted by Chief Minister of Gujarat.

Earlier, the region used to face chronic water shortage in spite of average annual rainfall of 890 mm! Agriculture centric economy of the area was marred by soil erosion due to massive deforestation, unawareness about methods of soil and water conservation; and dependency on rain-fed agriculture which resulted in forced migration during lean seasons. Some of the key factors necessary for agriculture in this area have been analyzed and discussed in the following paragraphs.

2.1.1 Rainfall pattern in Chhotaudepur district

The climate of the study area is extreme with large variations in temperature. The district receives rain from the south-west monsoon during the months of June to September. The rainfall trend based on 32 years annual rainfall of Chhotaudepur shows that overall rainfall is declining. Average rainfall for three and five year periods as shown in the Figure-2.2 below, point to an interesting phenomenon that three years average is close to normal rainfall but five year average rainfall is showing deviation from the

normal rainfall, which indicates that at least 2 years out of five years witness abnormal rainfall, i.e. either flood or drought.

Figure- 2.2 Average annual rainfall (1982-2012) in Chhotaudepur district

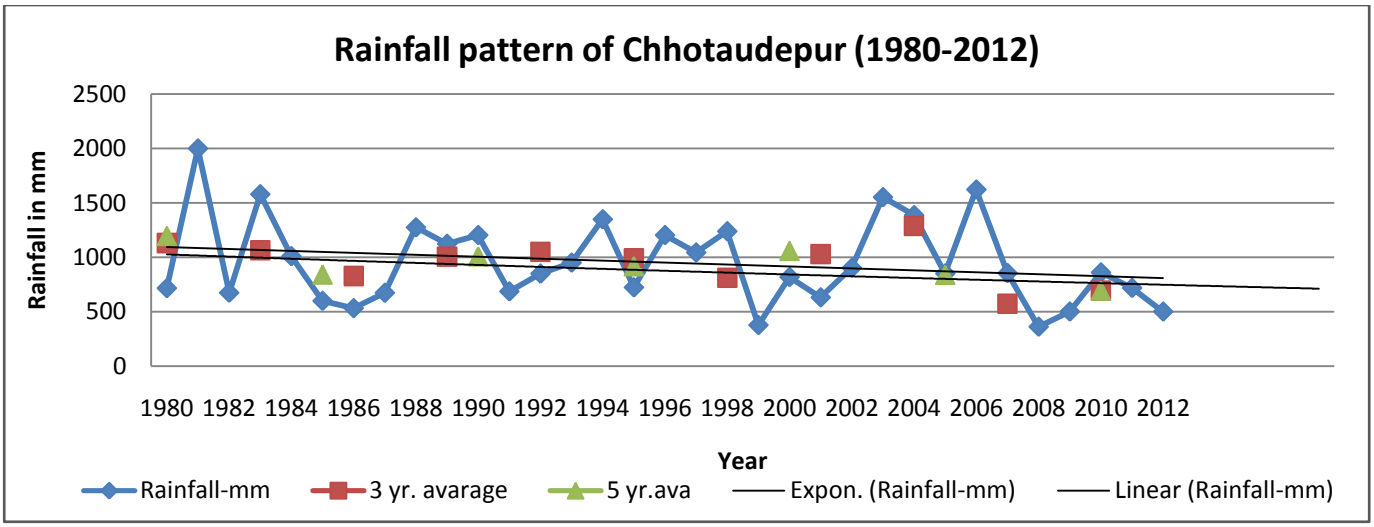


Fig.2.3 Change in cropping and Irrigated Areas in Study Talukas (2001-2011)

Details	Chhotaudepur		Change in NCA/ GIA (%)	Jetpur-pavi		Change in NCA/ GIA (%)	Total NCA/GIA in Study talukas		Change in NCA/ GIA (%)
	2001	2011		2001	2011		2001	2011	
Net Cropped Area (NCA)	36177	38513	6.46	51388	51722	0.65	87565	90235	3.05
Gross Cropped Area(GCA)	47050	49686	5.60	55578	71347	28.37	102628	121033	17.93
Gross Irrigated Area (GIA)	10873	11173	2.76	24121	25451	5.51	34994	36624	4.66

The Fig.2.3 above shows overall change in area under cultivation. Agriculture area including irrigated agriculture has increased in the study area. During the decade of 2001-2011 only 3% additional area was brought under agriculture but a major change has been brought by increased irrigation facilities in Jetpur-pavi block. The GCA increased by 28% in Jetpur-pavi, which led to overall increase in GCA of 18%.

Thus increased Gross irrigation of 5.5% led to 28% increase in GCA indicating that irrigation water is used effectively to generate more than two crops in Jetpur-pavi. On the other hand in Chhotaudepur taluka, same period witnessed higher change in NCA but the change in GIA has remained very less. This shows that majority of the farmers were able to grow only one crop. This also shows that agriculture has become more progressive in Jetpur-pavi block, which is having multi-season crops.

2.1.2 Cropping area in Study Talukas

The study area covers Chhotaudepur and Jetpur-pavi talukas of Chhotaudepur district. The total agricultural land available in these two taluka is 115413 ha. A major shift was witnessed in the area under main crops during 2001 to 2011. The area under all major crops has increased due to increase in

irrigation facilities and land development activities promoted by the state government (See, Figure-2.4). The area under Paddy, Cotton and Groundnut is rapidly increasing and so is the case of vegetables.

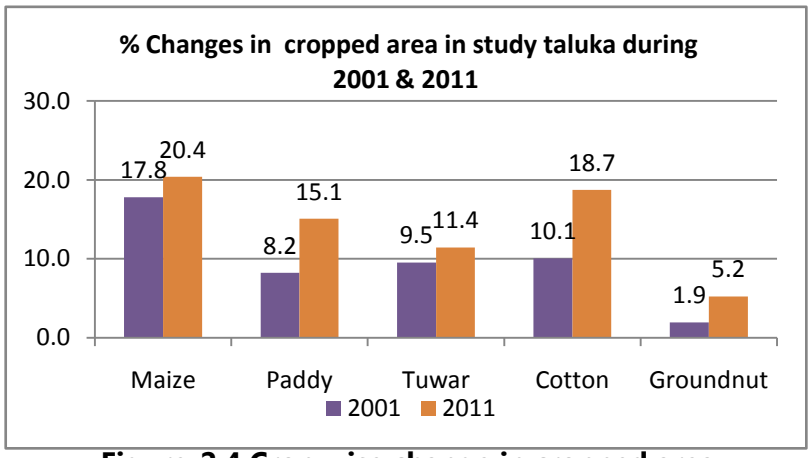


Figure-2.4 Crop wise change in cropped area (2001-2011) in Chhotaudepur district

Among above crops Maize, Paddy and Tuar are traditional crops grown in the area, while cultivation of cotton and ground nut is relatively new crops. The cultivation of these two crops has increased as the laborers from these talukas migrate to Saurashtra and other part of Gujarat where they have learnt cultivation of these crops. The increasing cotton cultivation can also affect food security of the tribal families who are largely dependent on maize and paddy as their staple food. Figure-2.5 below shows season wise extent of cultivation for key crops among farmers covered under study.

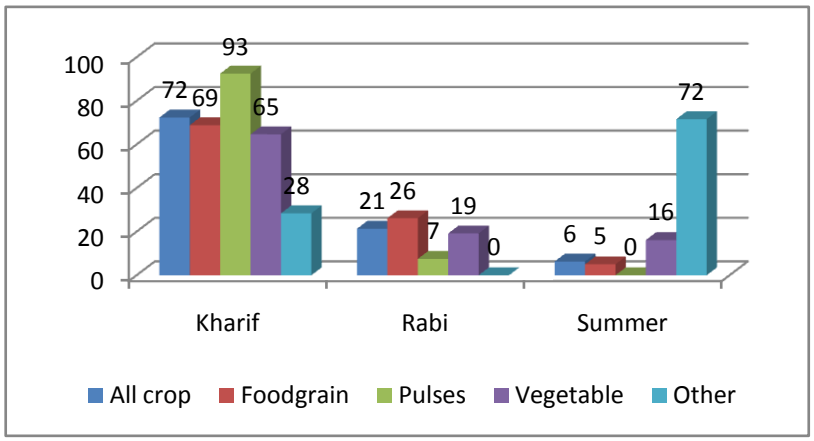


Figure – 2.5 Season wise cultivation of crops (in %) by surveyed farmers

It is interesting to note that most of the crops cultivated by the farmers during Kharif show higher percentages which may be due to heavy dependence on rain-fed agriculture in this area. It shows high dependency on Kharif season for overall crop production and food grain production. This heavy dependency on Kharif season under changing climatic scenario is big challenge for food and nutritional security of the families.

Cropping Pattern in the study area	% of Total
Total land (in acres)	**717**
Maize	33.2
Paddy	30.4
Tuar	14.9
Other crops	10.3
Black gram	9.3
Gram	2.0

Fig.2.6 Crop wise total cultivated area among surveyed farmers

The cropping pattern among the farmers covered under this study is shown in the Fig.2.6 below. It shows that maize and paddy are two prominent crops cultivated in the study villages. The reason for the same is that these crops are part of the daily diet in the tribal families and hence given an opportunity and natural conditions, farmers prefer to opt for its cultivation to ensure food security for their families.

As the availability of irrigation water gradually decreases from Kharif to rabi and then in summer seasons, farmers are unable to cultivate paddy in others seasons. But they cultivate maize on a smaller area in both Rabi and summer seasons as its irrigation water requirement is lower than that of paddy. Maize is a

traditional crop for the tribal area but since 2010 farmers have adopted the hybrid seeds promoted under a government project called "S*unshine*". The use of hybrid seeds has doubled the Kharif maize production and hence second and third cropping provide farmer an opportunity for selling the crop to meet their financial needs.

Fig 2.7 below shows percentage of the total farmers cultivating crops across all seasons. All 223 farmers are divided in to three farmer categories viz. small (> 1 acre), medium (1-2 acre) and large (<2 acre). This classification is customized according to land holding size in the study area. Nearly 50% farmers are from small farmer category, while rests of the two categories have 22% and 29% of total surveyed farmers respectively.

The percentage of the farmers cultivating single crop, two crops and crops taken by them across all seasons remain more or less same across all land holding categories. The reason for this pattern is access to water and labour force. About 1/3rd of the surveyed farmers are able to cultivate only one crop (Kharif) irrespective of land available with them. During Kharif season all these farmers cultivate either maize or paddy or both as mono crop or maize with tuar.

Details	% of farmers			
	Small	Medium	Large	Total
Total farmer	109	49	65	223
% of total farmers	48.9	22.0	29.1	100.0
Kharif only	35.8	30.6	36.9	35.0
K + R	45.9	51.0	47.7	47.5
All season	18.3	18.4	15.4	17.5

Fig- 2.7 Farmer category wise crop cultivation across seasons

The production and income data for the Maize and Paddy crop indicates that they earn in the range of Rs.8000 to Rs.17000/acre. Thus respective agriculture income for the small and medium land holding families will be maximum Rs.17, 000 to Rs. 34,000/acre/annum which is inadequate to meet the needs of a family with five persons. The approach of agriculture diversification is essential to elevate living standards of the families cultivating only Kharif crops.

2.2 Factors influencing Crop selection

The choice of crop and seed varieties depends on many factors. Based on the farmer survey done for the study, it is found that crop choice primarily depends on the size of the family and land holding. The 229 families covered under the farmer survey are further classified based on the size of the families and their land holding. The 229 families covered under survey were divided into three classes viz. 3 or fewer members, 4 to 5 and more than 5. Similarly, the 229 families were divided in to three land holding class viz. less than 1 acre, 1 to 2 acre & more than 2 acres. Accordingly the number of families identified under each class is shown in the Fig.2.8 below.

Fig. 2.8 Family size & landholding wise distribution of the surveyed farmers

Family size class	3 or less(Acre)	4 to 5 (Acre)	>5 (Acre)	Total No. of response
No. of families	30	76	123	229
Land holding	Less than 1 (Small)	1 to 2 (Medium)	More than 2 (Large)	Total No. of response
No. of families	109	49	65	223

2.2.1 Family size

The Fig-2.9.1 shows family size wise percentage of cropped area during respective season. During Kharif season, the percentage of the top three crops remain same across all family size, which shows that the

	Kharif			Rabi			Summer		
Family size>	**4 to 5**	**>5**	**1-3**	**4 to 5**	**>5**	**1-3**	**4 to 5**	**>5**	**1-3**
Crop	**214.4**	**395.5**	**69.0**	**62.2**	**116.5**	**21.45**	**29.4**	**21.05**	**6.05**
Blackgram	7.21	12.26	3.62						
Brinjal	3.43	3.02	7.83	5.06	3.65	1.17	6.80	11.16	4.13
Cotton	0.93	0.08	0.00						
Maize	35.34	34.09	39.49	86.82	78.11	90.91	42.52	65.32	82.64
Okra	2.47	3.12	3.91	3.30	3.22	0.93	12.59	6.65	13.22
Paddy	31.79	32.47	29.78						
Tuar	17.66	14.70	15.36						
Gram				4.82	9.01	2.33			
Wheat					6.01	4.66			
Ground nut							23.81	3.80	
Mango							5.78	13.06	
Other	1.17	0.25	0.00				8.50	0.00	

Fig-2.9.1: Family size wise % of cropped area in crop season

crop priority is same for all three family size classes. But during Rabi season the crop priority and percentage of the cropped area under same crop show variations. The small sized families prefer to continue with maize compared to other two family size classes. Their second priority of the crop is wheat and third is gram. This shows that small sized families prefer to cultivate food grain crops which need less labour and inputs.

During Rabi season, the farmers having large families prefer maize, gram and wheat which is similar to that of small family size farmers but they grow more vegetables and gram than small size families and less of maize. Thus the farmers with large families are able to diversify their crops probably due to availability of more manpower in their families.

The farmers having medium size families are having top most priorities for Maize, Brinjal and Gram, which indicate that they are able to diversify their cropping but largely depend on Maize. It is interesting to note that during Rabi season, farmers having small family size focus more on food grain crops and do not take much of vegetable cultivations. It can be interpreted that the scope of wage employment or share cropping may be more remunerative for them during this season.

During summer season, farmers having small family size cultivate only three crops viz. maize, okra and brinjal. This shows that they can leverage labour as well as those having small holding do not have scope for wage employment due to smaller area under cultivation and hence cultivating vegetables is the most appropriate income generation activity for them in this season.

The farmers having medium and large families reduce their Maize cultivation and use land for cultivation of ground nut, vegetables and other crops. Thus family size is clearly a major factor having direct influence on the crop selection. The larger the size, more opportunities explored while cultivating their own land. If family size is smaller than the preference to cultivate food grain crops which require less management as compared to vegetables and earn income from labour work/share cropping etc. is preferred.

2.2.2 Land holding

The amount of land owned by a farmer is the first decisive factor for crop selection. As indicated in Fig 2.9.2, all three land holding categories have similar crop selection priorities i.e Maize, Paddy and Tuar during Kharif season but small land holders cultivate more blackgram crop in percentage terms than other two categories. During Rabi season, all three categories of land holders cultivate similar crops in nearly similar proportion. But during summer, the proportion of Maize crop reduces to around 55% of the total cropped area and rest of the area is used for vegetable and ground nut cultivation. Small farmers prefer cultivation of ground nut crop other than Maize. The farmers of all the categories also prefer cultivation of vegetable crops during summer.

Fig 2.9.2 Land holding wise % of cropped area in crop season

Season/ Crop	Kharif			Rabi			Summer		
	>1 acre	1-2 acre	<2 acre	>1 acre	1-2 acre	<2 acre	>1 acre	1-2 acre	<2 acre
Total-acres	**310.1**	**158.6**	**210.1**	**85**	**48.85**	**66.3**	**21.7**	**12.75**	**22.05**
Blackgram	11.61	7.85	8.57						
Brinjal	3.26	5.01	3.17	3.24	3.89	4.52	3.23	10.98	11.34
Cotton	0.00	0.00	1.09						
Maize	34.18	34.36	36.79	81.76	81.88	82.96	55.30	58.82	53.29
Okra	2.90	4.04	2.36	2.06	1.94	4.98	8.06	9.02	13.61
Other	0.81	0.63	0.00						
Paddy	31.60	34.52	30.63						
Tuar	15.64	13.59	17.40						
Gram				6.47	9.21	6.03			
Wheat				6.47	3.07	1.51			
Ground nut							23.04	0.00	12.70
Mango							5.76	13.33	6.80
Other							4.61	7.84	2.27

2.3 Season wise cropping pattern

Fig 2.10 shows percentage of the total farmers in each land holding category growing various crops during Kharif season.

The small landholder's (farmers with less than 1 acre land) preference for paddy, black gram and vegetable cultivation is lower than that of other two categories. Total 72% of annual crops are grown during Kharif season which is indicative of prominent of the rain fed agriculture. Among Kharif food grain crops- Maize and Paddy are cultivated by all land category farmers, however preference for Paddy is higher among medium & large land holders. Since both the crops are having almost same market rates, the farmers having higher investment capacity prefer to go for transplantation method of Paddy which give almost double yield than that of conventional paddy cultivation. Since small farmers do not have capacity for initial investment they prefer Maize cultivation.

Farmer Category/ Crops	Small	Medium	Large	Total
Total farmer	**109**	**49**	**65**	**223**
Maize	85.3	85.7	87.7	**86.1**
Paddy	82.6	95.9	95.4	**89.2**
Tuar	53.2	61.2	58.5	**56.5**
Blackgram	28.4	36.7	47.7	**35.9**
Brinjal	16.5	30.6	20.0	**20.6**
Okra	12.8	28.6	20.0	**18.4**
Other	1.8	2.0	1.5	**0.0**

Fig. 2.10 Kharif cropping % among land holding

Among the Kharif –pulses crops, Tuar is preferred over blackgram by all category of the farmers mainly because it can be cultivated as mix crop with Maize and to some extent due to rise in market rates. Though, blackgram is also a part of staple food in the tribal families, the cultivation of blackgram is reducing because of repeated incidences of crop failure due to pest attack.

The cultivation of vegetables is also picking up among small land holders in Kharif season. Those small land holders having irrigation facilities prefer to grow vegetable crops. The vegetable crops require small land and are highly lucrative for income on regular basis.

As shown in Fig.2.11, In Rabi season, around 50% of the farmers in all categories cultivate Maize, where as other crops like vegetable and Gram is cultivated by less than 10% of the farmers in all land holding categories.

Fig-2.11 Rabi cropping % among land holding

	Small	Medium	Large	Total
Total farmer	**109**	**49**	**65**	**223**
Maize	46.8	55.1	49.2	**49.3**
Okra	9.2	6.1	4.6	**7.2**
Brinjal	7.3	8.2	9.2	**8.1**
Gram	6.4	8.2	9.2	**7.6**
Wheat	0.9	4.1	3.1	**2.2**

The higher percentage of the Maize cultivation during Rabi season is mainly due to the fact that there is no other food crop option available to the farmers except wheat. Since objective of the Rabi maize is market oriented production, the cultivation of same crops by the large section of the farmers increase potential of rate exploitation. Introduction of alternative rabi crop providing similar income will help in favour of the farmers. The basket of Rabi crop is having potential to diversify with crops which can be cultivated with drip irrigation.

2.4 Inputs & knowledge Services

The inputs and information is key decisive factors for agriculture production. Timely availability and quality of land preparation, irrigation and harvesting facilities, seeds, fertilizer, and pesticides are important factors for crop production. Additionally, the critical information about weather, seed variety, crop management and market rates also influence crop production and income.

The inputs required by the farmers in the Chhotaudepur are largely access through private and co-operatives sector operating in the area. The co-operatives, NGOs and authorized private players also play vital role in providing benefits/ subsidies of the Govt. programme benefits to the farmers. Though there is a Govt. human resource & schemes for providing agriculture related information and knowledge, the farmers from the study area has very limited access to these services.

2.5 Information needs & its status

The farmers are seeking the information regarding weather, seeds and fertilizer use, crop advisory, Govt. schemes, new crops, market rates etc. Though various agro met & crop advisory services are run by the Govt., but only 20% farmers are (47 out of 229) of the farmers are aware about it as majority of them are provided through IT based services like mobile SMS or online internet. Due to low literacy levels among the farmers, these services are out of their reach. Of those who are aware about it only 14% tried to use it. In one of the interaction with the farmers during focus group discussions (FGD) at village Kanas of Chhotaudepur block, the farmer informed that they have done soil testing last year and have received soil testing report. But no one has followed the recommendations as scientific language of the report is beyond the understanding of the farmers. Farmers expressed that for effective application of soil analysis, someone is required to explain them in layman's language so that farmers can follow it.

The use of knowledge services proves to be of great help for the farmers to reduce their unwanted expenditures and increase income. In the context, of tribal farmers, it is also required to remove misconceptions and de-learning of the past practices. The present generation of tribal farmers is caught up between the domain of traditional & new scientific knowledge, which increase their confusion which affect their agriculture practices. Eg. Proper Seed and Soil treatment can help in reducing pest attack to large extent; however farmers have their perception about seed treatment and believe that seed treatment actually reduce the crop yield as the coating of seed do not allow fullest germination of seed. Similarly, the farmer prefers to do direct use of cow dung for improvement of soil quality. But this practice increases the problem of termite and thrips in the soil.

The farmers are dependent more on the person they interact in the market or neighborhood for information related to seeds, sowing, and crop management and market rates. The information shared by these sources is largely influenced by the interest of the informant. The information sources for the Govt. scheme are mostly NGOs and Panchayat members. The NGOs play vital role and provide support for accessing Govt. schemes benefits for the farmers. For the Govt. scheme benefits, the farmers are highly dependent on the NGOs and private player, as it require large amount of documentation and submission to different Govt. agencies. The farmer say that if they want to access benefits of Govt. scheme on their own than they have to visit Govt. office for minimum 5 to 6 times. Every time they go to Govt. officials, the official demand additional document. But in case of private players or NGOs, they get clarity on very first interaction if they are eligible for the benefits or not.

During survey 120 farmers have reported that they had suffered due to incidences crop loss/damage during last three years, however only 25 farmers who have taken bank loan have received crop insurance. The rainfall and pest attack are two main reasons for the crop losses, however due to lack of awareness about it, they have to suffer loss of income and have to spend for buying food grain.Since majority of the farmers sell small quantities of the agriculture produce and sell it to the money lender who has provided

credit, they do not bother about the market rates of the various commodities. Only 20 out of 229 farmers have heard about minimum support price (MSP) and 30 farmers have sold their crops in Agriculture Produce Marketing Committee (APMC). The APMC in the Chhotaudepur is non-functional and only farmers from Jetpur-pavi block are using APMC for selling their produce.

2.6 Inputs:

The credit, seeds, fertilizers, irrigation and pesticides are important inputs discussed here with reference to study area and crops.

2.6.1 Credit

The access to credit from formal banking sector is relatively new practice for the area. The farmers mainly take credit for purchase of seeds and fertilizer. The farmers mostly need credit for Kharif crop cultivation as the availability of cash is low during this season. For Maize and Paddy the requirement is Rs. 10000 to Rs.13500 and for Pulses it is Rs.7000 to 9000. The farmer survey analysis shows that about 17% of the farmers surveyed have taken loan, most of them from Govt. and co-operative banks and about 67% (27 out of 40 farmers) have taken it for purchase of agriculture inputs. Though the survey indicate only 17% of the farmer taking loan, but in reality farmer who takes inputs on credit from local input suppliers is not considered as a loan by the farmer. It is estimated that at least 70% of the farmers are taking seeds and fertilizer on credit from local input supplier. These local suppliers charge 5% monthly interest on the credit. The farmer told that they are not bound to sell their produce to the input supplier but are bound to repay their credit capital and interest on it. These families and the input supplier are having strong relation from past generations and hence the supplier provide round the years credit for any needs of the families. The entire account is settled after harvest of the crop. But farmers do not know, the amount of interest is paid by them.

Project Sunshine

Project Sunshine and JEEVIKA was a five years program supported by Tribal Development Dept., with a single line objective to 'double' the income of tribal farmers.

Shroffs Foundation Trust (SFT) implemented these programme in two blocks of Chhotaudepur for three years reaching out to 41000 farmers. The complete package of Agri inputs under Sunshine and JEEVIKA were distributed for the crops of Maize, Cotton, Pigeon pea and Horticulture for one acre; consisting of certified and high yielding seeds, fertilizers, crop insurance and education to farmers on farming techniques.

As a result of multi-dimensional approach the farmers have started planning of cropping to balance their food and financial requirements. Annual income of farmers in the cluster has risen up to 80%, horticulture farming become part of regular practices and has played an important role to strengthen the financial condition of the tribal farmers.

SFT reached up to more than 41000 tribal farmers; still the extension services, availability of quality inputs, soil and water testing facilities and guidance on weather and government schemes were scattered and difficult to access in the area.

The access to the formal banking sector is limited. Only after the *JandhanYojana* and Direct Subsidy Transfer (DST), the banks have opened account of the farmers. The farmers who were having their bank account are either bank defaulters or do not operates their bank account. Overall, the farmers depend on input supplier for the credit needs.

2.6.2 Seeds & fertilizers

The availability of good quality seeds & fertilizer is big challenge during the Kharif cropping season. The credit link input purchase is one of the points of exploitation of the tribal farmers by the input suppliers. Since large section of farmers procure seeds and fertilizer after first rain in Kharif season, the sellers' market lead to creating artificial shortage of the seeds and fertilizers. The suppliers take advantage of the artificial and sell inferior quality seeds and fertilizer.

Since farmer relay on the supplier for input supply on credit they take it. The chairman of the Bodeli APMC admitted that majority of the private agriculture input suppliers are selling spurious and duplicate inputs having attractive packaging.

The rate of seeds and use of fertilizer for cultivation of one acre of various crops is shown in the table 9. The farmer survey show that, the amount of seeds used by the farmers is close to recommendations by the research organization like Krishi Vigyan Kendra (KVK).

Fig. 2.12 Actual V/s recommended seed rates for crops cultivated in the study area

Sr. No.	Crop	Seed Use	Recommendation	
			Mini.	Max.
		Kg/acre		
1	Maize	8.4	8	10
2	Paddy	11.3	8	10
3	Blackgram	8.6	4.8	6
4	Gram	20.0	40	50
5	Tur	5.7	4.8	6
6	Brinjal	0.5	0.12	0.16
7	Okra	5.0	3.2	5
8	Mango (No. of plant)	28.0	40	80
9	Ground nut	6.4	40	48
10	Wheat	12.7	48	50

After project sunshine farmers have accepted use of hybrid seeds in Maize and Paddy crops, which gives high yield as compared to local variety. The use of hybrid maize in tribal areas of Gujarat state started with project "Sunshine: - A Public Private Partnership (PPP) project model with Monsento partnerships with Tribal Development Department (TDD) of Government of Gujarat covering 5 districts and 2,00,000 tribal farmers. It showed that farmers had doubled their income to Rs 6,500 from using their hybrids, whereas they got just Rs 3,300 per acre (0.4 ha) from the open pollinated varieties (OPVs). Indian farmers use OPVs for the most part and the seed replacement is extremely low. (Source: Down to Earth, Aug-2011).

The use of hybrid seeds has rapidly increased during past decade reaching to 80% of the cultivated area in Maize and Paddy. In case of lack of cash, seeds bartering are also in practices. There is lack of awareness about sorting of quality seeds for sowing from the production.

Fig.2.13 Crop wise type seed used by the farmers

% of farmer using				
No.	**Crop**	**Hybrid**	**Local**	**Certified**
1	Maize	77.21	20.51	2.28
2	Paddy	68.63	27.94	3.43
3	Blackgram	5.10	57.14	37.76
4	Gram	0.00	69.57	30.43
5	Tuar	3.09	52.58	44.33
6	Brinjal	95.6	4.4	00
7	Okra	87.6	10.3	2.1
8	Mango	58.4	41.6	00

Presently certified seed cost forms around 15% & 4% of the per acre cost of cultivation for Maize and Paddy. (Ref: Fig-5: Cultivation cost break up)

2.6.3 Fertilizer inputs

Traditionally the agriculture production were carried out with the intention of food security, however, with emergence of cash needs for education, health and living standard improvement, it lead to use of chemical fertilizer for surplus production. The use of chemical fertilizers received boost after acceptance of certified and hybrid seeds in the area. At present the production of any crop without use of chemical fertilizer has become a rare phenomenon in tribal agriculture practices. Though acceptance and demand for chemical fertilizers has increased, still farmers continue to use manure as a fertilizer in the fields. Presently as a thumb rule farmer use 2 bags of Urea and 1 bag of Diamonium Phosphate for one acre field crop. Very few farmers are using super phosphate and potash as fertilizer. The use of chemical fertilizer has increased with advancement of certified seeds.

The awareness about fertilizer scheduling and dose are area of concern for effectiveness of fertilizer use. The farmers are using recommended quantity of fertilizer but lack scheduling and dose knowledge as a result, farmer do not get return as per desire.

Despite the facts and experiences discussed above the farmers in this area are yet to realize the full potential of their agriculture, both in terms of achieving optimum productivity and also in terms of getting the optimum returns for their farm production. It requires a close scrutiny to understand the missing links in the agricultural Value Chains of the area. Hence, the need for agricultural Value Chain study was felt by both the implementing organization SFT and the knowledge institution like IRMA. This led to conceptualization and implementation of such a study in the tribal district of Chhotaudepur in Gujarat.

Chapter – 3 Research Design

Given the last 30 years of SFT interventions in the tribal belt on the eastern border of Gujarat, IRMA and SFT team together decided to focus upon the tribal district of Chhotaudepur in this region. SFT is in the advance stage of implementing a project on sustainable agriculture through entrepreneurship development among women tribal farmers from the project area.

Since, SFT is operating in many villages of the tribal dominated Chhotaudepur district. It was planned to sample 10 villages in both Chhotaudepur and Jetpur-pavi regions of Chhotaudepur district. In each village there may exist minimum 20 farmers available during the day of survey so that in each crop one can find at least 30 farmers in total sampled villages.

3.1 Objective of the study

1) To understand the role and activities of all players in the Value Chain of 8 study crops.
2) To do impact study of the interventions taken up by SFT in their operational areas
3) Study the feasibility of developing some entrepreneurship programs in SFT's operational areas, in order to enhance income for the producers and other existing stakeholders as well as the new activity players.

3.2 Methodology

To achieve the above mentioned objectives, interactions with major activity players were conducted in the form of interviews with structured questionnaires and focused group discussions with producer groups. Research methods like regression and discriminant analysis were used to study and analyze the

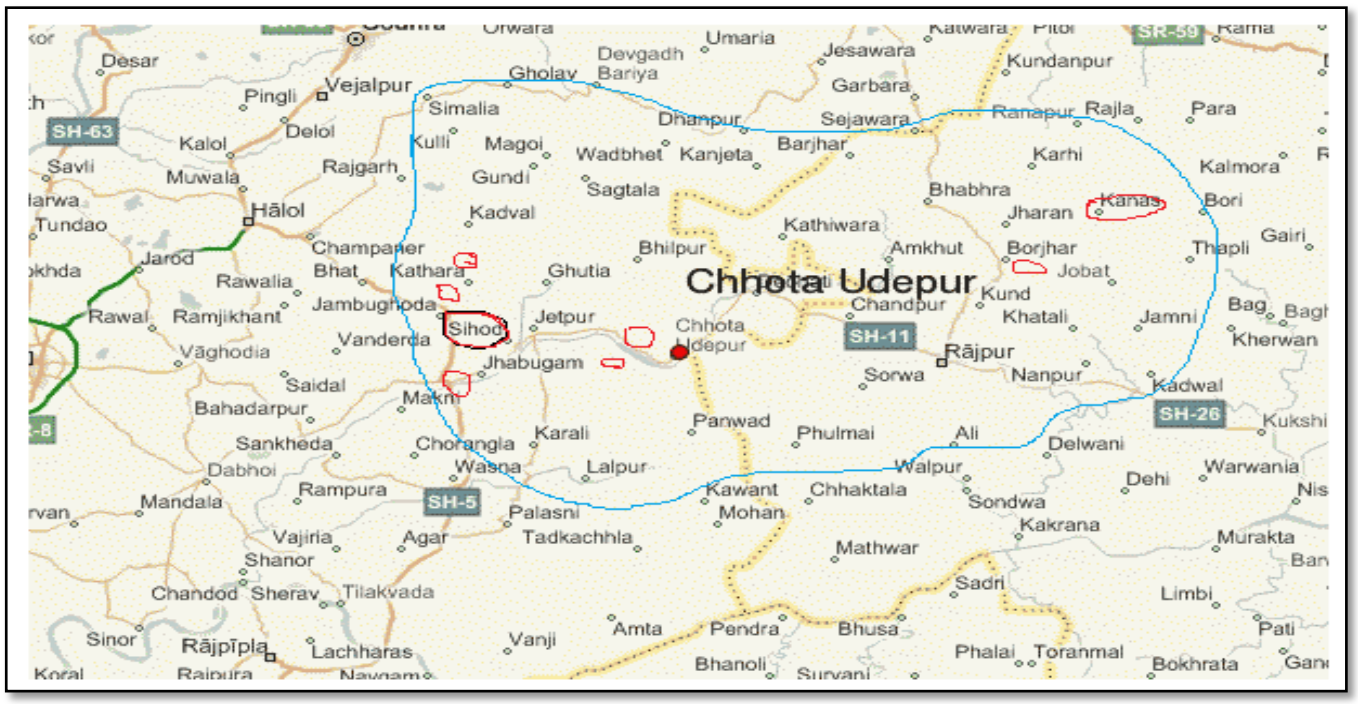


Fig-3.1 Map showing area covered under study in Chhotaudepur District

data. SFT's technological and entrepreneurial interventions were studied and analysed with sustainability and social impact. Suggestions and improvements in the respective interventions were

developed. For conducting interviews with the farmers as well as observing SFT's interventions, a sample of 8 villages in Chhotaudepur and Jetpur-pavi regions have taken. Sampled villages can be viewed from the following map with red borders indicate the sampled villages whereas blue border indicate SFT's operational area boundary.

Taking cognizance of the intricate features of the thematic area of the study, it was decided to use survey questionnaires, Focused Group Discussions (FGDs), interviews in addition to in-depth review of literature, informal conversations and observations as research tools.

Data analysis was carried out after the aggregation of data in various forms using both the qualitative and quantitative methods. It involved:

a) SPSS and MS Excel based quantitative analysis
b) Secondary literature and inferences based qualitative analysis (Inferences drawn from FGDs/Interviews/Informal Discussions-observations/ In-house and other published material) were also used to construct the narrative).

The synthesis of crop based analysis for all 8 crops selected for the value chain study is done including indicator wise findings for each crop (e.g. all types of stakeholder/input costs/access/area or crops specific features etc.).

Chapter – 4 Synthesis of Crop Based Analysis for Crops covered under Value Chain Study

Value Chain network

In general Value Chain of any crop can be explained by the following network shown in Fig.4.1:

SFT's interventions play a central role in services. SFT had been formed to serve the farmers in various types of services viz supplying inputs, provide technology in agricultural mechanization, providing good marketing services, maximizing employment benefits through promoting entrepreneurship activities and other services. The study has done detail analysis of each component of the Value Chain for various crops.

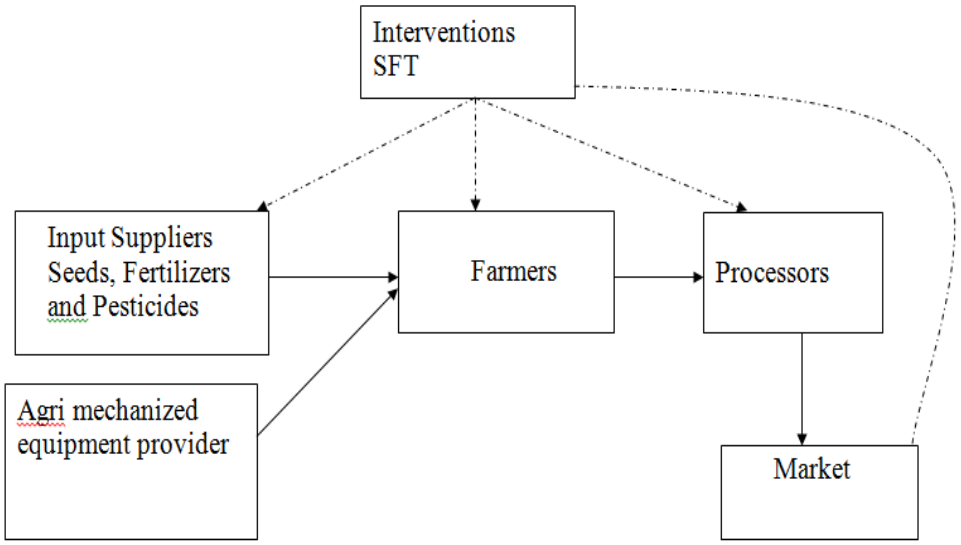


Fig4.1General Value Chain

4. Studying the Value Chain of Maize in Chhotaudepur district of Gujarat

4.1 Introduction

***"The last two decades saw the revolution in rice and wheat, the next few decades will be known as maize era"*- Noble Laureate Dr. Norman E. Borlaug Father of Green Revolution**

Maize (Zea mays L.) is an important cereal crop in world after wheat and rice. The importance of maize lies in its wide industrial applications besides serving as human food and animal feed. It is the most versatile crop with wider adaptability in varied agro-ecologies and has highest genetic yield potential among the food grain crops.

Maize is grown throughout the year in India. It is predominantly a kharif crop with 85 per cent of the area under cultivation in the season. Maize is the third most important cereal crop in India after rice and wheat. It accounts for ~9 per cent of total food grain production in the country and hence an important crop for food security. The Maize is used for various purposes including grain, feed, fodder, green cobs, sweet corn, baby corn, popcorn and industrial products. Corn area, production and productivity in India has shown a steady upward trend in recent years. New production technologies offer great promise for increasing productivity to meet the growing demands of world consumers. For decades, corn growers have worked for continuous improvement and greater efficiency. India is also on the threshold of a similar maize revolution. The introduction of new hybrid seeds has made maize a profitable alternative even for small farmers. Hybrid seeds are also responsible for making maize a pan-India crop.

The present study is an effort to look at the status and scope of present value chain in brining economic change in favour of tribal farmers in Chhotaudepur by understanding

- Factors associated with pre-production, production and post-production of Maize
- Identify areas/factors which lead to improvements in Value Chain performance
- Suggest the Value Chain that offers the most promising prospects for economic growth of farmers

4.2 Climatic Requirement

Maize is called 'queen of cereal' as it is grown throughout the year due to its photo-thermo insensitive character and highest genetic yield potential among the cereals. In India, maize is cultivated throughout the year in most of states of the country.

In Chhotaudepur Maize is a traditional crop and important part of staple food source and hence is cultivated in three seasons, but mainly during Kharif season.

4.3 Area, Production And Yield Of Maize Crop Growing States In India

Maize production in India has grown at a Compound Annual Growth Rate (CAGR)of 5.5 per cent over the last ten years from 14 MnMT in 2004-05 to 23 MnMT in 2013-14. The area under maize cultivation in the period has increased at a CAGR of 2.5 per cent from 7.5 Mn hectare in 2004-05 to 9.4 Mn hectare in 2013-14, the remaining increase in production is due to increase in yield. Factors such as adaptability to diverse agro-climatic conditions, lower labour costs and lowering of water table in the rice belt of India have contributed to the increase in acreage. Productivity of maize (yield) has increased at a CAGR of 2.9 per cent from 1.9 MT/hectare in 2004-05 to 2.5 MT/hectare in 2013-14.

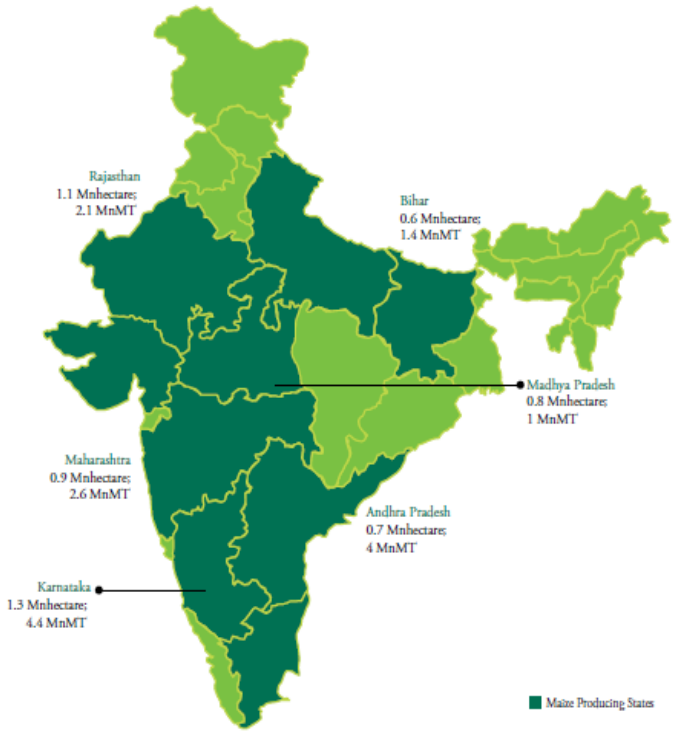


Fig.4.2 Major Maize Producing States in India

Production of maize in India is dominated by Andhra Pradesh and Karnataka which contributes to ~38 per cent of the total production.

In Gujarat Maize is cultivated across the state, but it is one of the important agriculture crop for food security & income generation among the tribal area in eastern hilly belt having marginal lands. In Chhotaudepur district, maize is grown in all three seasons.

4.4 Importance of Maize in Indian Agriculture

Maize is a staple food for Tribal and an important food component and source of carbohydrate providing food security. The growing market for Maize value chain in India would continue to contribute towards livelihoods of poor and marginalized families. Study by National Centre for Agricultural

Economics and Policy Research (NCAP) has showed that there is an increasing demand for maize in the industry sector which caters to consumer needs like textiles, paper, glue, alcohol, confectionery, food processing and pharmaceutical industry etc., of which the demand keeps on increasing with population pressure. This will again contribute to the local economy and campaign of "Make in India". Thus Maize is the only crop among top three most cultivated crops in the country that do not have conflict with industrial growth.

In view of the changing farming scenario in the country, maize has been emerging as one of the potential crops that addresses several issues like food and nutritional security, climate change, water scarcity, farming systems, bio-fuel etc.

Maize being a photo-insensitive crop has better options for adaptation and mitigation of climatic changes. Peninsular India is considered to be a neutral environment for maize wherein maize can be cultivated in either of the seasons. Therefore, it is emerging as a potential driving force for diversification i.e. diversification of rice-rice with rice-maize and other maize based high value cropping systems. Water scarcity/lowering of water table is a major concern in rice growing belt of India and making rice cultivation non-remunerative. Hence, maize has emerged as a potential as well as profitable crop in these areas.

Overall looking at the growing market demand, wide adoptability, capacity to with stand climate changes, high productivity at low investment and potential for intercropping - Maize is becoming one of the most suitable crop for the large section of farmers especially small and marginal.

4.5 SWOT analysis of Maize

The Maize is a versatile crop suitable across wide range of agroclimatic conditions and considered best under irrigation condition. Maize has become cost intensive crops but most reliable in production and market. It also has advantage of yielding fodder which support animal rearing for dairy business possible.

Strengths	Weaknesses
1. Genetic competency large industrial application. 2. Knowledge of Cultivating the Crop 3. Cultivating traditionally as well as with use of technologies. 4. Experience in cultivating the crop 5. Grow in medium quality land 6. Requires less rain fall 7. Provide food security- with irrigation facility cultivated in two season 8. Easy for marketing	1. Market rates are steady 2. No local processing unit, dependency on outside market.

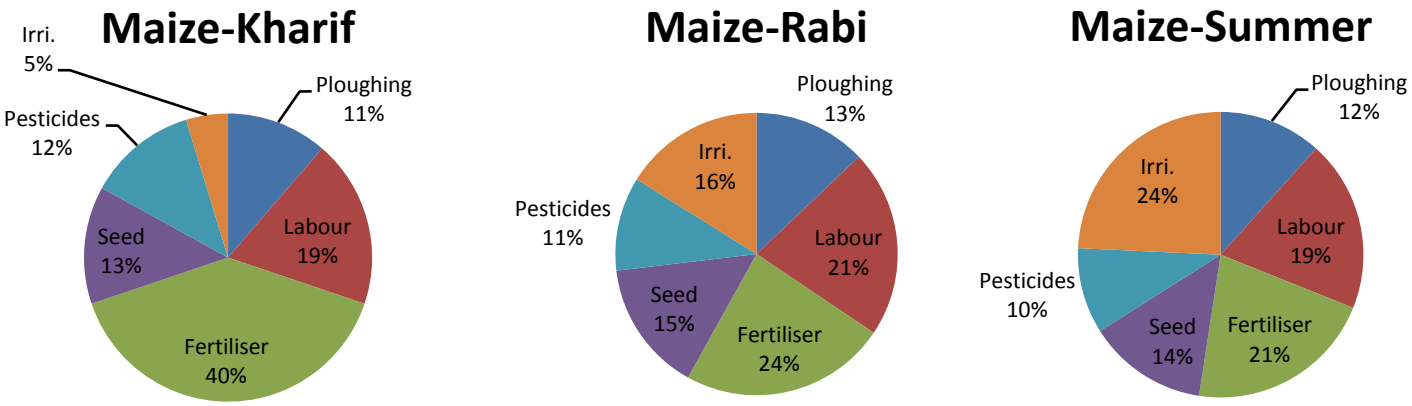
Opportunities	Threats
1. Suitable for this agro-climatic condition 2. Fodder as byproduct leading to promotion of animal husbandry 3. Acceptance of High yielding variety in farmers 4. Cultivated in all three season-provide additional income 5. Involvement of family labour 6. Low operational cost 7. Low pest and disease incidence	1. Any new crop possibilities will replace maize crop e.g increasing cotton & soyabean is done by replacing maize. 2. Incidence of diseases due to use of raw cowdunk in Kharif Maize.

Fig. 4.3 Strength-Weakness-Opportunities-Threats (SWOT) analysis of Maize production in Chhotaudepur area

The SWOT analysis of Maize cultivated in the Chhotaudepur district is shown in the Fig.4.3 . The SWOT has taken in to consideration of farmer's perspective, production risk and advantage, food security & markets.

4.6 Cost of cultivation in Maize

Fig-4.4 Cultivation cost break up for Maize & Paddy crops in Chhotaudepur area



The share of fertilizer expenditure in total crop cultivation cost is about 30% to 40% in Kharif Maize mainly due to use of manure during Kharif season, while during Rabi & summer season the fertilizer expenditure for Maize is around 25%.

The chemical fertilizers are procured mostly from the co-operatives and dealers of the fertilizer companies. For the farmers ease the fertilizer companies have their dealership with co-operatives and private agriculture suppliers at the cluster level.

The farmers also use cow dung as manure during Kharif season for increasing soil productivity. The current use of about 1 trolley per acre helps in maintaining the soil health, but direct use of it leads to increase the termite and pest problem. Application of compost prepared from agriculture waste and cow dung is very low. SFT has started intensive efforts for promotion of use of compost and vermi-compost in the area by large scale demonstrations through farmer schools. These practices are now very well accepted by the farmers especially in crops like Paddy and vegetables.

4.6.1 Pest attack

Maize is frequently getting infected by pest and diseases. The detailed study of pest and diseases in Maize shows that ignorance of farmers about farm management as well as soil and seed treatment are the root causes of the frequent attack by the pests & diseases. Moreover after suffering by the pest attack and diseases they do not know the treatment and are highly dependent on the input supplier having wasted interest of selling pesticides. Most of the pest attack and diseases can be controlled or reduced by adoption of proper farm, soil and seed treatment. SFT has recognized the exploitation of the farmers by the pesticides supplier and hence is promoting low cost organic pesticides and growth promoters which can be produced locally using local agriculture resources. The women farmer groups are producing and marketing these products in the villages.

4.6.2 Irrigation water

The irrigation water is available for majority through wells in hard rock and to some by lift from river streams. The hard rock terrain is characterized by shallow aquifers with limited water storage. The water is available for 3 to 5 hr. during 24 hr., which reduced as summer approach.

Irrigation is very critical input for Maize as it is grown round the years. The area is having very limited irrigation water and hence its optimum use decides the profit or loss in agriculture production. With increase in area under transplanted Paddy and use of certified seeds in Maize cultivation, the access to irrigation water become critical for crop production. Since last few years, the on setting and rainfall spells of monsoon has become irregular resulting in higher irrigation demand for protective irrigation during Kharif season.

Water conservation for soil moisture retention and water harvesting by watershed treatment has resulted in increase in cropped area and also reduced water demand. The use of flow irrigation method is common for Maize. No attempt of using drip irrigation in Maize is observed. It is essential to increase water productivity along with crop productivity in the area through water use efficiency and use of soil moisture.

4.7 Production of Maize

India is on the threshold of a maize revolution. The introduction of new hybrid seeds having resistant to climate variability & pest resistance with high productivity has made maize a profitable alternative even for small farmers. Hybrid seeds are also responsible for making maize a pan-India crop. Increase in rabi production, along with increased acreage and supply, has turned India into a net exporter. Though 85% of the maize is cultivated during Kharif, it is also grown throughout the year in India. Maize is the third most important cereal crop in India after rice and wheat. It accounts for ~9 per cent of total food grain production in the country.

The increase in production of Maize in India is largely because of increase in its productivity rather than area expansion. The overall, production increased with annual rate of 5.5% to 23 Mn. MT in 2013-14, while its productivity reached to 2.5 from 1.9 MT/hectare. Factors such as adaptability to diverse agro-climatic conditions, lower labour costs and lowering of water table in the rice belt of India have contributed to the increase in acreage.

Though in India the production of Maize has increased substantially, its productivity levels of 2.5 MT/ha. Is far below the global productivity of 5.5 MT/ha. But it is also observed that change in productivity is faster in India than the global rate. The Indian Maize productivity increased at rate of 1.9% CAGR as compared to world rate of 1.2% CAGR.

Thus India is figured in major technological breakthrough in the world achieving fast improvement in its productivity.

Fig-4.5 Area, Production and Yield of Maize for period 2001 to 2013 in Vadodara district (including Chhotaudepur&Jetpur-pavi blocks).

Year	Season	00-01	04-05	09-10	10-11	11-12	12-13	Remarks
A	Kharif Maize	50200	52000	47500	43300	44700	44100	Productivity is doubled during 2001 to 2013 but unchanged during last 3 years
P		46700	58200	69600	85500	86900	86600	
Y		0.93	1.12	1.47	1.97	1.94	1.96	
A	Maize-Rabi				63900	25500	24600	Productivity is increasing gradually over 3 years
P					131800	56000	62700	
Y					2.06	2.20	2.55	

The same scenario of increasing Maize productivity is observed during Kharif season in the study area during 2000 to 2010. However, 2011 onwards productivity has not achieved major growth. On the other hand, the productivity of Rabi Maize is continuously keeps increasing. The Kharif –Maize area has reduced as compare to that in early period of 20th century, but 2010 onwards both area and production has remain same. This is mainly due to increasing amount of paddy, groundnut and cotton cultivation in the area which has replace Maize.

The trend shows that further increase in Maize area is possible only if area under Rabi cultivation is increased, where Maize do not have any competing crop except wheat. This is a strong possibility as lowering of wheat production has become regular phenomenon during last few years. **In this case, the future focus in rabi season must be kept on Rabi-Maize. This scenario may further strengthen animal husbandry as this will ensure fodder availability round the years.**

4.7.1 Constraints in Maize production in India

- Climatic conditions resulting in drought/excess water associated with increased pressure of diseases/pests
- Cultivation in kharif is mainly under rain-fed conditions on marginal lands with inadequacy in irrigation
- Only about 30 per cent of the area is under single cross hybrid (SCH). Lack of development of SCH technology, which is a key to higher productivity gains like USA, China and other countries
- Limited adoption of improved production-protection technology
- Deficiencies in the production and distribution system of quality seed
- Small farm holdings and limited resource availability with farmers

4.7.2 Factors influencing Maize production

A. Rainfall

As mentioned earlier Maize crop is highly dependent on the rainfall pattern. The area under cultivation and production varies according to rainfall. The Fig 4.6 depicts the changes in cropped area and production with rainfall in Chhotaudepur district. This shows that cropped area show very small variation, irrespective of rainfall. This indicates that irrespective of the rainfall majority of farmers do sowing of Maize crop. However, Maize production graph shows that it varies irrespective of amount of rainfall. Thus production does not depend on amount of rainfall but the pattern of rainfall.

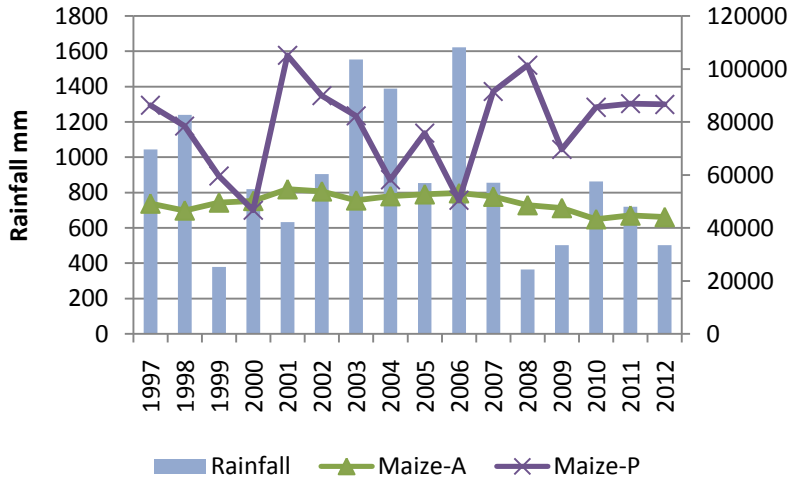


Fig 4.6 Area and production change of Maize with rainfall in Chhotaudepur district.

4.7.3 Maize: Pest Management:

The poor investment in agriculture field & soil management along with increasing diversification in the scope due to increased irrigation facilities in the study area is leading to increase in the pest and crop diseases. Although Maize crops are prone to many insect pests and seed borne diseases during Kharif season, the extent and amount of pest attack during Rabi & summer is negligible.

The normal pest attacks found in the Chhotaudepur area are Leaf stunting, stem borer. The farmer reported higher No. of incidences of pest attack in Maize as compare pulses, however in past 2-3 years pest attack is rampant in pulses as a result farmers have stopped intercropping of pulses.

The problem of pest attack is more severe in Kharif Maize. More than 25% of the farmers have reported pest attack in Maize. The crop diseases of Leaf stunting, stem borer in Maize are commonly reported. The farmer practice use of pesticides worth Rs.200/bigha as precautionary measure for Maize.

In case of pest attack, farmers have to get pesticides from block head quarter or large village like Tejgadh. Almost 90% of the farmers know only 3 to 4 pesticides and prefer to use same for the crop protection from the pest attack. However, if the pest is not controlled than they are wholly dependent on the agriculture input supplier. Merely any farmer has reported of Government services in case of pest control measure.

The low level of farmer's self-knowledge about diseases and pest treatment and lack of appropriate extension services of the Govt. has lead Shroffs Foundation Trust (SFT) to think of providing local and marketing through local women entrepreneur. The two products namely "AmrutPani" & "Bramhastra" are 100% non-chemical liquid fertilizer and crop diseases controller respectively. Looking at the increasing cultivation of vegetable and two season crops due to irrigation facility is providing ample opportunity to establish these products as alternative to chemical and harmful pesticides.

The production trial and pilot marketing has established the feasibility and market for these two products in the villages of Chhotaudepur and Jetpur-pavi blocks. It is required to have proper and targeted approach for brining farmers' awareness about ill-effects of chemical pesticides on environment, natural resources and human as well as its food chain. Small group of 10-15 farmers per village should be targeted for use of these products. The increase in acceptance of such non-chemical pesticides will also help in branding the agri-produce of the farmer under "No Pesticides Managed" (NPM) produce, which can be safe for consumer and also fetch better value for produce.

4.7.4 Maize: Crop Harvesting and post-harvest:

Majority of harvest & post-harvest operations in Maize is done using both manual labour as well as machines. The reason is larger area of cropping and higher labour requirement. For harvesting of Maize, the extended families mutually decide about the harvesting operations and accordingly it is carried out turn by turn.

4.7.5 Post –Harvest losses:

Maize suffers heavy post-harvest losses estimated at 20-30 per cent. The main causes of these losses are improper shelling and drying techniques (Moisture content) and improper storage and handling Fig.4.7 shows some areas of post-harvest losses & its management techniques that can help reduce losses.

Fig 4.7 Details of harvest & post-harvest losses in Maize

Stage at which losses can occur	Causes	Effect	Measures to be taken
Physiological maturity	• Delayed harvest (increased exposure to pests, livestock and animals) • Varieties susceptible to diseases and pests	• Losses in quality and quantity	• Timely harvest • Planting resistant varieties • Protecting crops from livestock, etc.
Harvesting	• Poor handling • Poor threshing or shelling practices • Termites and rodents	• Losses in quantity	• Careful handling of produce • Pest control • Timely harvest
Mechanical damage during harvest	• Poor handling • Poor threshing or shelling practices	• Quality decreases Increased vulnerability to pests and diseases	• Careful handling of produce • Threshing and shelling methods should reduce damage
Drying and storage	• Temperatures too high during drying • Storage pests and fungi • Insufficient drying before storage • Moisture in storage area • High relative humidity	• Losses in quality • Possible production of mycotoxins • Swelling and germination of grain	• Use of bulk handling • Control storage pests • Dry produce sufficiently before storage • Storage facility should be moisture proof and adequately aired

Source: IRRI, CIMMYT, KPMG Analysis

The resource poor tribal farmers in Chhotaudepur area are avoiding use of sophisticated equipment for harvesting and threshing. The available equipment are traditional and hence leads to long operations with poor quality output and losses. Agri-mechnisation services emerged as a big opportunity in the area with increase in the productivity of Maize and Paddy crop. The effective agri-mechnisation will help in timely harvest and processing.

4.8 Sales & Marketing of Maize

The market of the agriculture produce has always remains major challenge for the Indian farmers. Similarly, the tribal farmers with small quantities of the produce have very limited choices for selling their market produce. Since majority of the farmers cultivates maize, they prefer to sell it to the nearest market either to local aggregators or to main traders in nearest town. Only groundnut & cotton are sold in the APMC by the farmers from Jetpur-pavi block, while farmers from Chhotaudepur sell all agriculture produce in the Chhotaudepur or Alirajpur trader shop. The local aggregators also provide them annual credit for household requirement of family, which is settled against the procurement of agriculture produce. Those farmers having little higher quantity prefer to sell it in bigger markets like Jetpur-pavi, Chhotaudepur or Alirajpur.

The farmer survey data of production, use and sales in *maan(20 Kg)* for Maize is shown in Fig. 4.8 below.

Fig 4.8 Farmer survey data of production, use and sales in maan for Maize

Crop	Area	Production	HH_USE	SALES	Sale %
Maize	437.55	16466	8514.5	7476	**45.40**

The selling of 45% of Maize and 31% of Paddy production cumulatively generated estimated income of about Rs.100 Crore annually for the farmers from two blocks of Chhotaudepur and Jetpur-pavi. The market rates of Maize show marginal variation during last five years. The average wholesale price for Maize in Baroda market has increased just by 7.7% during last five years (Ref : Fig.4.9)

Fig.4.9 : Weekly average wholesale rates of Maize in Month of December for Vadodara,

Maize Minimum Support Price (MSP) for 2016 was Rs.273 against cost up to market around Rs. 190. However, about 65% farmers were forced to sell their Maize at rate below MSP in the market. The Fig-4.10 shows farmer wise rate/maan received for Maize. It shows that price volatility in case of Maize is high.

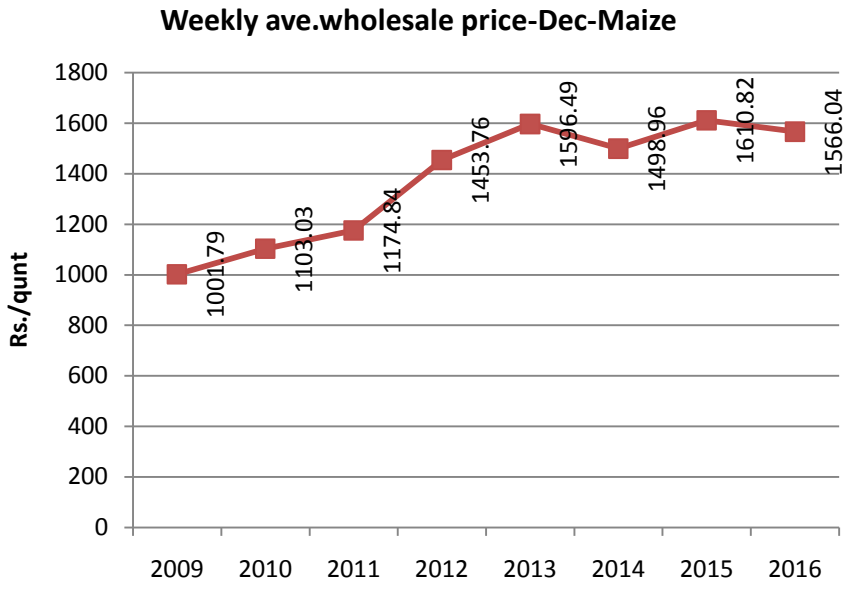
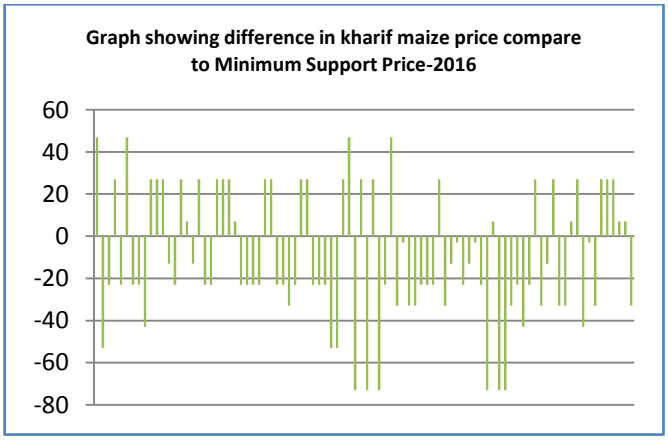
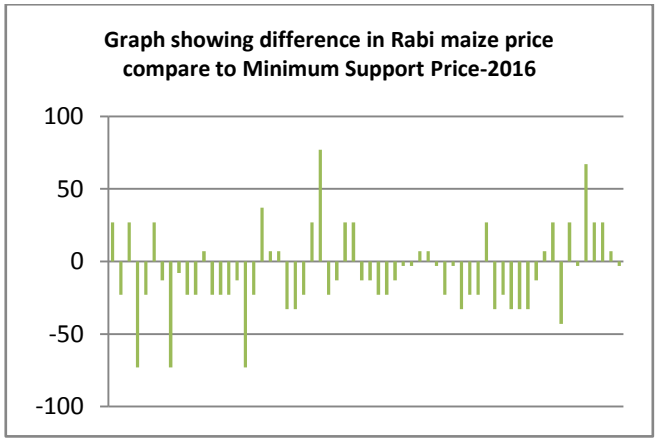


Fig-4.10 Variation in price realization by pulse crop growers with reference to Minimum Support Price (MSP)





4.9 Cost-Benefit analysis:

The expenditure and income on the basis of the farmer survey data for Maize is analyzed for profit and loss assessment. The Fig. 4.11 gives details of the farmers who shared their crop sell information during survey and Fig-4.12, show crop wise variation in profitability of the farmer on the basis of the rate variation based on sell at actual average market rate, maximum market rate, Minimum market rate and MSP rate. The average, minimum and maximum market rates were derived from the farmer survey data while MSP rate is considered for the current year MSP rate for specific crops.

The crop wise expenditure is worked out from the actual survey data and for calculating profitability the crop wise average production in Maan/acre is considered. The value of byproduct derived from the crop harvesting is added to the income from crop selling under each type of crop selling scenario. The Maize crop is cultivated by 192 surveyed farmers during Kharif and 111 during Rabi, however only 90 farmers sold it during Kharif and 62 farmers during rabi.

	No. of farmers			Rate Rs./Maan			MSP	Production
Crop	Sold	Above MSP	Below MSP	Average	Mini	Maxi		Mann/acre
Maize-Kharif	90	33	57	263	200	**320**	273	37
Maize-Rabi	62	21	41	265	200	350	273	
Maize-Summer	13	5	8	267	240	320	273	
Maize-average	**165**	**59**	**106**	**265**	**213**	**330**		
Paddy	70	17	53	264	200	400	294	43

Fig. 4.11 Crop season wise crop sell information shared by farmers during survey

The Fig-4.12 indicate that under maximum rate maize farmer received highest profitability, while at minimum selling price they have made losses. Since there are large No. of farmer selling Maize it shows that MSP hardly able to earn enough to sustain a family. This is particularly true for farmers who are dependent only on single season crop. The study also checked if farmer has to get minimum net profit of Rs.10,000 per acre than how much crop wise productivity enhancement is required.

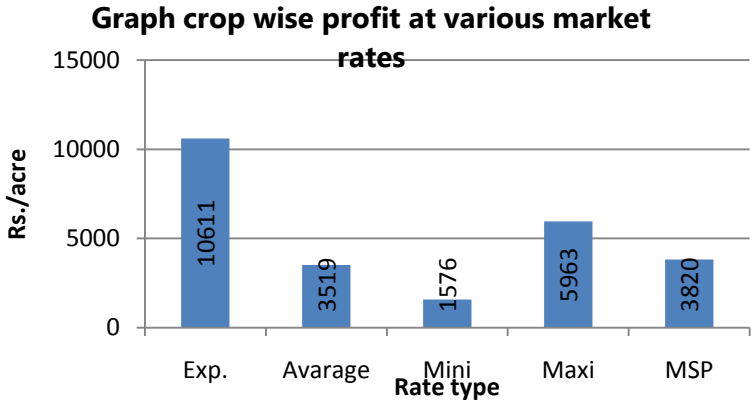


Fig-4.12 Crop wise profit for Maize & Paddy at various market rates

The Fig 4.13 shows gap in the crop productivity when compared with productivity at district and state levels. The analysis shows that the productivity is better than that of district and state and hence very little scope to enhance production in Maize.

Crop	Productivity Maan/acre			Productivity Gap	
	State	District	Study area	Maximum	Minimum
Maize	30	36	37.6	-7.6	0

Fig-4.13 Gap in the productivity with compare to district and state

To achieve minimum income of Rs.10,000/acre under Maize crop, the required crop productivity at the present MSP rate is found to be 65 maan/acre. In case of maize it requires lot of effort to reach production of 65 mann/acre. However, intercropping of pulse crop can be a better option to attain desired return of Rs.10,000/acre/season.

MSP is very effective tool for providing better returns to the farmers as the traders offer rate with reference to MSP and hence higher MSP rates always favour small and marginal farmers who sell mainly in open market. However, in study area the profitability of Maize/Paddy can only be achieve if collective marketing mechanism is established and sold at MSP rate in APMC or Govt. procurement centre.

Crop	Productivity -Maan/acre			% increase	MSP-Rs./acre	Profit Rs./acre
	Present	Required	Increase by			
Maize	37.6	60.2	22.6	60.11	273	10012

Fig 4.14 Increase in production required for attaining minimum profit of Rs.10000/acre from pulses cultivation

4.10 Market potential and future of Maize cultivation

The future potential demand for Maize is going to remain mainly due to following reasons.
First, from a consumption perspective, the growing industrial use and animal feed is evident with population growth. Moreover India is a net exporter of Maize in other part of Asia like Japan and hence if not consumed locally option is available for export.

Secondly, the growing population demand will increase in domestic market consumption.
The above two arguments clearly direct towards increasing domestic production which will provide assured market for maize producers. Additionally, India is always keeping buffer stock of cereals to take care of food security of its large population.

A. Maize: Environmental impacts

Maize is environment friendly because of it's a photo-insensitive crop and has better options for adaptation and mitigation of these climatic changes. It can grow in wide range of climatic conditions which provide option for crop rotation in highly cropping intensive regions of rice and wheat production belt in the country.

B. Maize: Potential for crop replacement and intercropping

The Maize crop is having unique feature of cultivation in all three seasons. This provides an opportunity to replace any crop in any geography. However, in areas like Chhotaudepur where Maize is the major crop, the advancement of any other more remunerative crop like cotton and groundnut replace maize.

4.11 Value Chain process

As the Fig-4.15 indicates, first player in the value chain is farmer. Farmer plays the role of primary producer. After harvesting, a farmer has a choice of three players to approach to sell his/her produce. The first such player is Maize sheller operator who converts the Maize cobs in to kernels and gives it back to the farmer by charging some fixed processing charges. The next and most common player that a farmer approaches is trader. Most of the farmers take their produce to mandi (an un-organised one) and sell it to traders over there. The last option that a farmer has is to sell directly to big processors i.e industrial users or large markets like super markets, exporters.

Out of these 3 channels selling to traders is the easiest option for farmers but it is also the channel wherein farmer is being exploited the most. Whereas selling directly to the big trader earns the highest value for farmers but it is extremely difficult for a farmer to directly approach big processors since they procure only in bulk quantities and also due to presence of mediators in this channel. Traders, who procure from farmers, sell to the next player in the channel i.e processor or exporter. If a trader is selling to processor outside the local vicinity then that deal would be facilitated through mediators who have a significant say in fixing the price between processors and traders. Thus procured goods is processed at industrial set up or exported.

Then with the help of mediators, the processed products is passed onto the wholesalers in the market who in turn sell the products to end users industries or to retailer from whom the end consumer purchases thereby completing the chain.

The numerous intermediaries makeup for weak infrastructure, and deliver critical value in each leg at very low cost. But many times, by blocking flow of information & market signals, they are able to extract more profits for themselves than the value they are delivering. A more effective business model must be able to leverage the physical transmission capabilities of these intermediaries, yet dis-intermediate them from the flow of information and market signals. This is possible by use of Information Technology.

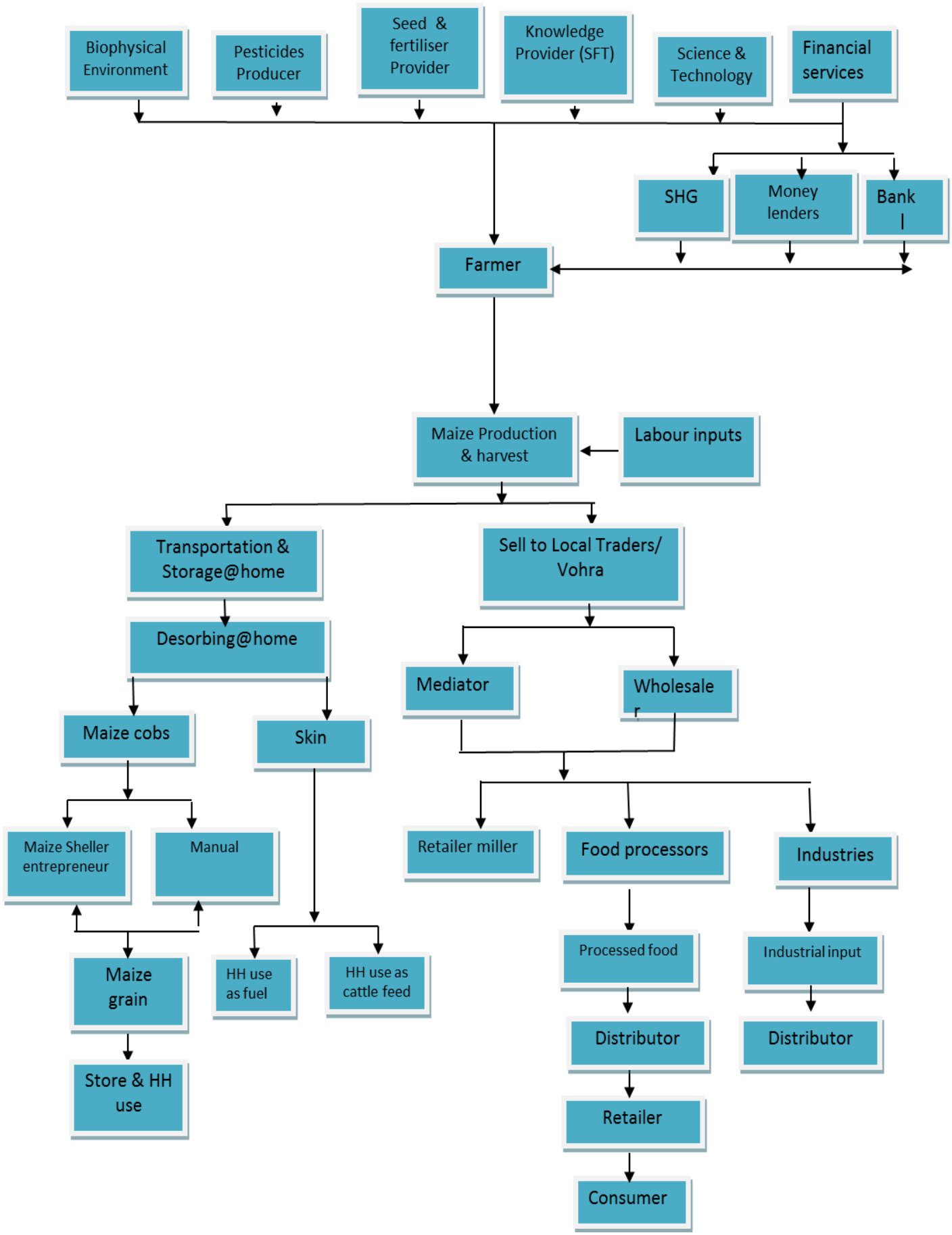


Fig-4.15 Value chain farmer growing Maize

4.12 Existing value Chain for Maize production at Farmer's end

A. Supplementary Activities

A.1 Infrastructure – Major infrastructure farmer is using at his end are tractor for ploughing, thresher, sprayers for irrigation both being hired in most of the cases. There are no special equipments like ridge builder required for ideal maize cultivation practice.

A.2 Human resources – Given the changing face of rural society, labour requirements of agriculture has changed significantly. Family labour is still in demand for agriculture operations but in many operations farmer require hiring labour. In the tribal society, the concept of community help is still in practices and hence for operations like harvesting and thrashing, it is used by the community. The members of the extended families or neighbors work in turn by turn in each other's fields. Though modern equipment like threshers are available for harvesting, farmers are still going for manual labour only. Farmers are employing labour in almost all the activities ranging from ploughing through harvesting.

A.3 Technology – Farmers are making use of advanced agricultural technologies particularly adopting improved seeds and fertiliser, pesticides in Maize. In Maize, technology adoption is in seeds and use of fertiliser and pesticides. Many farmers have adopted maize sheller machine for decobbing of maize.

SFT supported co-operative provide hiring services related to land development & preparation. The two co-operatives-one in each in Chhotaudepur & Jetpur-pavi blocks cover about 1000-1500 farmers each. The major services of land preparation is opted by the farmers. Though the co-operative is having all equipments, the demand for ridge builder and land leveler is negligible as compare to tractor with plough and thresher. The co-operative is successfully able to provide services to the members of the co-operatives members at rate lower then market rate.

A.4 Procurement – Farmers are procuring most of their inputs from the local markets like Chhotaudepur, Alirajpur, Jetpur-Pavi and Bodeli. Though there co-operatives in the area not all procurement is done from Co-operatives. Procurement from Co-operatives need cash transactions and hence only fertilisers are largely procured from Co-operatives, while seeds and pesticides are procured from private suppliers who provide credit. Because of this, farmers are spending more on their inputs thereby losing a significant share of their returns.

B. Primary Activities

B.1 Inbound Logistics – Thus procured inputs are shifted to their places using local modes of transport.

B.2 Processing – In case of Maize, farmers are not doing any type of processing for selling in the market except removing skin. But for self-consumption, they are doing decobbing and storing the maize grain. There is very little scope for grading and sorting in case of Maize and hence it is not practiced at all.

B.3 Outbound Logistics – Farmers pack their produce in regular bags and transport them to local traders using own or hired transport facilities depending on the quantum. The large producers carry produce in hire vehicle or own tractor. At this stage, they are incurring loading charges and unloading charges. Usually Maize is stored in traditional baskets prepared from bamboo. Each basket has storage

capacity of 25 Maan. For preservation of dry neem leaves are kept at the bottom and side of the basket. They sell it in small quantities according to cash requirement.

B.4 Marketing and Sales – Most of the farmers are selling their produce to traders in local mandi at bigger village within radius of 20 Km. This mandi being a completely unorganised one, has no regulation of prices. Due to lack of awareness regarding marketing prices, MSP and having lower yields in their hands, farmers are enjoying no leverage in terms of prices.

C. Exploring the External Environment for Maize (3-E Exercise)

C.1 Factor Conditions

1. Availability of Inputs – All inputs required for Maize is adequately available in the region, except irrigation water and hence the rabi and summer maize is cultivated only by the farmers who are having adequate facilities for irrigation. Almost 50% of the Maize produced is sold in the market. Since it is produced in all three season the availability is round the year. Though export of the Maize is increasing currently Maize export is only 11% at national level.

2. Availability of Human Resources – Being a drought prone region, Chhotaudepur district has a good share of unemployed people migrating to other part of Gujarat for employment. So there is no dearth for human labour to initiate a processing unit of corn oil or animal feed which can also provide local market. At present there is no processing unit in the region. The Maize processing units are in Anand and vadodara district and hence these industries procure maize from the local traders who collect it from farmer and forward it to them.
   SFT has facilitated local youth as entrepreneurs for providing services for maize threshing and decobbing. The entrepreneurs are able to sustain the services since last five years. These services are beneficial to large farmers as they save time in both this operations.

3. Availability of Capital – Since amendment in the 1956, companies act in 2006, the companies act has created space for primary producers in the market participation. In present days, farmer organised under formal institutionalized registered structure do not face problem of finance. Both NABARD and PSBs have attractive products for FPOs for both fixed and working capital requirements. Besides this, Small Farmers' Agri-Business Consortium (SFAC) also provides loans under several schemes like Enhanced Credit Guarantee Fund (ECGF) etc.

4. Availability of Infrastructure- Chhotaudepur to Dhar railway line is already laid and is likely to get started in a year or two. This is going to change the trade opportunity in this area soon. So do farming community should get benefit of same. The area will get easy connectivity with several big markets like Vasad and in Madhya Pradesh- the Pulse production capital of India.

D. Demand Conditions

1. Size of Demand – Traditionally, most maize went to livestock as feed but modern technology has helped it find new uses in food industry with animal protein and starch driving global demand today. International maize trade is now larger than international rice trade. USA, Brazil, Argentina and India

are the major exporters of maize while Japan, South Korea, Mexico are the major importers. Export of Maize has increased significantly during last decade.

Apart from the export, the market size for industrial use is growing very fast consuming whatever quantity available. The market for Maize based processes food for poultry and human consumption is growing very fast. In the ready to eat market more and more Maize base product are developed and is available across the rural and urban markets. The market for frozen kernels and baby corn is growing in daily use as vegetables and international products like Pizza and Pasta.

2. Number of buyers – Due to domestic & export potential for maize, buyers are always available for it.

3. Sophistication of buying process – Though buying process is not technologically sophisticated, buyers value transparency in quality and follow strict weighing measures.

E. Industry Conditions

1. Number of Firms – There is no processing industry in Chhotaudepur district.

2. Existence of competition among firms – There are only aggregators and traders operating locally. They are acting as an agent for buyer from industries or exporter. Since the scale of the produce and market size is big, everyone get equal opportunity to operate. But in most of the cases, these agents exploit producers and do not offer rates by creating doing syndicate for cartel.

3. Possibilities of setting up new firms – Entry barriers in processing industry are low.

F. Institutional Conditions

1. Presence of efficient promotional agency – With increased focus on producer organisations, several effective nodal agencies, like SFAC have come up to support FPOs. In case of frozen food, oil mill and cattle feed, human food, several schemes are available through Ministry of MSMEs.

2. Existence of Functioning FPOs – There are many co-operatives operating in the area, however no one is in the business of value processing or trading in the market.

3. Availability of Training Institutes – There are no Maize specific training institutes available in the district but Anand Agriculture University has its Maize research station at Dahod. Shroffs Foundation Trust (SFT) through its farm school is offering crop specific knowledge and input services to the farmers.

Chapter – 5 Studying the Value Chain of Paddy in Chhotaudepur district of Gujarat

5.1 Introduction

Paddy is one of the major crops that provide food to the mankind. Along with wheat, Paddy is a major staple food in India. India contributes, 20% of world Paddy production. Paddy value chain provides livelihood (income and employment) to large number of marginalized families. West Bengal, AP and Orissa are major paddy growing states in India. It is observed that coverage under paddy is directly linked to coverage under irrigation.

Paddy value chain is associated with number of actors that links paddy farmers to final consumers. This includes farmers, local traders, millers, whole sellers, retailers and exporters. State owned Food Corporation of India (for procurement of paddy) and Public Distribution System (PDS) has strong influence on the operation of the value chain. Other actors in the value chain are: transporters, seed companies, agrochemical companies, agriculture equipment companies, irrigation equipment related companies, banks, inspection agencies (like seed certification agency), commerce/tax authorities, agriculture department, farmer's organization, association of Paddy Millers, research organization like ICAR, policy makers, Civil Society Organizations involved in extension services and also Consumer Forums.

The present study is an effort to look at the status and scope of present value chain in brining economic change in favour of tribal farmers in Chhotaudepur by understanding

- Factors associated with pre-production, production and post-production of Paddy
- Identify areas/factors which lead to improvements in value chain performance
- Suggest the value chain that offers the most promising prospects for economic growth of farmers

5. 2 Climatic Requirement

In India Paddy is grown under widely varying conditions of altitude and climate. Paddy cultivation in India extends from 8 to 35° N latitude and from sea level to as high as 3000 meters. Paddy crop needs a hot and humid climate. It is best suited to regions which have high humidity, prolonged sunshine and an assured supply of water. The average temperature required throughout the life period of the crop ranges from 21 to 37° C. Maximum temp which the crop can tolerate 40° C to 42° C.

In Chhotaudepur Paddy is an important part of staple food source and is cultivated in Kharif season.

5. 3 Area, Production And Yield of Paddy Crop & its Growing States in India

Rice is one of the most important food crops of India. Major share of Paddy is cultivated during Kharif season. A small share of Paddy is grown in rabi /summer season with assured irrigation. Indian Paddy production largely depends on monsoon rains and only 59 per cent Paddy area has assured irrigation.

Paddy is grown under so diverse soil and climatic conditions that it is said that there is hardly any type of soil in which it cannot be grown including alkaline and acidic soils. Paddy crop has also got wide physical adaptability. Therefore, it is grown from below sea-level (Kuttanad area of Kerala) up to an elevation of

2000 metres in Jammu & Kashmir, hills of Uttaranchal, Himachal Pradesh and North-Eastern Hills (NEH) areas. The Paddy growing areas in the country can be broadly grouped into five regions. Western region comprises of Gujarat, Maharashtra and Rajasthan. Paddy is largely grown under rain fed condition during June-August to October - December.

Between the period of 1st& 11th plans, the area under Paddy cultivation has increased from 30.68 m ha to 43.64 mha registering growth of nearly 42.2 per cent. During same period Paddy production increased from 25.03 m tonnes to 97.05 tonnes during, nearly 4 times increase in production. The corresponding yield change was 816 kg/ha to 2224 kg/ha.

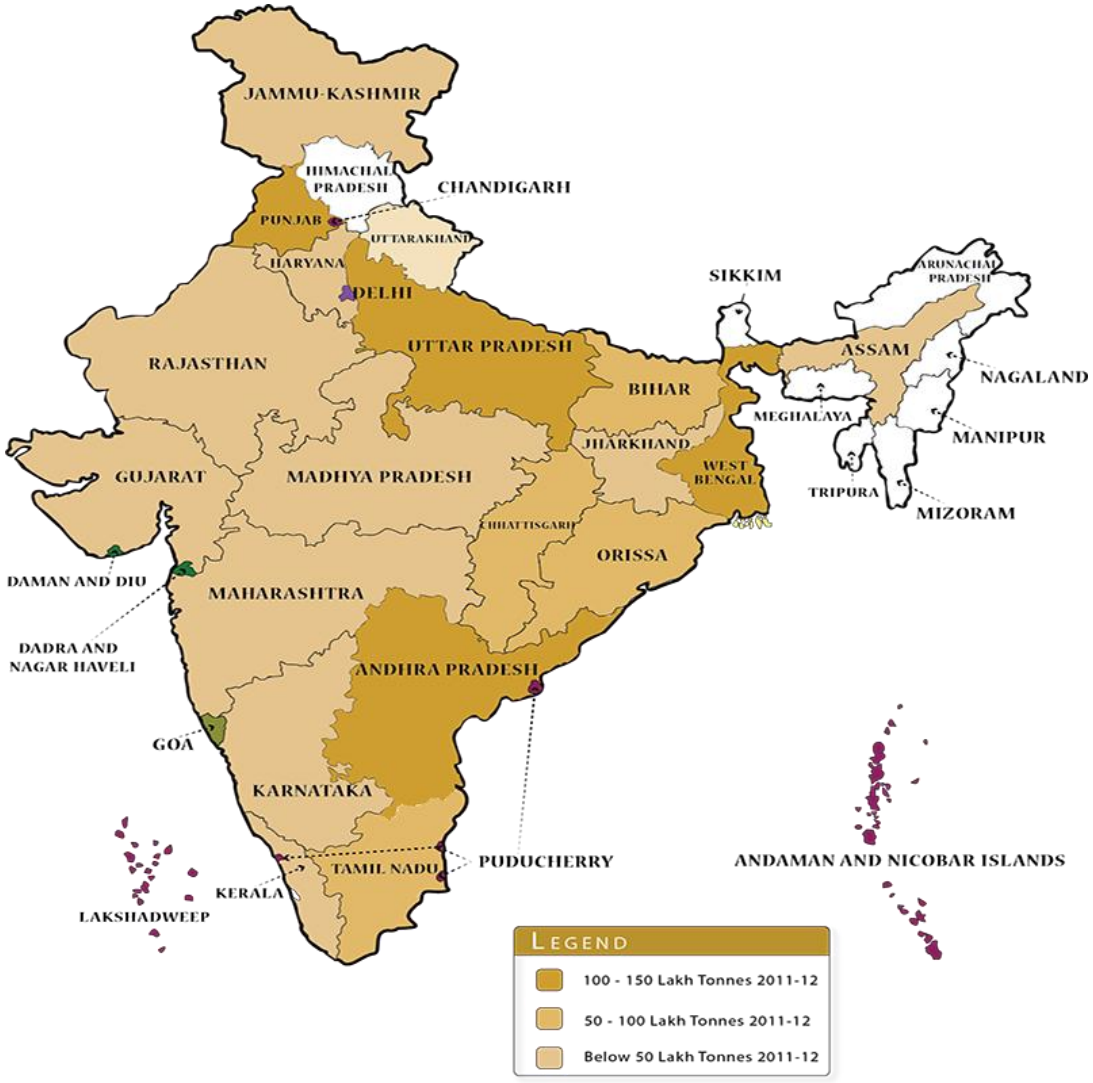


Fig.5.0 Major Paddy Producing States in India

5.4 Importance of Paddy in Indian Agriculture

Rice has shaped the culture, diets and economic of millions of peoples. For more than half of the humanity "rice is life". Importance of rice is as follows:

1. Paddy is an important staple food crop for more than 60 per cent of the world people. In 2008, more than 430 million metric tons of Paddy were consumed worldwide, according to the USDA.
2. Ready to eat products eg. popped and puffed rice, instant or rice flakes, canned rice and fermented products are produced

3. Rice straw is used as cattle feed, used for thatching roof and in cottage industry for preparation of hats, mats, ropes, sound absorbing, straw board and used as litter material.
4. Rice husk is used as animal feed, for paper making and as fuel source.
5. The Paddy production and consumption in India has more or less stabilized, nevertheless, given the size and scope of paddy value chain in India, it would continue to contribute towards livelihoods of poor and marginalized families.

5.5 SWOT analysis of Paddy

Paddy is versatile crop suitable across wide range of agro-climatic conditions and considered best under irrigation condition. Paddy have become cost intensive crops but most reliable in production and market. It also has advantage of yielding fodder which supports animal rearing for dairy business possible.

The SWOT analysis of Paddy cultivated in the Chhotaudepur district is shown in the Fig.5.1. The SWOT has taken in to consideration of farmer's perspective, production risk and advantage, food security & markets.

Fig.5.1 Strength-Weakness-Opportunities-Threats (SWOT) analysis of Paddy production in Chhotaudepur area

Paddy	
Strengths	**Weaknesses**
1. Knowledge in cultivation of Paddy 2. Paddy is traditional crop of this area 3. Cultivating with advance technology leading to production at part with state average. 4. Cultivate some traditional varieties 5. Some place farmers grow rice by only using compost fertilizer	1. The cropping practice does not allow inter cropping. 2. Require special land preparation. Cannot be cultivated on all types of land. 3. The area is not known for Paddy production hence no major branding possible. 4. Processing units retain Paddy husk. 5. Relative to Maize require higher investment and labour. 6. Short sowing season. 7. Reduction in production if not sown at right time.
Opportunities	**Threats**
1. Local adaptability 2. Popularity in the farming community. 3. Paddy husk is nutritious animal feed. 4. Rice is important food of the locality 5. Paddy act like ATM machine. It can be sold round the years. 6. Large number of people's Involvement in cultivation	1. Dealy in onset of monsoon result in loss of nursery. 2. Sudden outbreak of pest and disease 3. More water requirement 4. Labour problem 5. Fluctuation of Market price 6. Use of machine tool for sowing is essential.

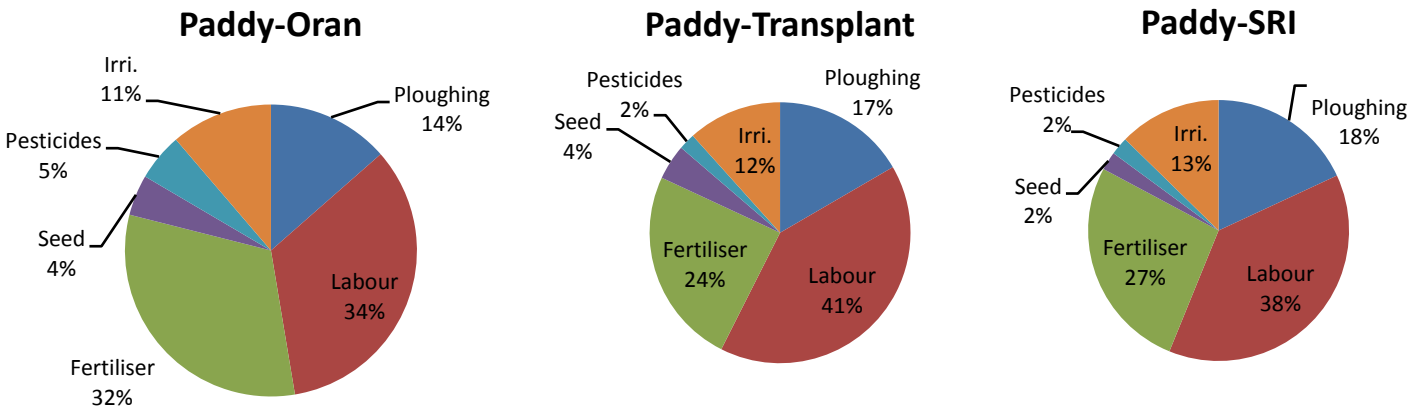
5.6 Cost of cultivation

The share of fertilizer expenditure in total crop cultivation cost is about 30% to 40% in Kharif Paddy mainly due to use of manure during Kharif season.

The chemical fertilizers are procured mostly from the Co-operatives and dealers of the fertilizer companies. For the farmers ease the fertilizer companies have their dealership with co-operatives and private agriculture suppliers at the cluster level.

The farmers also use cow dung as manure during Kharif season for increasing soil productivity. The current use of about 1 trolly per acre helps in maintaining the soil health, but direct use of it leads to increase the termite and pest problem. Application of compost prepared from agriculture waste and cow dung is very low. SFT has started intensive efforts for promotion of use of compost and vermi-compost in the area by large scale demonstrations through farmer schools. These practices are now very well accepted by the farmers especially in crops like Paddy and vegetables.

Fig-5.2 Cultivation cost break up for Paddy crop in Chhotaudepur area



5.6.1 Pesticides

Paddy is frequently getting infected by pest and diseases. The detail study of pest and diseases in crops shows that ignorance of farmers about farm management and soil and seed treatment, are the root causes of the frequent attack by diseases and pest. Moreover after suffering by the pest attack and diseases they do not know the treatment and are highly dependent on the input supplier having wasted interest of selling pesticides. Most of the pest attack and diseases can be controlled or reduced by adoption of proper farm, soil and seed treatment. SFT has recognized the exploitation of the farmers by the pesticides supplier and hence is promoting low cost organic pesticides and growth promoters which can be produced locally using local agriculture resources. The women farmer groups are producing and marketing these products in the villages.

5.6.2 Irrigation water

The irrigation water is available for majority through wells in hard rock and to some by lift from river streams. The hard rock terrain is characterized by shallow aquifers with limited water storage. The water is available for 3 to 5 hr. during 24 hr, which reduced as summer approach.

Irrigation is very critical input for Paddy crop. The area is having very limited irrigation water and hence its optimum decides the profit or loss in agriculture production. With increase in area under transplanted Paddy the access to irrigation water become critical for crop production. Since last few years, the on setting and rainfall spells of monsoon has become irregular resulting in situation of failure of Paddy nurseries and higher irrigation demand for protective irrigation during Kharif season.

Water conservation for soil moisture retention and water harvesting by watershed treatment has resulted in increase in cropped area and also reduced water demand. The use of flow irrigation method is common for Paddy. It is essential to increase water productivity along with crop productivity in the area through water use efficiency and use of soil moisture.

5.7 Production of Paddy

In India Paddy is mainly grown in two types of soils i.e., (i) uplands and (ii) low lands. The method of cultivation of Paddy in a particular region depends largely on factors such as situation of land, type of soils, irrigation facilities, availability of labourers intensity and distribution of rainfalls. The crop of Paddy is grown with the following methods

- Dry or Semi-dry upland cultivation
    - Broadcasting the seed
    - Sowing the seed behind the plough or drilling
- Wet or lowland cultivation
    - Transplanting in puddled fields.
    - Broadcasting sprouted seeds in puddled fields.

Chhotaudepur region falls under low land cultivation area.
The introduction of new climate variability tolerant hybrid seeds and development of Systemic Rice Intensification (SRI) has made Paddy a profitable alternative even for small farmers. Use of SRI techniques is also responsible for making Paddy –viable raifed crop.
Though 85% of the Paddy is cultivated during Kharif, it is also grown throughout the year in India. Paddy is the top most important cereal crop in India followed by wheat and Maize. It accounts for 20 per cent of total Paddy production in the world.

Fig. 5.3 Area, Production and Yield of Paddy for period 2001 to 2013 in Vadodara district (including Chhotaudepur & Jetpur-Pavi blocks).

Year	Season	00-01	04-05	09-10	10-11	11-12	12-13	Remarks
A	Kharif Paddy	51500	52100	52500	55100	44400	44600	Productivity is doubled during 2001 to 2013 but unchanged during last 3 years
P		61000	54300	47700	68100	55300	63200	
Y		1.2	1.04	0.91	1.24	1.25	1.42	

The study area recorded increase in Kharif –Paddy productivity during 2000 to 2010. However, 2011 onwards productivity has not achieved major growth. The Kharif –Paddy area has reduced as compare to that in early period of 20th century. 2011 onwards area is stabilised and production has increased showing improvement in productivity.

Further increase in Paddy area is possible only if Kharif –maize is replaced by Paddy. However, on the ground Kharif maize is getting replaced by cotton and hence it is very difficult to increase paddy area in future. On the contrary, it is likely that paddy area will reduce as the temperature conditions are becoming more and more unpredictable, which is having highest impact on the growth of paddy. Thus the future remains in increasing productivity of paddy by adopting SRI techniques.

5.8 Factors influencing Paddy production

5.8.1 Rainfall pattern

As mentioned earlier Paddy crop is highly dependent on the rainfall pattern & temperature during different growth stage. The area under cultivation and production varies according to rainfall. The following Fig 5.4 depicts the changes in cropped are and production with rainfall in Chhotaudepur district.

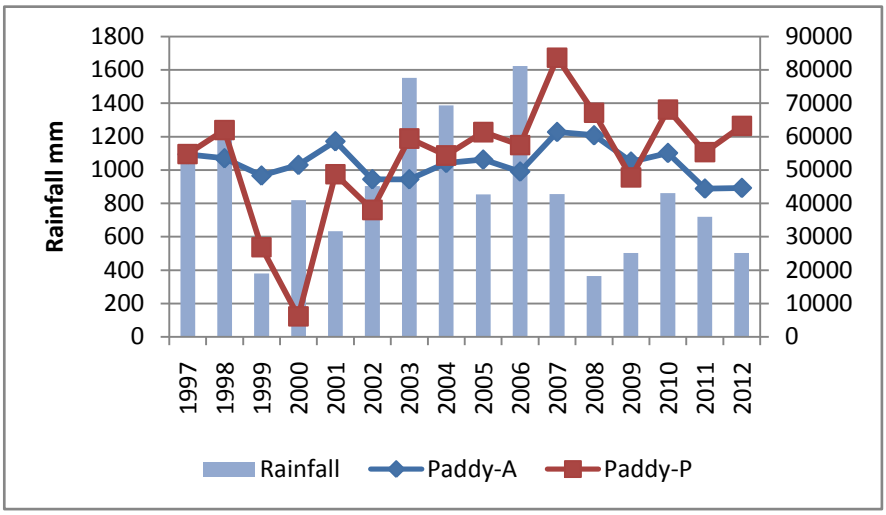


Fig 5.4 Area and production change of Maize with rainfall in Chhotaudepur district.

The Fig 5.4 shows annual cropped area and production for Kharif-Paddy crop. This shows that cropped area do not have co-relation with rainfall. This indicates that irrespective of the rainfall majority of farmers do sowing of Kharif Paddy crop. However, Paddy production graph shows that it varies irrespective of amount of rainfall. Thus both production and cropped area are not directly dependent on amount of rainfall but the pattern of rainfall.

5.8.2 Temperature condition during paddy crop :

In India Paddy is grown under widely varying conditions of altitude and climate. Paddy cultivation in India extends from 8 to35ºN latitude and from sea level to as high as 3000 meters. Paddy crop needs a hot and humid climate. It is best suited to regions which have high humidity, prolonged sunshine and an assured supply of water. The average temperature required throughout the life period of the crop ranges from 21 to 37º C. Maximum temp which the crop can tolerate 400C to 42 0C.

Temperature at different stage:

Minimum temperature for sprouting is100C at the time of tillering, the crop requires a high temperature than for growth. Minimum temperature for flowering range from 22-230C.Temperature requirement for blooming is in the range of 26.5to 29.5º C. Minimum temperature for grain formation from 20-21 degree at the time of ripening the temperature should be between 20-25ºC.

Potential Impacts of Temperature on Paddy Production:

Temperature greatly influences not only the growth duration, but also the growth pattern and the Paddy crops. The temperature sum, range, distribution pattern, and diurnal changes, or a combination of these

may be highly correlated with grain yields. Paddy plant has nine growth stages with its three distinct growth phases and every stage has an optimum temperature range for its proper development. Duration of the critical temperature, have a great impact on physiological status of the plant. Extreme temperature, whether low or high, cause injury to the Paddy plant. High temperatures are a constraint to Paddy production and cause a significant yield reduction. When temperatures exceed the optimal for biological process, crops often respond negatively with a steep decline in net growth and yield. Critical temperature for the development of Paddy plant at different growth stages is given in Fig-5.5.

Fig. 5.5 Critical temperature for the development of Paddy plant at different growth stages

Growth stage	Critical temperature (0C)		
	Low	High	Optimum
Germination	16-19	45	18-40
Seedling emergence	12	35	25-30
Rooting	16	35	25-28
Leaf elongation	7-12	45	31
Tillering	9-16	33	25-31
Initiation of Panicle primordial	15	-	-
Panicle differentiation	15-20	30	
Anthesis	22	35-36	30-33
Ripening	12-18	>30	19-20

The rise in temperature condition during Kharif season is evident in Chhotaudepur region and hence would be having potential negative impact on the Paddy growth. Since as mentioned above there are several stage and corresponding temperature range for optimum impact of temperature, it is very complex to understand the impact of temperature on Paddy crop. But looking at the climate change parameter it can be said that temperature is on rising scale in Chhotaudepur.

5.9 Paddy: Pest Management:

The poor investment in agriculture field & soil management along with increasing diversification in the scope due to increased irrigation facilities in the study area is leading to increase in the pest and crop diseases. Paddy crop is prone to many insect pests and seed borne diseases during Kharif season. Paddy is more susceptible to pest attack than Maize due to its sensitivity to changes in temperature and humidity condition during crop growth. The normal pest attacks found in the Chhotaudepur area are Stem borer, white grab, and army warm.

The study data shows that the pest and disease attack in Paddy crop is 4 times that of pulses and equal to that of Maize. More than 20% of the farmers have reported pest attack in Maize and Paddy crop. The crop diseases of Leaf stunting, stem borer in Maize and Stem borer, white grab, army warm in Paddy are commonly reported. The farmer practice use of pesticides worth Rs.400-500/bigha as precautionary measure for Paddy. In addition to pesticides, weedicides are also used in Paddy to prevent weeds in the nursery.

In case of pest attack, farmers have to get pesticides from block head quarter or large village like Tejgadh. Almost 90% of the farmers know only 3 to 4 pesticides and prefer to use same for the crop protection from the pest attack. However, if the pest is not controlled than they are wholly dependent on the agriculture input supplier. Merely any farmer has reported of Government services in case of pest control measure.

The low level of farmer's self-knowledge about diseases and pest treatment and lack of appropriate extension services of the Govt. has lead Shroffs Foundation Trust (SFT) to think of providing local and marketing through local women entrepreneur. The two products namely "Amrut Pani" & "Brahmashtra" are 100% non-chemical liquid fertilizer and crop diseases controller respectively. Looking at the increasing cultivation of vegetable and two season crops due to irrigation facility is providing ample opportunity to establish these products as alternative to chemical and harmful pesticides.

The production trial and pilot marketing has established the feasibility and market for these two products in the villages of Chhotaudepur and Jetpur-Pavi blocks. It is required to have proper and targeted approach for brining farmers' awareness about ill-effects of chemical pesticides on environment, natural resources and human as well as its food chain. Small group of 10-15 farmers per village should be targeted for use of these products.

The increase in acceptance of such non-chemical pesticides will also help in branding the agri-produce of the farmer under "No Pesticides Managed" (NPM) produce, which can be safe for consumer and also fetch better value for produce.

5.10 Paddy: Crop Harvesting and post-harvest :

Majority of harvest &post-harvest operations in Paddy is done using both manual labour as well as machines. The reason is larger area of cropping and higher labour requirement. For harvesting of Paddy, the extended families mutually decide about the harvesting operations and accordingly it is carried out turn by turn.

In the sample of 229 farmers, it was observed that 45% of the sampled crop area was utilised for paddy production during kharif season. Post harvesting period, most of the families is having storage godowns for keeping paddy for one to three years.

Required amount of paddy will be taken from the storage bin and process it for self-consumption. Earlier they used to go to the town(Bodeli) and process it. Now after SFT had developed a low cost paddy processing machine which can be operated at village level. SFT had given training to one entrepreneur in each of those villages where a paddy processing machine was installed. There exists a dilemma between woman entrepreneur and farmers group. With a good intervention of SFT, a woman entrepreneur who trained in paddy processing machine had purchased the machine at a cost of just Rs. 62,000 through loan. Users of that machine are none other than a group of farmers from the same village. Paddy farmers used to store the paddy in a typical bin made by self. This machine used to run for about two to four hours per day. In a year it will run 270 days and process about 1 lakh kilograms. 60% of the processed paddy contains unpolished rice for self-consumption and remaining will be husk. Unlike in the processing of the agriculture goods, users of paddy processing machine will not be charged, but husk will be retained by processor. This husk will be sold to by-product processors at rate of Rs. 350 per 50kg bag. This is the only source of income for a woman entrepreneur. Expenses for running a machine and maintenance of machine will be Rs. 50,000 annually. All paddy farmers will sell some part of the paddy produce at the market during harvest and store remaining for self- consumption. As and when required they do processing.

A year after establishing this paddy processing machine supported by SFT, it was observed that woman entrepreneur got benefited whereas group of farmers could not benefit much though woman entrepreneur depends heavily on the group of farmers from the same village.

The husk collected by the entrepreneur is purchased by the cattle feed manufacturer. Other ingredients (mostlyagri-waste/byproducts) are mixed with husk for manufacturing cattle feed. Thus the raw products supplied by rural farmers are converted in to cattle feed and sold to them. Simple understanding of logistics particularly transportation cost of low valued goods like many ingredients of cattle feed as well as the cattle feed itself can be minimized if the low cost cattle feed machine can be developed at village level. Location of plant should be strategic and should lead to provide low cost cattle feed to people of rural areas, which can help the group of farmers benefited. Cotton also grows in Chhotaudepur region and cotton seed cake is one of the ingredients for cattle feed production. For obtaining efficiency in operations, one needs to minimize the logistics cost in particular the transportation for low valued goods.

There are No. of by-products and agri-waste products which are ingredient for producing products which having rural mass a s consumer. One need to identify the end use of such by-products/agri-waste to understand its value for producing processed products.

5.11 Sales & Marketing of Paddy

The market of the agriculture produce has always remains major challenge for the Indian farmers. Similarly, the tribal farmers with small quantities of the produce have very limited choices for selling their market produce. Since majority of the farmers cultivates maize, they prefer to sell it to the nearest market either to local aggregators or to main traders in nearest town. Only groundnut & cotton are sold in the APMC by the farmers from Jetpur-pavi block, while farmers from Chhotaudepur sell all agriculture produce in the Chhotaudepur or Alirajpur trader shop. The local aggregators also provide them annual credit for household requirement of family, which is settled against the procurement of agriculture produce. Those farmers having little higher quantity prefer to sell it in bigger markets like Jetpur-pavi, Chhotaudepur or Alirajpur.

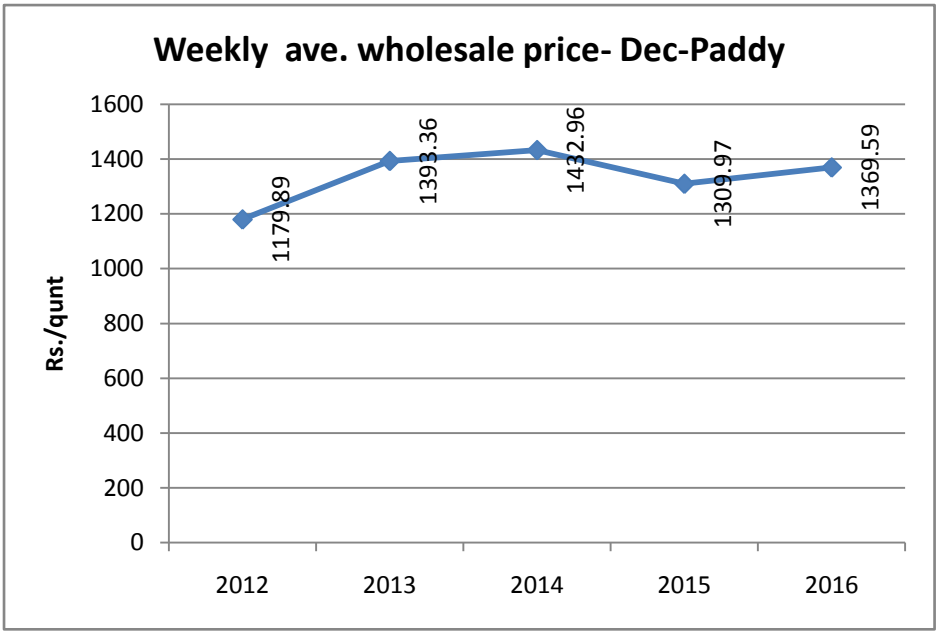
The farmer survey data of production, use and sales in *maan* for Paddy is shown in Fig 5.6 below.

Fig- 5.6 Farmer survey data of production, use and sales in maan for Paddy [1 Quintal = 5 Mann**]**

Crop	Area	Production	HH_USE	SALES	Sale %
Paddy	218.1	9438	6177.5	2918	**30.92**

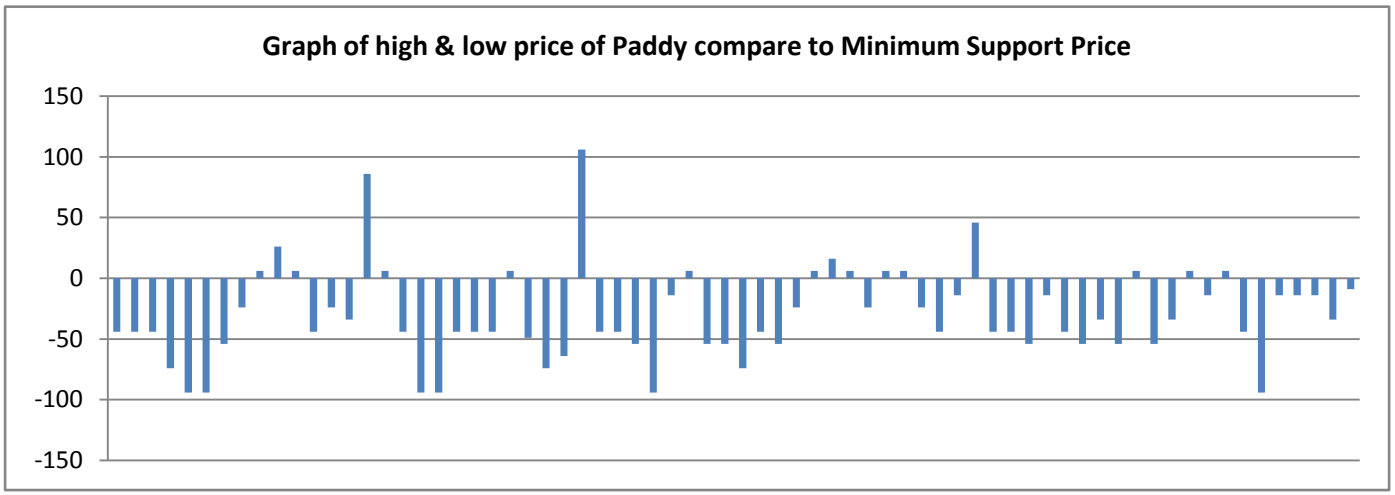
The selling of 30% of Paddy production cumulatively generated estimated income of about Rs.50 Crore annually for the farmers from two blocks of Chhotaudepur and Jetpur-pavi. The market rates of Paddy shows 16% variation during last five year. However, the rate between two consecutive years shows lots of fluctuations. (Ref Fig.5.7)

Fig.5.7 : Weekly average wholesale rates of Paddy in Month of December for Vadodara,



Minimum Support Price (MSP) for 2016 was Rs.294 against cost up to market around Rs.240. However, about 75% were forced to sell their Paddy at rate below MSP in the market. In case of Paddy farmer sell it as and when need cash and hence in very small quantity in local market. This is the main reason for higher % of farmers receiving rate lower than MSP. The Fig-5.8 shows farmer wise rate/maan received for Paddy.

Fig-5.8 Variation in price realisation by Paddy crop growers with reference to Minimum Support Price (MSP)



It shows that price realization for Paddy is always lower than MSP. Only few farmer (25%) could able to get price realization above MSP.

5.12 Cost-Benefit analysis:

The expenditure and income on the basis of the farmer survey data for Paddy is analyzed for profit and loss assessment. The Fig 5.9 gives details of the farmers who shared their crop sell information during survey and Fig-5.10, Variation in profitability of the farmer adopting Paddy cultivation by Oran and Transplant method on the basis of selling at actual average market rate, maximum market rate, Minimum market rate and MSP rate. The average, minimum and maximum market rates were derived from the farmer survey data while MSP rate is considered for the current year MSP rate for specific crops.

The crop wise expenditure is worked out from the actual survey data and for calculating profitability the crop wise average production in Maan/acre is considered. The value of byproduct derived from the crop harvesting is added to the income from crop selling under each type of crop selling scenario.

The Paddy crop is cultivated by 199 surveyed farmers during Kharif, however only 70 farmers sold it during Kharif.

Crop	No. of farmers			Rate Rs./Maan			MSP	Mann/acre
	Sold	Above MSP	Below MSP	Average	Mini	Mini		
Paddy	70	17	53	264	200	400	294	43

Fig 5.9 Crop season wise crop sell information of farmers collected during survey

The Fig-5.10 indicate that under maximum rate maize farmer received highest profitability, while at minimum selling price they have made losses. Since there large No. of farmer selling Paddy it shows that MSP hardly able to earn enough to sustain a family. This is particularly true for farmers who are dependent only on single season crop.

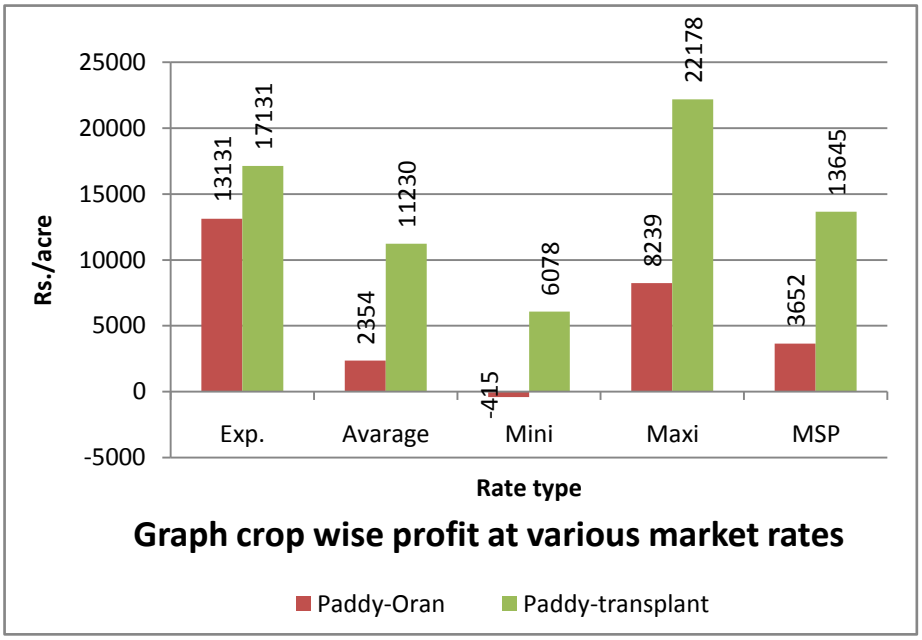


Fig-5.10 Crop wise profit for Paddy (Oran& Transplant) at various market rates

The study also checked if farmer has to get minimum net profit of Rs.10,000 per acre than how much crop wise productivity enhancement is required.

The Fig. 5.11 shows gap in the crop productivity when compared with productivity at district and state levels. The analysis shows that the productivity is better than that of district and state and hence very little scope to enhance production in Paddy remains.

Fig 5.11 Gap in the Paddy productivity as compare to district and state

Crop	Productivity Maan/acre			Productivity Gap	
	State	District	Study	Maximum	Minimum
Paddy	41	41	43.3	-2.3	-2.3

To achieve minimum income of Rs. 10,000/acre under Paddy crop, the worked out crop wise productivity at the present MSP rate is found to be 65 maan/acre. In case of Paddy it is possible to reach production of 65 maan/ acre with Systemic Rice Intensification (SRI) method which reduce expenditure and increase

production. Some of the farmers who have adopted SRI have already produced about 80-90 maan of Paddy per acre.

Fig 5.12 Increase in production required for attaining minimum profit of Rs.10000/acre from Paddy cultivation

Crop	Productivity -Maan/acre			% increase	MSP-Rs./acre	Profit Rs./acre
	Present	Required	Increase by			
Paddy	43.3	64.9	21.6	49.99	294	9990

MSP is very effective tool for providing better returns to the farmers as the traders offer rate with reference to MSP and hence higher MSP rates always favour small and marginal farmers who sell mainly in open market. However, in study area the profitability of Paddy can only be achieve if collective marketing mechanism is established and sold at MSP rate in APMC or Govt. procurement centre.

5.13 Market potential and future of Paddy cultivation

The future potential demand for Paddy is going to remain mainly due to following reasons.
First, from a consumption perspective, Paddy is the staple food for the largest section of the society. Thus from food security point of view, Govt. is procuring Paddy to create buffer stock to take care of feeding its large population without panic in case of continuous drought situation. However, in case of Chhotaudepur region-looking at the other factors like stagnation of the cropped area and possibilities of replacement by the other crops, the future growth of paddy will only be productivity enhancement driven and only for food security point of view. As far as the populations keep growing there will be demand for Paddy for consumption.

5.13 a Paddy: Environmental impacts

Paddy is one of the crop which release methane gas during its production and hence it is contributing to global warming. However, many researchesis going on to reduce methane emission during Paddy production. Apart from this, Paddy is water intensive crop and hence it has negative impact on the water balance in the cropping area. However, Paddy husk is very effective mulch and can contribute to lowering of water use if used in that fashion.

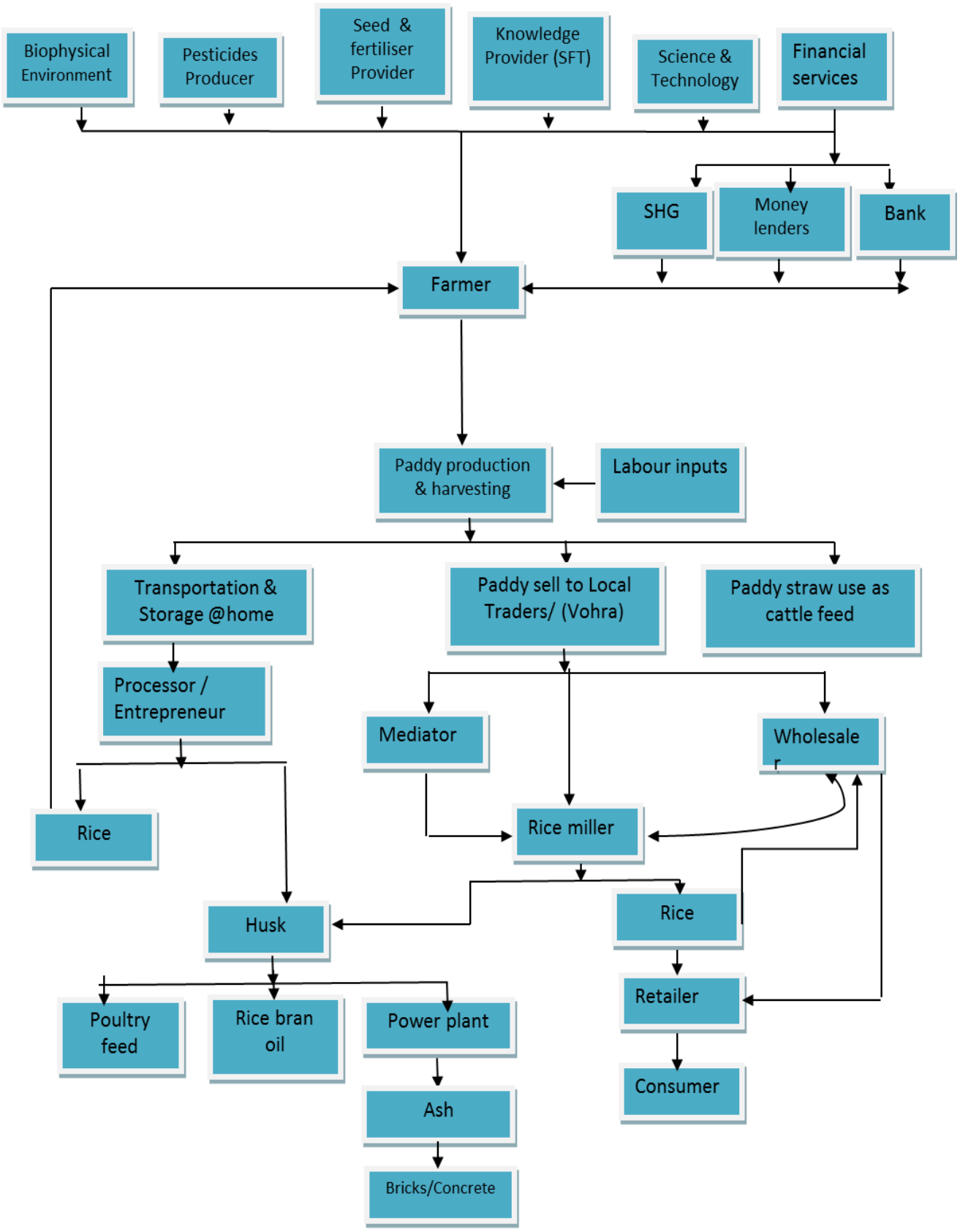
5.13 b Paddy : Potential for crop replacement and intercropping

The Paddy crop is having limitation of possibilities of it cultivation in areas having assured irrigation facilities, which restrict it from expansion in areas like Chhotaudepur. This only opportunity it has is adding intercrop to it.

5.14 Value Chain process

As the Fig-5.13 indicates, first player in the pulses value chain is farmer. Farmer plays the role of primary producer. After harvesting, a farmer has a choice of three players to approach to sell his/her produce. The first such player is Paddy processor who converts the Paddy to the consumable rice and gives it back to the farmer by charging some fixed processing charges or retaining husk as service charge.

The next and most common player that a farmer approaches is trader. Most of the farmers take their produce to mandi (an unorganised one) and sell it to traders over there. The last option that a farmer has is to sell directly to big processors i.e. industrial users or large markets like super markets, exporters.



5.13 Value chain farmer growing Paddy

Out of these 3 channels selling to traders is the easiest option for farmers but it is also the channel wherein farmer is being exploited the most. Whereas selling directly to the big trader earns the highest value for farmers but it is extremely difficult for a farmer to directly approach big processors since they procure only in bulk quantities and also due to presence of mediators in this channel. Traders, who procure from farmers, will sell to the next player in the channel i.e processor or exporter. If a trader is selling to processor outside the local vicinity then that deal would be facilitated through mediators who have a significant say in fixing the price between processors and traders. Thus procured goods is processed at industrial set up or exported

Then with the help of mediators, the processed products is passed onto the wholesalers in the market who in turn sell the products to end users industries or to retailer from whom the end consumer purchases thereby completing the chain.

The numerous intermediaries makeup for weak infrastructure, and deliver critical value in each leg at very low cost. But many times, by blocking flow of information & market signals, they are able to extract more profits for themselves than the value they are delivering. A more effective business model must be able to leverage the physical transmission capabilities of these intermediaries, yet dis-intermediate them from the flow of information and market signals. This is possible by use of Information Technology.

5.15 Existing value Chain for Paddy production at Farmer's end

5.15.1 Supplementary Activities

a. Infrastructure – Major infrastructure farmer is using at his end are tractor for ploughing, sprayers for irrigation both being hired in most of the cases. There are no special equipment like ridge builder is used for cultivation.

b. Human resources – Given the changing face of rural society, labour requirements of agriculture has changed significantly. Family labour is still in demand for agriculture operations but in many operations farmer require hiring labour. In Paddy farming 10-12 person is hired for transplanting operation. In the tribal society, the concept of community help is also in practices and hence for operations like harvesting and thrashing, it is used by the community. The members of the extended families or neighbours work in turn by turn in each other's fields. Though modern equipment like threshers are available for harvesting, farmers are still going for manual labour only. Farmers are employing labour in almost all the activities ranging from ploughing through harvesting.

c. Technology – Farmers are making use of advanced agricultural technologies particularly adopting improved seeds and fertiliser, pesticides in Paddy. In Paddy, technology adoption is in seeds, use of fertiliser and pesticides. The new technology of SRI is being promoted by SFT and well accepted by many women farmers who have been trained in this practice. Many farmers have adopted services of mini rice mill which can convert small quantum of Paddy in to rice for self-consumption.

SFT supported co-operative provide hiring services related to land development & preparation. The two co-operatives-one in each in Chhotaudepur & Jetpur-pavi blocks cover about 1000-1500 farmers each. The major services of land preparation is opted by the farmers. In case of Paddy cultivation, co-operative provide services for paddling equipment operation apart from regular ploughing and threshing

equipments. The demand for ridge builder and land leveler is negligible as compare to tractor with plough and thresher. The co-operative is successfully able to provide services to the members of the co-operatives members at rate lower then market rate. In Paddy, the adoption of SRI method is very fast which is helping in changing the economics of Paddy cultivation. Use of tractors and tractors mounted thresher has reduced hard work of women.

d. Procurement – Farmers are procuring most of their inputs from the local markets like Chhotaudepur, Alirajpur, Jetpur-pavi and Bodeli. Though the co-operatives are not in the area not all procurement is done from Co-operatives. Procurement from Co-operatives need cash transactions and hence only fertilisers are largely procured from Co-operatives, while seeds and pesticides are procured from private suppliers who provide credit. Because of this, farmers are spending more on their inputs thereby losing a significant share of their returns.

5.15.2 Primary Activities

a. Inbound Logistics – Thus procured inputs are shifted to their places using local modes of transport.

b. Processing – In case of Paddy, farmers are not doing any type of processing for selling in the market except threshing. But for self-consumption, they are doing milling and store paddy in grain. Though there is a scope for grading and sorting in case of Paddy but it is not practiced at all. It is found that those Paddy produced under irrigation water shortage condition, the grains gets broken during milling and loose its value. Due to this reason it is practices to sell Paddy.

c.Outbound Logistics – Farmers pack their produce in regular bags and transport them to local traders using own or hired transport facilities depending on the quantity of sale. At this stage, they are incurring loading charges and unloading charges. Usually Paddy is stored in traditional baskets prepared from bamboo. Each basket has storage capacity of 25 Maan. For preservation of dry neem leaves are kept at the bottom and side of the basket. They sell it in small quantities according to cash requirement.

d. Marketing and Sales – Most of the farmers are selling their produce to traders in local mandi at bigger village within radius of 20 Km. This mandi being a completely unorganised one, has no regulation of prices. Due to lack of awareness regarding marketing prices, MSP and having lower yields in their hands, farmers are enjoying no leverage in terms of prices.

5.16 Exploring the External Environment for Paddy (3-E Exercise)

5.16.1 Factor Conditions

a. Availability of Inputs – Paddy is adequately available in the region easily but it need cash transaction for procurement. The miller has to get it convert to rice for further process. However, during year where, the rainfall is not as per Paddy growth requirement stage irrespective of total rainfall, the availability reduces drastically in the area.

b. Availability of Human Resources – Being a drought prone region, Chhotaudepur district has a good share of unemployed people migrating to other part of Gujarat for employment. So there is no dearth for human labour to initiate a processing unit of Paddy processing for rice, cattle feed which can also provide local market. At present there is no processing unit in the region. Paddy processing units are in

Anand and Ahmedabad district and hence these industries procure Paddy from the local traders who collect it from farmer and forward it to them.

SFT has facilitated local youth as entrepreneurs for providing services for of rice mill. In absence of this services the farmers were taking their produce to Bodeli (50-60 Km). The entrepreneurs are able to sustain the services since last five years. These services are beneficial to entrepreneurs as well as large farmers as they save time in both this operations.

c. Availability of Capital – Since amendment in the 1956, companies act in 2006, the companies act has created space for primary producers in the market participation. In present days, farmer organised under formal institutionalised registered structure do not face problem of finance. Both NABARD and PSBs have attractive products for FPOs for both fixed and working capital requirements. Besides this, Small Farmers' Agri-Business Consortium (SFAC) also provides loans under several schemes like Enhanced Credit Guarantee Fund (ECGF)etc.

d. Availability of Infrastructure- Chhotaudepur to Dhar railway line is already laid and is likely to get started in a year or two. This is going to change the trade opportunity in this area soon. So do farming community should get benefit of same. The area will get easy connectivity with several big markets like Khambhat and in Ahemdabad.

5.17 Demand Conditions

5.17.1 Size of Demand – Conventionally, most of the Paddy went for food consumption as rice. But now many value added products and processes are also integrated in to value chain of Paddy. The rice papdi, puffed rice, Murmura are general other eatables having market across urban and rural land scape. On high end products such as rice bran edible oil is also becoming popular as premium products. Apart from this, premium Basmati rice and preserved variety of old rice, organic rice are having wide range.
The by-product husk based cattle feed has huge demand in the area particularly in Jetpur-pavi block having diary network and milch animal rearing activity.

5.17.2 Number of buyers – Due to large use of rice and rice product in daily use, buyers are always available for it. The whole chain of value addition from Paddy to rice to rice value added products have buyer base on routine basis.
5.17.3 Sophistication of buying process – Though buying process is not technologically sophisticated; buyers value transparency in quality and follow strict weighing measures.
5.18 Industry Conditions

5.18.1 Number of Firms – There are only rice miller of micro size catering to population of 4 to 5 villages each are operating.

5.18.2 Existence of competition among firms – There is no completion among the existing service firms due to limited working/machine capacity.

5.18.3 Possibilities of setting up new firms – Entry barriers in rice mill, cattle feed, rice base value added products are low if cash payment system is established in procurement of raw paddy.

5.19 Institutional Conditions

5.19.1 Presence of efficient promotional agency – With increased focus on producer organisations, several effective nodal agencies like SFAC have come up to support FPOs. In case of oil mill and cattle feed, human food, several schemes are available through Ministry of MSMEs.

5.19.2 Existence of Functioning FPOs – There are many co-operatives operating in the area, however no one is in the business of value processing or trading in the market. Three year back, ShardadeviGramudyog Society (SGS) has started value processing and selling of consumer products based on agriculture produce like mango pickle, sitafal pulp, Pulses, rice papdi, Bio-pesticides, vermin-compost etc.

5.19.3 Availability of Training Institutes – There are no Paddy specific training institutes available in the district. But Shroffs Foundation Trust (SFT) through its farm school is offering crop specific knowledge and input services to the farmers.

Chapter – 6 Studying the Value Chain of Pulse Crops (Tuar, Black gram and Gram) in Chhotaudepur district of Gujarat

6.1 Introduction

Pulses are consumed as Dal, which is a cheap source of plant protein. These are consumed because of body building properties having presence of various amino acids. By products of pulses like leaves, pod coats and bran are given to animals in the form of dry fodder. Some pulse crops like Gram, Lobia, Urdbean & Moongbean are fed to animals as green fodder. Moong plants are also used as green manure which improve soil health and adds nutrient into the soil.

India is the global lead for the area under pulses. Total 35% of the global cropped area under pulses is in India which produces about 24% of the world production. The global productivity of the pulses is 890 Kg/ha, against which India has pulses productivity of 661 Kg/ha.A number of pulse crops are grown in India and world. Among the crops, major ones are Gram, Pigeonpea, Lentil, Fieldpeas etc.

6.2 Climatic Requirement

Pulse crops are cultivated in Kharif, Rabi and Zaid seasons of the Agricultural year. Rabi crops require mild cold climate during sowing period, during vegetative to pod development cold climate and during maturity/harvesting warm climate. Similarly, Kharif pulse crops require warm climate throughout their life from sowing to harvesting. Summer pulses are habitants of warm climate.

In Chhotaudepur Blackgram is an important part of staple food source and Tuar& Gram are important income provider due to suitability of its cultivation under situation of low water availability condition.

In study area Pulses are cultivated in three seasons, but mainly during Kharif season.

6.3 Area, Production And Yield Of Major Pulse Crops Growing States In India

The pulses were cultivated on 239 lakh ha area with yield of 158 lakh tonnes in India (at triennium ending 2010-11). The major contributing states are Madhya Pradesh, Rajasthan, Maharashtra, Karnataka and Uttar Pradesh. During this period, productivity of pulses was recorded as 661 kg / ha with highest in Punjab (905 kg/ha), Haryana (891), Bihar (839), Uttar Pradesh (823) and West Bengal (811) (Ref. Fig.1 Map: Major Pulses Producing States in India).

In Gujarat Pulses are cultivated across the state, but it is one of the important agriculture crop for food security & income generation among the tribal area in eastern hilly belt having marginal lands. In Chhotaudepur district, main pulses grown are Tuar, Blackgram and Gram. In recent years farmers have started cultivation of summer green Blackgram&moong due to losses of blackgram in Kharif season due to viral pest attack.

6.4 Importance of Pulses in Indian Agriculture

Pulses' being staple food intake for the large section of the Indian society, Govt. of India is highly dependent on import of pulses to fulfil the country's demand. India is net importer about 20-30 lakh tonnes/year of pulses. In 2010, India imported 30 lakh tonnes of pulses mainly from Canada.

Pulses have become a matter of concern for the nation due to acute production shortage and bumper imports. Per capita availability of pulses has witnessed frequent fluctuations despite being a cheap and rich source of protein in the Indian meals. Per capita net availability of pulses has reduced from 60.7 grams per day in 1951 to 30 grams per day in 2001. Inclusion of pulses in National Food Security Mission (NFSM), improvement in yield and import has brought per capita availability of pulses to 41.9 grams per day in 2013.The irony is that import but not domestic production is the major reason behind this increase in per capita availability of pulses. Slip in the acreage under pulses for two continuous years (2011-12 and 2012-13) and abrupt weather conditions in the next two years have widened the gap between supply and demand.

Source: Status Paper on Pulses by NFSM

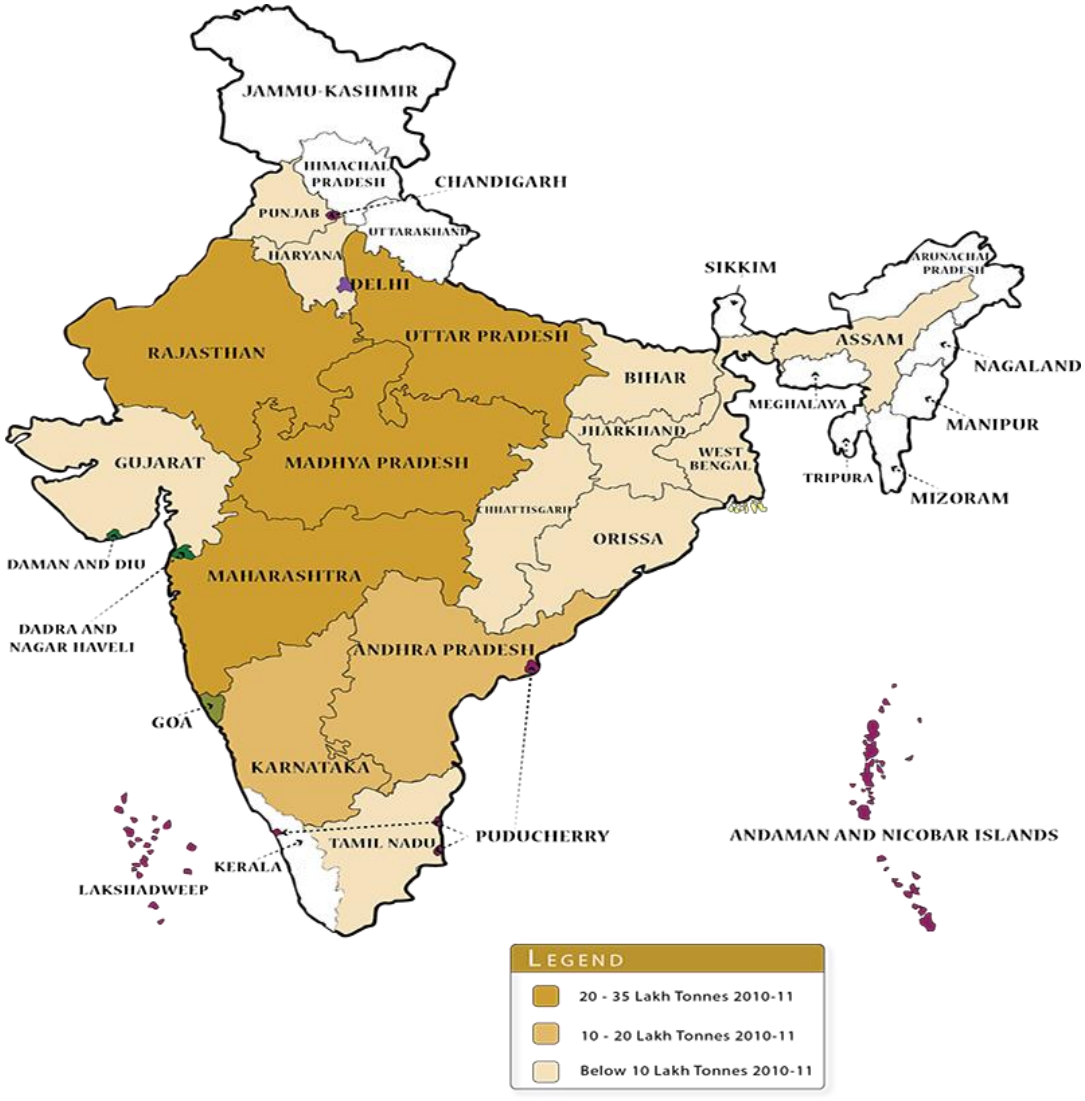


Fig.6.1 Major Pulses Producing States

Resultantly, imports of pulses have surged to new heights and prices have become astronomically high. Further increase in price of pulses will reduce consumption by poor more than the rich consumers as pulses are known as poor man's meat (Reddy 2000). But during last year good rainfall followed by boomer production has led to slash in the pulses prices in wholesale & retail markets and Govt. has open procurement centers to safeguard farmers interest. There is doubtlessly an urgent need to increase area, production and yield of pulses.

6.5 SWOT analysis of Pulses

Pulses as a crop is very versatile crop suitable across wide range of agroclimatic conditions and considered best under rainfed conditions.It is also a low investment crop with short duration. The only drawback of pulses crop is its sensitivity to abrupt climate change and compare to cereal crops have low yield of fodder as by-product.

The SWOT analysis of Pulses crop- Tuar, Blackgram and Gram cultivated in the Chhotaudepur district is shown in the Fig.6. The SWOT has taken in to consideration of farmer's perspective, production risk and advantage, food security & markets.

Fig. 6.2 Strength-Weakness-Opportunities-Threats (SWOT) analysis of Pulses production in Chhotaudepur area

Strengths	Weaknesses
1. Knowledge of cultivating the Crop 2. Cultivable in rainfed situation on any type of land. 3. Cultivating Traditionally 4. In case of Tuar& Gram farmer can sell it as green pods to earn early income. 5. Family experience in cultivating the crop 6. Cultivated as a mixed crop in maize 7. Grown in Minimum rainfall 8. Blackgram&Tuar is part of staple food 9. Convenient for storage 10. Major losses are in the processing of Dal and hence do not affect farmer income. 11. Take optimum yield in Tuar & Blackgram.	1. Largely grown as intercrop. 2. Long duration crop 3. Use low improved yielding varieties 4. Less risk bearing practices 5. No processing units in the area. 6. Small quantities at individual levels for market sales. 7. Yield Gap in Gram.
Opportunities	**Threats**
1. The consumer demand is met by import of pulses. 2. Local suitability 3. Suitability for cultivation of marginal land, rejuvenated waste land. 4. Early income gaining 5. Family involvement 6. Meet family need 7. Available high yielding and short duration varieties 8. Dal processing for local market & employment	1. Sudden outbreak of pest and diseases 2. Labour problem due to migration during harvest season. 3. Fluctuation of market prices 4. No established market in the area. 5. Unorganised sell restrict producers sell in consumer price.

6.6 Cost of Cultivation

Fertilizer inputs

Earlier pulses cultivation was solely based on the manure use; however, with advancement of certified seeds farmers are now using chemical fertilizers in Pulses production also. The share of fertilizer expenditure in total crop cultivation cost is about 22% for Kharif pulses crops of Tuar and Blackgram, while for Kharif cereal crops of Maize and Paddy it is in range of 30% to 40%.

The chemical fertilizers are procured mostly from the Co-operatives and dealers of the fertilizer companies. For the farmers easy the fertilizer companies have their dealership with co-operatives and private agriculture suppliers at the cluster level.

6.7 Production of Pulses

Over the years pulses cultivation in India has been pushed to marginal lands and rainfed areas. Still pulses are cultivated in the country on more than 12 per cent of total cultivated area and they constitute more than 4 per cent of the output of crop sector in value terms.

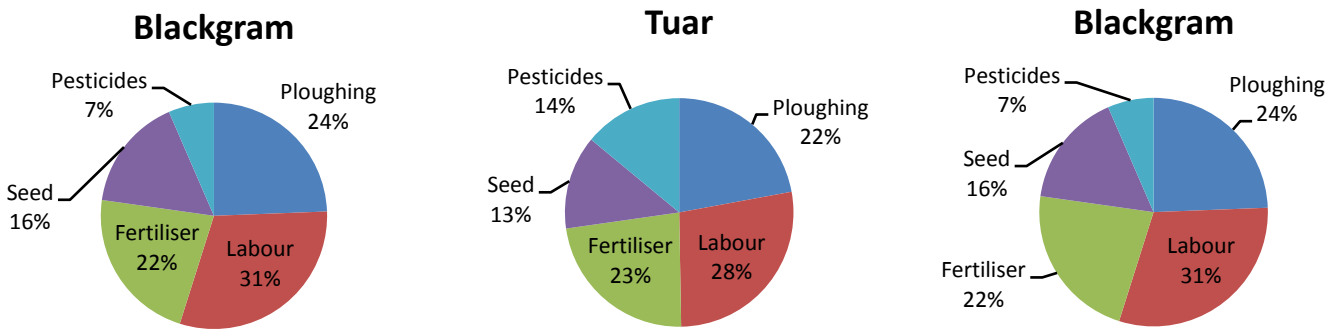


Fig-6.3 Cultivation cost break up for Pulses crops

Pulses production got a big setback in the country after the onset of green revolution. Production of pulses increased by 18.13 per cent during 40 years from the onset of green revolution as against 130 per cent increase in population in India for the same period. Consequently, per capita availability of pulses fell from about 61grams per day in the early sixties to about 32 grams in the initial years of the new century. In the same period India was able to raise cereal production substantially. The increase in cereal production was 40 per cent higher than the increase in population. The following major reasons for stagnation of the pulses production in India are derived by the experts.

1. Differential impact of technology and relative profitability
2. Expansion of irrigation facilities
3. The relative profitability and risk involved in pulses cultivation
4. Competition from shorter duration crops.
5. Relative return
6. Risk in productivity and farm income

Though India is the largest producer of most of the pulses, its productivity levels are generally low and it does not figure among top five countries in terms of productivity of major pulses. Productivity of lentil, arhar and field pea is lower than the world average. India did not figure in major technological breakthrough in the world with countries like Canada and others achieving averages of around two tonnes per hectare in pulses productivity. This relative stagnation in pulses productivity in the country is a matter of concern.

Fig 6.4 Area, Production and Yield of three Pulses crops for period 2001 to 2013 in Vadodara district (including Chhotaudepur &Jetpur-Pavi blocks).

Year	Kharif	2000-01	2004-05	2009-10	2010-11	2011-12	2012-13	Remarks
Area	Black gram	16200	11800	14100	12300	13700	13200	Cropped area fluctuates with 20% increase in the productivity.
Production		11200	7600	8900	11500	11300	11100	
Yield		0.69	0.64	0.63	0.93	0.82	0.84	
Area	Tuar	90600	76500	72400	78500	75100	64100	30% reduction in cropped area, while productivity become 2.5 times.
Production		32500	73200	75200	83300	88300	80800	
Yield		0.36	0.96	1.04	1.06	1.18	1.26	
Area	Gram	900	1400	2300	1500	3600	1300	Both cropped area & productivity fluctuate widely.Overall productivity doubled.
Production		500	900	2200	2000	4100	1300	
Yield		0.56	0.64	0.96	1.33	1.14	1.00	

The fluctuations in the area and production of the main pulses crops are evident from Fig 6.4. Though productivity of these three crops increased since 2001, the crop area keeps changing indicating high dependency on the monsoon.

Pulses are largely grown under un-irrigated and rainfed conditions and in many cases in marginal lands suffering from instability. Shifts in cropping pattern across states at national level show that pulses are preferred over coarse cereals which are more risky and also less profitable than pulses. It seems quite likely that pulses would get some of the areas from millets, bajra, ragi and sorghum in several states. Pulses are also having potential to replace cotton in some parts where cotton yield is low. These trends will accentuate if demand step up is substantial which may be expected. This scenario may have potential threat to animal husbandry as the pulses crops which are yielding meager amount of fodder as compare to the cereal crops.

The best possibility to increase production of pulses through area expansion would be by

1. Fitting pulses in cropping sequence where it helps in increasing cropping intensity (as has been the case with soyabean in some regions) and
2. By cultivation of short duration varieties of pulses particularly, in between the main season crops.
3. Another big potential area will be areas where limited irrigation facilities become available as for example in watershed development projects in rainfed areas.

6.8 Major Constrains in Pulses Production:

Pulses are mainly grown under rainfed conditions as a consequence area under pulses and their productivity are dependent on amount and distribution of rainfall. Rainfall intensity and distribution leads to vulnerability of kharif pulses to water stagnation (oxygen stress) and that of rabi pulses to water stress. Occurrence of mid-season cold waves and terminal heat during winter season has also been causing losses to crop productivity of rabi pulses in many regions.

6.8.1 Soil related constraints

Pulses crops are generally very sensitive to acidic, saline and alkaline soil conditions. North-western states have extensive areas with high soil pH. The problem has been compounded by rising deficiency of micronutrients such as zinc, iron, boron and molybdenum and that of secondary nutrients like sulphur particularly in traditional pulse growing areas. This emerges to an extent from the fertilizer subsidy policies. Recent incentives to specialty fertilisers ameliorate this stress.

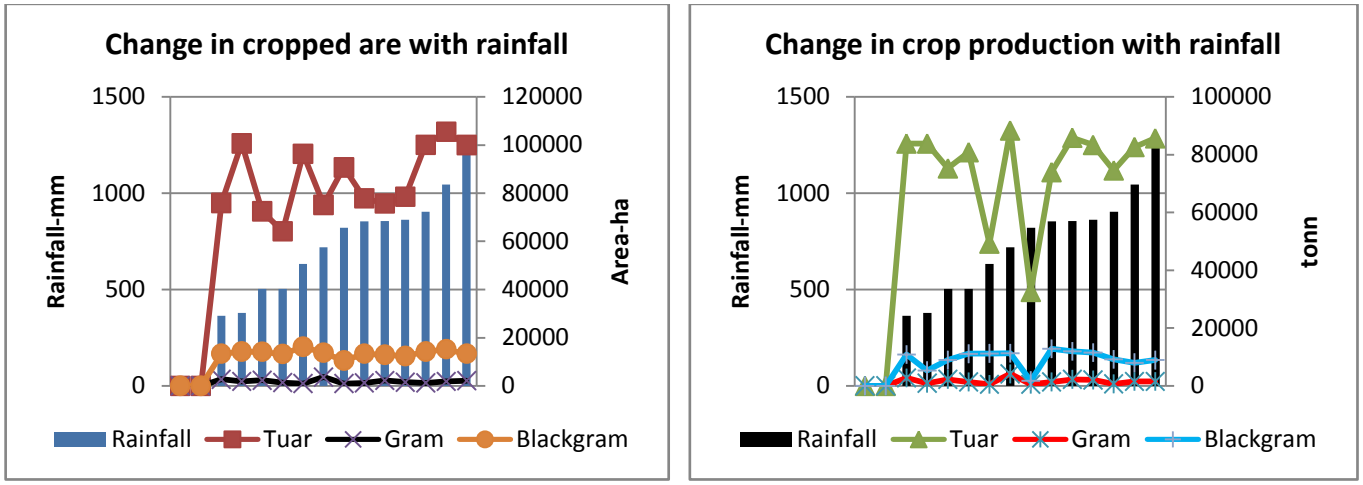
6.8.2 Credit and marketing related constraints

Farmers engaged in cultivation of pulses are mostly small and marginal. A majority are in areas with poor banking infrastructure. They have poor resource base and lack risk-bearing capacity. They therefore either lack access to credit or turn defaulters.

6.9 Factors influencing Pulse production

As mentioned earlier Pulse crops are highly dependent on the rainfall pattern. The area under cultivation and production varies according to rainfall. The following Fig 6.5 depicts the changes in cropped are and production with rainfall in Chhotaudepur district.

Fig 6.5 Area and production change of Pulses with rainfall in Chhotaudepur district.



It can be interpreted that the pulses crops behaves differently to rainfall. It also indicate that the total rainfall is not the only factor deciding the area & production of the crops, but it also depends on rainfall pattern. All three crops graph show that the area and production do not increase or decrease with respect to the rainfall amount.

The Fig-6.5 shows annual cropped area for Tuar, Blackgram and Gram crops. This shows that cropped area for Blackgram and Gram across the years show very small change. It largely remains same irrespective of rainfall. But the cropped area of Tuar shows large ups & downs, which shows that the farmer decision regarding sowing Tuar is based on the rainfall.

Fig-6.5 graph-b shows annual rainfall and production of Tuar, Blackgram and Gram. The graph shows that production of Gram is the most stable irrespective of rainfall amount or pattern, whereas the production of Black gram fluctuates proportionately to the cropped area. But Tuar crop has highest uncertainty of crop production shown by high swing of the line graph. There is no co-relationship between rainfall and production. Higher rainfall does not guarantee higher production of Tuar, which indicate that Tuar production has high influence of factors other than rainfall.

Gram production increase or decrease in proportion to that of the cropped area (the cropped area line & production line graph has similar pattern over a period) and hence it is relatively easy to have early assessment of crop production based on amount of area cultivated. This information can be useful for market planning of gram.The production graph of Tuarcrop does not show any relation with either rainfall or cropped area, which indicates that its production is highly sensitive to all variables like rainfall, its pattern, pest attack, diseases etc. Since Tuar is the largest cultivated pulse crop it requires more attention tuards pest control, crop sowing advisory etc. so that farmers can take proper decision regarding timely sowing.

6.10 Pulses: Pest Management:

The poor investment in agriculture field & soil management along with increasing diversification in the scope due to increased irrigation facilities in the study area is leading to increase in the pest and crop diseases.Although pulse crops are prone to many insect pests and seed borne diseases, pod-borer in pigeonpea has been a major cause of concern as its incidence, if not controlled, devastates the crop. Popfly and Maruca also cause serious damage to pigeon pea. Fusarium wilt is wide spread in chickpea, pigeon pea and lentil growing regions. Urd crop is often damaged by yellow mosaic virus and powdery mildew. In addition, heavy damage to pulses grain is caused by pests during storage.

The pulses crops are more susceptible to pest attack due to its sensitivity to changes in temperature and humidity condition during crop growth. The normal pest attacks found in the Chhotaudepur area are Leaf-curl virus, white fly, thrips, Athidthrips in black gram and Pod eating caterpillar, Pod eating fly in Tuar. The farmer reported less incidences of pest attack in pulses as compare to Maize and Paddy, however in past 2-3 years leaf curl virus attack in blackgram is rampant and leading to complete failure of crop. The farmers have reported production of 10-15 Kg./bigha of blackgram in village Kanas.

Under National Food Security Mission (NFSM) it is proposed to increase the production of pulses crops, as part of initiative, the KVK –Mangalbharti, provided research variety black gram seeds and inputs to 30 farmers from village Kanas in Chhotaudepur. It was informed that the seeds have resistance of virus, however, due to disturbance in the rainfall cycle the crop failed miserably. The problem of pest attack is more severe in Kharif crops of Maize and Paddy. More than 25% of the farmers have reported pest attack in Maize and paddy crop. The crop diseases of Leaf stunting, stem borer in Maize and Stem borer, white grab, army warm in Paddy are commonly reported. The farmer practice use of pesticides worth Rs.200/bigha as precautionary measure for Maize, while pesticides expenditure in Paddy is almost

double. In addition to pesticides, weedicides are also used in Paddy to prevent weeds in the nursery.In case of pest attack, farmers have to get pesticides from block head quarter or large village like Tejgadh. Almost 90% of the farmers know only 3 to 4 pesticides and prefer to use same for the crop protection from the pest attack. However, if the pest is not controlled than they are wholly dependent on the agriculture input supplier. Merely any farmer has reported of Government services in case of pest control measure.

The low level of farmer's self-knowledge about diseases and pest treatment and lack of appropriate extension services of the Govt. has lead Shroffs Foundation Trust (SFT) to think of providing local and marketing through local women entrepreneur. The two products namely "AmrutPani" & "Bramhastra" are 100% non-chemical liquid fertilizer and crop diseases controller respectively. Looking at the increasing cultivation of vegetable and two season crops due to irrigation facility is providing ample opportunity to establish these products as alternative to chemical and harmful pesticides.

The production trial and pilot marketing has established the feasibility and market for these two products in the villages of Chhotaudepur and Jetpur-pavi blocks. It is required to have proper and targeted approach for brining farmers' awareness about illeffects of chemical pesticides on environment, natural resources and human as well as its food chain. Small group of 10-15 farmers per village should be targeted for use of these products.The increase in acceptance of such non-chemical pesticides will also help in branding the agri-produce of the farmer under "No Pesticides Managed" (NPM) produce, which can be safe for consumer and also fetch better value for produce.

6.11 Pulses: Crop Harvesting and post-harvest:

Among the three pulses crops under the study black gram is harvested at the end of the Kharif season, while Tuar and Gram are harvested during Rabi season. Due to small area under cultivation and availability of the local labour all farmer harvest and post-harvest operations of the pulses crop are done manually. On an average an acre of pulse crop harvesting cost Rs.400.

Due to manual harvesting and post harvesting operations, the produce have quality issues of grading & foreign elements of soil particles, leaves and other particles, which hamper the rate of the produce. It is essential to use good quality grader and cleaner to improve the quality of post-harvest produce. Since, pulses are cultivated on degraded and slopping land; the manual harvesting practices actually facilitate conservation of soil as with hand operation, the roots of the planted crop remain in the soil and do not losses the soil. Additionally, the uncut part of crop plant act as a cover to protect the soil erosion by strong winds.

In contrast to pulses, majority of harvest &post-harvest operations in Maize and Paddy is done using both manual labour as well as machines. The reason is larger area of cropping and higher labour requirement. For harvesting of Paddy and Maize, the extended families mutually decide about the harvesting operations and accordingly it is carried out turn by turn.

6.12 Sales & Marketing of pulses

The UN General Assembly declared 2016 the International Year of Pulses. For India, this declaration comes at a salient time. In the wake of two successive years of weak monsoons in 2014 and 2015 and the

resulting mismatch between demand and supply, prices of pulses rose sharply, leading to higher inflation and straining the purchasing power of consumers all over India. This is being followed in the current kharif season by the opposite development: a sharp increase in domestic production combined with a surge in global production of pulses. The resulting decline in prices threatens to affect farmers' incomes and livelihoods.

The market of the agriculture produce has always remains major challenge for the Indian farmers. Similarly, the tribal farmers with small quantities of the produce have very limited choices for selling their market produce. Since majority of the farmers produce very little Pulses for the market sells, they prefer to sell it to the local aggregators shop close to their village. These aggregators also provide them annual credit for household requirement of family, which is settled against the procurement of agriculture produce. Those farmers having little higher quantity prefer to sell it in bigger markets like Jetpur-pavi, Chhotaudepur or Alirajpur.

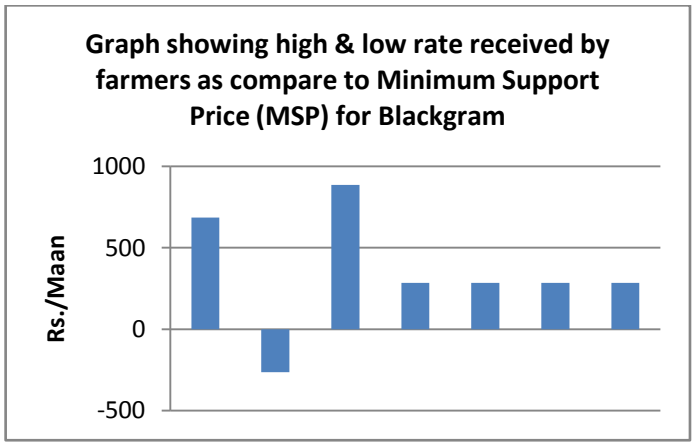
The farmer survey data of production, use and sales in maan for pulses is shown in Fig 6.6 below.

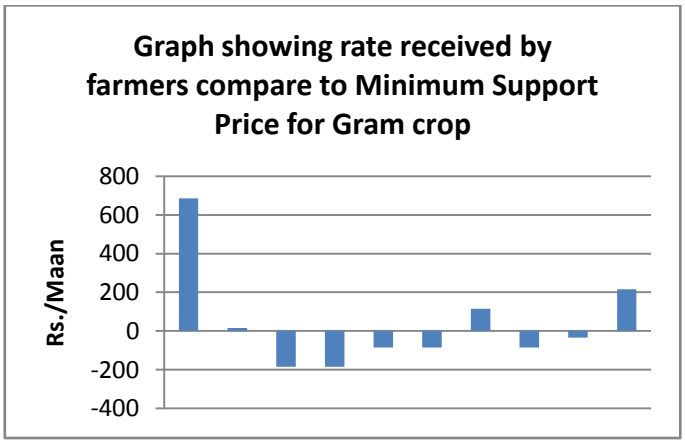
Fig 6.6 Farmer survey data of production, use and sales in maan for pulses

Crop	Area	Production	HH_USE	SALES	Sale %
Blackgram	66.45	494	371	56.5	11.44
Tur	106.6	1756	1147.5	469.5	26.74
Gram	14	158	75	72	45.57
Grand Total	**187.05**	**2408**	**1593.5**	**598**	**24.83**

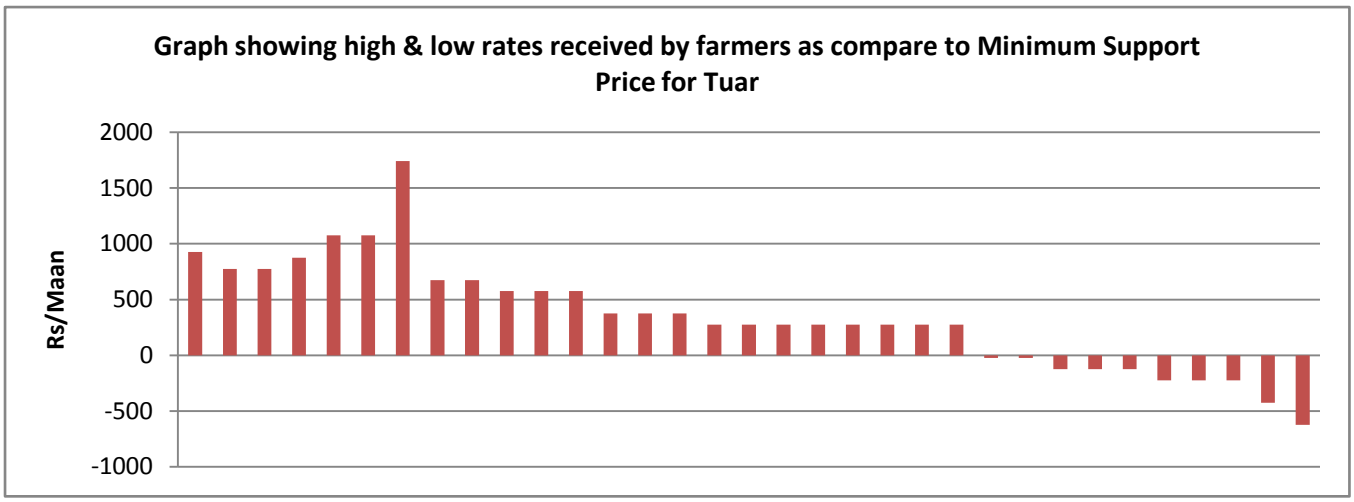
25% of the pulses produced are sold by the farmers. Since last two years, the rates of the pulses are booming and there is a sellers' market for pulse producer. Additionally, the Govt. Has also started procurement of the pulses with Minimum Support Price (MSP). This has kept the pulses rates in the open market remain high. Last year farmer received average Rs.1240/Maan for blackgram against MSP of Rs.945/maan. However, very small fractions of the farmers have surplus pulses for sell in the market. The Fig-6.7 below shows farmer wise rate/maan received for blackgram, Tuar and Gram.

Fig-6.7 Variation in price realisation by pulse crop growers with reference to Minimum Support Price (MSP)





It shows that price volatility in case of Tuar and Blackgram is much less as compare to Gram.



6.13 Cost-Benefit analysis:

The expenditure and income on the basis of the farmer survey data for three main Pulses grown in the area viz. Blackgram, Tuar and Gram are analyzed for profit and loss assessment. The Fig 6.8 gives crop wise details of the farmers who shared their crop sell information during survey and Fig-6.9 below, show crop wise variation in profitability of the farmer on the basis of the rate variation based on sell at actual average market rate, maximum market rate, Minimum market rate and MSP rate. The average, minimum and maximum market rates were derived from the farmer survey data while MSP rate is considered for the current year MSP rate for specific crops.

The crop wise expenditure is worked out from the actual survey data and for calculating profitability the crop wise average production in Maan/acre is considered. The value of byproduct derived from the crop harvesting is added to the income from crop selling under each type of crop selling scenario.

The blackgram crop is cultivated by 80 farmers covered under the survey, however only 7 farmers sold it this years because of crop failure due to viral crop disease. The Fig-6.9 indicate that under average rate blackgram farmer received highest profitability among all three crops and the profitability is higher than under MSP rate. Since there were only 7 farmers who sold blackgram for calculating the crop profitability it is advisable to go with MSP rate.

Fig 6.8 Crop seasonwise crop sell information collected during survey

Crop	No. of farmers			Rate Rs./Maan				Ava. Prod
	Total	Above MSP	Below MSP	Average	Mini	Maximum	MSP	Mann/acre
Black gram	7	1	6	1120	650	1800	915	14.9
Tuar	32	22	10	553	500	900	925	16.5
Gram	9	3	6	1255	1700	2660	685	11.3

Tuar crop is cultivated by 116 farmers and sold by 32 farmers covered under the survey. This shows that it is cultivated for both purpose of cash crop as well as for self-consumption. The graph indicate that profitability under all market rates (average, minim, maxi) is below the profitability at MSP rates, which

indicate that farmer who sold their crops in the open market received less profit as compare to those who can able to sell at MSP rate. Thus ensuring MSP rate is required for maximizing the profitability of Tuar crop.

Gram is cultivated by only 14 farmer out of which 9 sold it, which indicate that gram is cultivated as cash crop by the farmers. Gram profitability is the lowest among all crops at MSP rate, at the same time there is wide variation in profitability under average, minim and maxi. Market rate based profitability which indicates that the volatility of market rates is highest in case of gram. On the other hand since MSP rate is basis for market rates, to have maximum profitability under MSP rate, one has to increase the productivity of the gram.

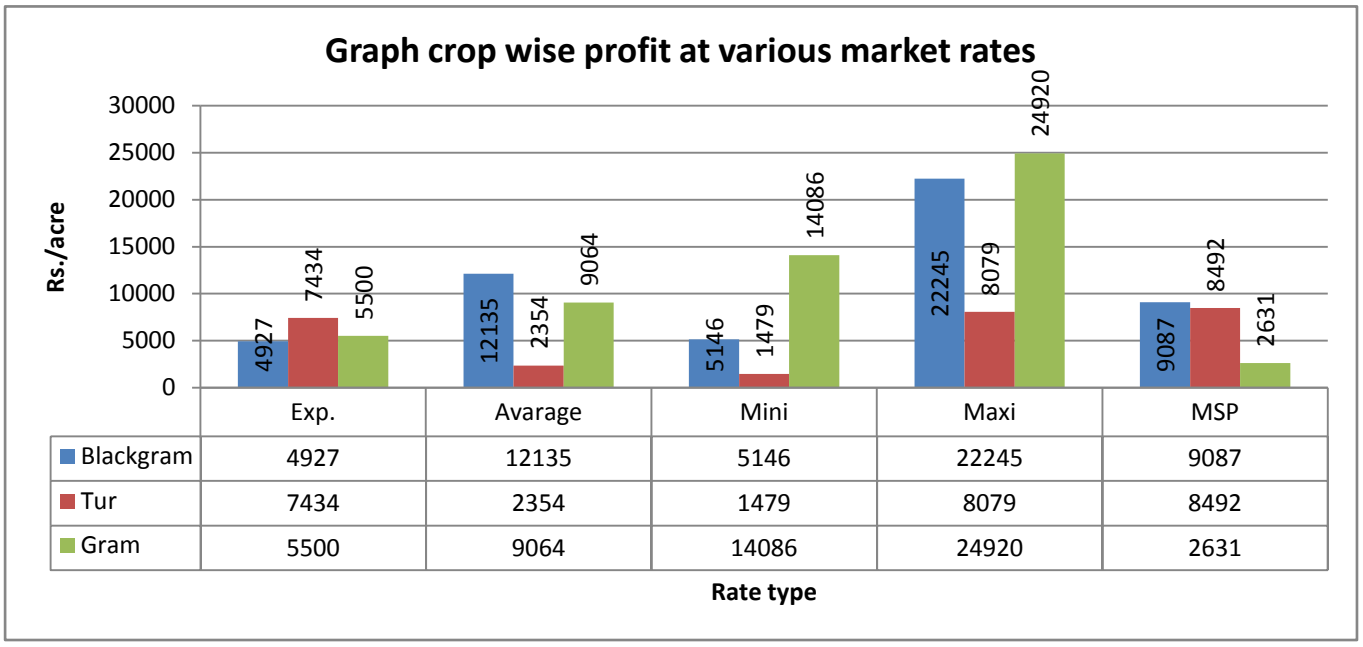


Fig-6.9 Crop wise profit for pulses crop at various market rates

The study also checked if farmer has to get minimum net profit of Rs.10,000 per acre than how much crop wise productivity enhancement is required.

The Fig 6.10 shows gap in the productivity with compare to district and state worked out based on district and state Area-Proudction-Yield (APY) data of respective levels. The analysis shows that there is a scope for improving production by 2.76, 3.4 and 13.72 maan/acre to reach to the state level yield.

Crop	Productivity Maan/acre			Productivity Gap	
	State	District	Study	Maximum	Minimum
Blackgram	12.14	17	14.9	2.76	2.1
Tuar	19.9	15.6	16.5	3.4	0
Gram	25.02	19	11.3	13.72	7.7

Fig 6.10 Gap in the productivity with compare to district and state

To achieve minimum income of Rs.10,000/acre under pulses crop, the worked out crop wise productivity at the given MSP rate is found to be 16, 19 and 23 Maan/acre for Blackgram, Tuar and Gram. Since the state level productivity is well within the range it is easily achievable. In terms of increase in percentage

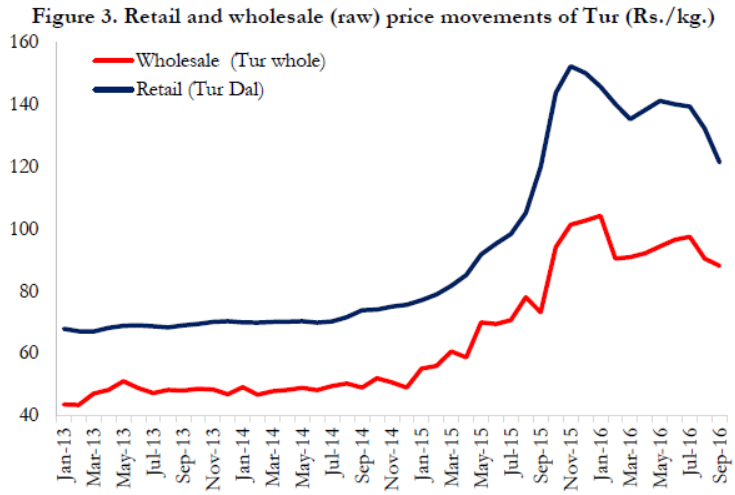
of existing productivity it is found to be 1%, 15% and 103% for Blackgram, Tuar and Gram respectively. Thus maximum focus on increasing Gram and Tuar productivity need to be targeted to satisfy the farmers' income from one acre cultivation.

Fig 6.11 Increase in production required for attaining minimum profit of Rs.10000/acre from pulses cultivation

Crop	Productivity -maan/acre					
	Present	Required	Increase by	% increase	MSP-Rs./acre	Profit Rs./acre
Blackgram	14.9	16	1.1	7.61	915	10122
Tur	16.5	19	2.5	15.15	925	10804
Gram	11.3	23	11.7	103.80	685	10655

The price volatility of Pulses not only affected producers but also adversely affected to the consumer market. As shown in the Fig 6.12 below sudden surge in the wholesale and retail market observed during rates of tuar and tuar dal.

To address the policy issues that would help address this volatility in acreage, production and prices in pulses, the Government constituted a Committee headed by Dr. Arvind Subramanian, Chief Economic Adviser, to review the Minimum Support Prices (MSPs) and related policies to incentivize the cultivation of pulses. The committee in report submitted in September, 2016 has shown strong belief that enhancing domestic productivity and production of pulses rapidly and sustainably is the only reliable way of minimizing volatility in pulses market, and safeguarding the interests of farmers and consumers.



Source: Wholesale – Agmarknet; Retail - Department of Consumer Affairs (Price Monitoring Cell); Data for September is as on 15th September 2016).

In turn, better incentives for farmers in the form of higher MSPs (to reflect the true social value of growing pulses compared to other crops) combined with effective procurement are recommended for increasing domestic availability and preventing price spikes. On the basis of the report Govt. Announced and procured pulses including Gram in Rabi-2016 and declared MSP of Rs. 60/Kg for Blackgram&Tuar. The MSP declaration and direct procurement of Pulses by the Government has created enabling condition for the marketing of the Pulses for the farmers.

6.14 Market potential and future of pulse cultivation

The future potential demands for pulses are going to remain mainly due to following reasons.

First, from a consumption perspective, pulses are going to be increasingly important in the dietary habits of the average Indian consumer. Normatively, this is desirable because the average Indian under-

consumes protein. The International Monetary Fund based data on protein consumption against the level of development of a country indicates that the average Indian consumes about 100 percent less protein than those in other countries at a similar level of development.

Secondly, pulses are not the only sources of the protein, but is the cheapest among all protein sources (one Kg of protein from Pulses cost in range of Rs.154 to 290). Same amount of protein from milk/egg/meat cost in range of Rs.440 to 1220). Hence looking at the socio-economic and cultural background of the Indian society the demand will keep growing.

Third, in future there will be demand-supply mismatch which cannot be filled by imports. At present India is the world's largest producer of key pulses, especially tur, accounting for 67.7 per cent of the global total and additionally it export about 30 percent tur. Consequently, if demand continues to race ahead of domestic supply, it will become increasingly difficult – and expensive – to make up the shortfall from abroad.

The above three arguments clearly direct towards the increasing domestic production which will provide assured market for pulses producers. Additionally, it is projected that if India need to be self-reliant in Pulse production and create buffer stock as in the case of cereal crops, India Pulse production has to grow at about 8 percent per year compared with the 3 percent currently in order to avoid significant shortfalls and price increases.

If technologies and cropping practices for Pulse production are developed for absorbing the climate shock this will be achievable and Pulses will become priority crop for farmers.

6.14.1 Pulses: Environmental impacts

Pulses are environment friendly crops that have the unique ability to fix nitrogen and thereby help improve soil health. Even though, they have low genetic potential in terms of realizing productivity as compared to cereals, they contribute to the environment protection. Opportunity exists in cultivation of pulses not only to increase production of other crops in the cropping system but also entitles pulses growers to claim Payment for Environment Services (PES) through carbon trading or other similar mechanisms.

6.14.2 Pulses: Potential for crop replacement and intercropping

The pulses crops give better return than wheat and other coarse grains like sorghum, barely etc. In the study area wheat is cultivated in some pockets of Jetpur-pavi. The replacement of wheat with Gram or irrigated Tuar will help farmer gain higher return than wheat.

Similarly, the summer season Moong crop is tried by the agriculture department in villages of Chhotaudepur, this can be good options for the area having small irrigation facilities.

Since cotton and ground nut cultivation is peaking up in the study area, Blackgram and Tuar can be introduced as inter crop in this crops.

6.15 Value Chain process

As the Fig-6.13 indicates, first player in the pulses value chain is farmer. Farmer plays the role of primary producer. After harvesting, a farmer has a choice of three players to approach to sell his/her produce.

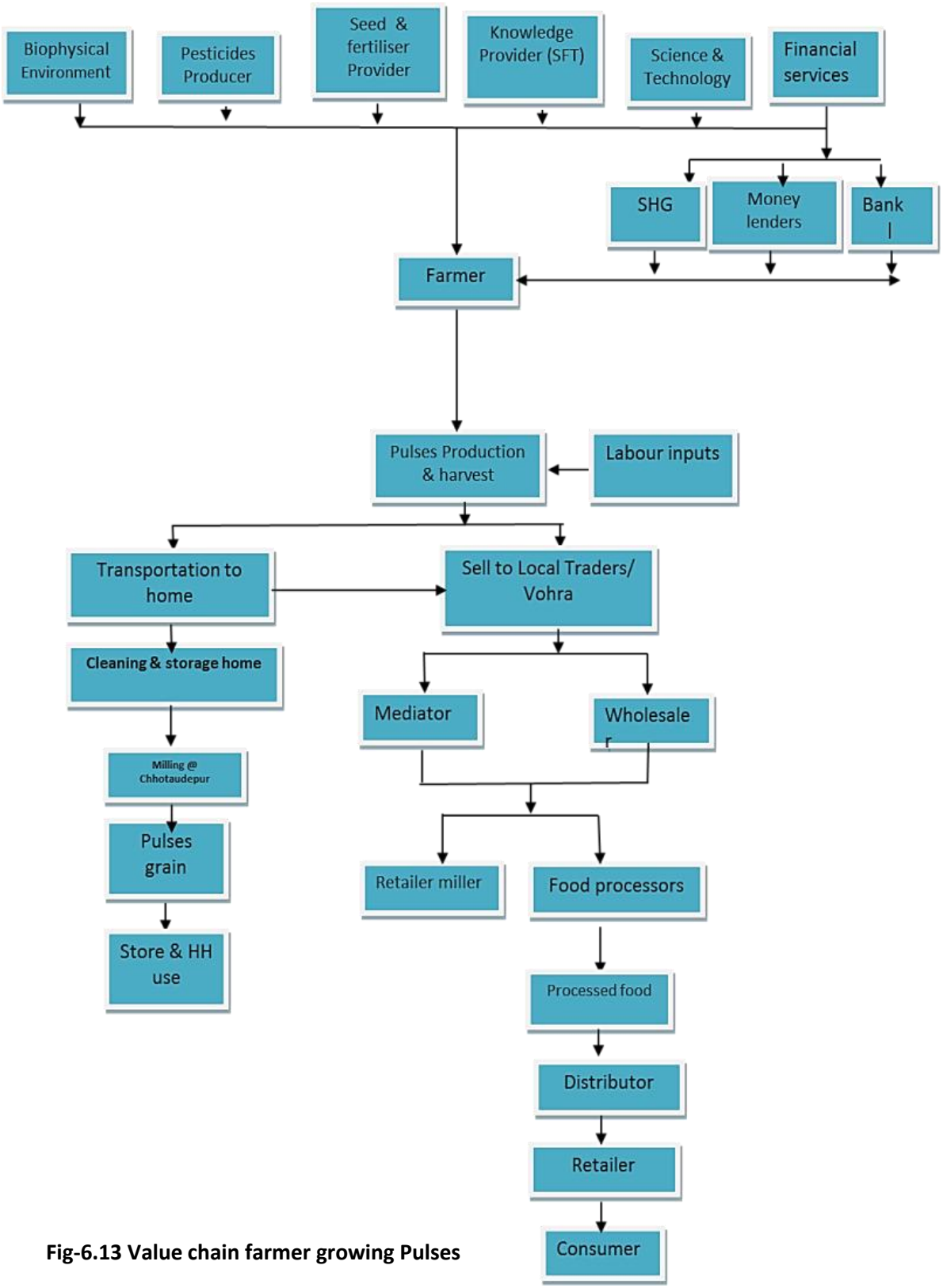


Fig-6.13 Value chain farmer growing Pulses

The first such player is dal processor who converts the pulses to the consumable dal and gives it back to the farmer by charging some fixed processing charges.

The next and most common player that a farmer approaches is trader. Most of the farmers take their produce to mandi (an unorganised one) and sell it traders over there. The last option that a farmer has is to sell directly to big processors i.e. dal millers.

Out of these 3 channels selling to traders is the easiest option for farmers but it is also the channel wherein farmer is being exploited the most. Whereas selling directly to the dal millers earns the highest value for farmers but it is extremely difficult for a farmer to directly approach big processors since they procure only in bulk quantities and also due to presence of mediators in this channel. Traders, who procure from farmers, will sell to the next player in the channel i.e. dal millers. If a trader is selling to big millers outside the local vicinity then that deal would be facilitated through mediators who have a significant say in fixing the price between millers and traders. Thus procured goods will be processed at dal mills and converted into dal. Then with the help of mediators, the goods will be passed onto the wholesalers in the market who in turn sell the goods to retailers from whom the end consumer purchases thereby completing the chain.

The numerous intermediaries makeup for weak infrastructure, and deliver critical value in each leg at very low cost. But many times, by blocking flow of information & market signals, they are able to extract more profits for themselves than the value they are delivering. A more effective business model must be able to leverage the physical transmission capabilities of these intermediaries, yet dis-intermediate them from the flow of information and market signals. This is possible by use of Information Technology.

6.16 Existing value Chain for Pulse production at Farmer's end

6.16.1 Secondary Activities

A. Infrastructure – Major infrastructure farmer is using at his end are tractor for ploughing, sprayers for irrigation both being hired in most of the cases. There are no special equipments like ridge builder is used for Pulses cultivation Land preparation is another important part of infrastructure.

B. Human resources – Given the changing face of rural society, labour requirements of agriculture has changed significantly. Family labour is still in demand for agriculture operations but in many operations farmer require hiring labour. In the tribal society, the concept of community help is still in practices and hence for operations like harvesting and thrashing, it is used by the community. The members of the extended families or neighbours work in turn by turn in each other's fields. Though modern equipment like threshers are available for harvesting, farmers are still going for manual labour only. Farmers are employing labour in almost all the activities ranging from ploughing through harvesting.

C. Technology – Farmers are hardly making any use of advanced agricultural technologies due to both non-affordability and unawareness. They are in absolute dark regarding the advanced technologies. A lot of value in terms of time and yield is being lost due to the lag in adopting technology.

D. Procurement – Farmers are procuring most of their inputs from the local markets like Chhotaudepur, Alirajpur, Jetpur-pavi and Bodeli. Though there co-operatives in the area not all procurement is done from Co-operatives. Procurement from Co-operatives need cash transactions and hence only fertilisers are largely procured from Co-operatives, while seeds and pesticides are procured from private suppliers who provide credit. Because of this, farmers are spending more on their inputs thereby losing a significant share of their returns.

6.16.2 Primary Activities

A. Inbound Logistics – Thus procured inputs are shifted to their places using local modes of transport.

B. Processing – In case of pulses, many farmers are not doing any type of processing including grading and sorting. When probed into the reasons, it is revealed that market is not differentiating between graded and non-graded produce thereby no extra value being added at this stage.

C. Outbound Logistics – Farmers pack their produce in regular bags or cloth and transport them to local traders using own two wheelers or three wheeler. The large producers carry produce in hire vehicle or own tractor. At this stage, they are incurring loading charges and unloading charges. Usually small producer store Tuar and Black gram in traditional baskets prepared from bamboo. Each basket has storage capacity of 25 Maan. For preservation of dry neem leaves are kept at the bottom and side of the basket. They sell it in small quantities according to cash requirement.

D. Marketing and Sales – Most of the farmers are selling their produce to traders in local mandi at bigger village within radius of 20 Km. This mandi being a completely unorganised one, has no regulation of prices. Due to lack of awareness regarding marketing prices, MSP and having lower yields in their hands, farmers are enjoying no leverage in terms of prices.

6.16.3 Exploring the External Environment for Pulses (3-E Exercise)

A. Factor Conditions

1. Availability of Inputs – Though all pulses is adequately available there is a dearth in the availability of black gram in the region due to crop failure and reducing cultivation. Given a disastrous crop this time, it is anticipated that it will be even lower next year.

2. Availability of Human Resources – Being a drought prone region, Chhotaudepur district has a good share of unemployed people migrating to other part of Gujarat for employment. A *dal mill* anyhow doesn't require highly skilled labour. So there is no dearth for human labour. A Black gram and Tuar processing unit was started in Jetpur-pavi but it failed to sustain itself as farmers from this area need cash on delivery payment. There are no big daal mills in the area. The Tuar processing mills are in Anand district and hence these millers procure Tuar from the local traders who collect it from farmer and forward it to millers in Vasad(Anand District) The feasibility of setting up a Dal mill plant in this region is bright if farmer follow scientific cultivation practices and follow advance technologies. Establishment of smaller units at a cluster level with local youth as entrepreneur is another way using Pulses for employment generation. If local Dal mill is available than the farmer will also have choices of selling raw pulses or processed Dals in the market which is always fetching higher returns than raw pulses.

3. Availability of Capital – Since amendment in the 1956, companies act in 2006, the companies act has created space for primary producers in the market participation. In present days, farmer organised under formal institutionalised registered structure do not face problem of finance. Both NABARD and PSBs have attractive products for FPOs for both fixed and working capital requirements. Besides this, SFAC also provides loans under several schemes like ECGF etc.

4. Availability of Infrastructure- Chhotaudepur to Dhar railway line is already laid and is likely to get started in a year or two. This is going to change the trade opportunity in this area soon. So do farming community should get benefit of same. The area will get easy connectivity with several big markets like Vasad and in Madhypradesh- the Pulse production capital of India.

6.16.4 Demand Conditions

A. Size of Demand – The import of pulses to the tune of 20-30 Million tonnes every year in India, provide ample scope for market. From the interactions with several players & literature review it is understood that there is huge demand in the market for pulses which every year goes unmet due to less production. As compare to other crops grown in the area, pulses have much higher margin between the farmer selling prices and consumer purchase price, thus if organised farmer organisation able to reach directly to consumer can change the fortunes of pulse growers more than any other crop growers.

B. Number of buyers – Due to unmet domestic demand of Pulses in India, buyers is always available for Pulses. Moreover, the tribal belt is known for pesticides free agriculture production of pulses. Buyers from Vasad millers also purchase Tuar directly from farmer or their organisations.

C. Product differentiation- The large section of the agriculture production under rainfedconditions do not use chemical fertiliser and pesticides. With little efforts in farmer's awareness about organic fertiliser& growth promoters, soil health and seed treatment the pulses production can become a non-pesticides pulses (NPP), which can be easily certified for export to western countries demanding chemical and pesticides free products.

D. Sophistication of buying process – Though buying process is not technologically sophisticated, buyers value transparency in quality and follow strict weighing measures.

6.16.5 Industry Conditions

A. Number of Firms – There are no *Dal* processing industry in Chhotaudepur district.

B. Existence of competition among firms – The Chhotaudepur district is closer to Madhya Pradesh, where many *dal* processing companies co-exist along with corporate giants like ITC in Pulses procurement. If good quality and branding is done for the pulses in the area, the processing firms like ITC having an advantage of scale can start their procurement center in this area and offering higher prices for quality. The situation can bring down the level of exploitation of the farmers by small traders.

C. Possibilities of setting up new firms – Entry barriers in *dal* processing industry are low.

6.16.6 Institutional Conditions

A. Presence of efficient promotional agency – With increased focus on producer organisations, several effective nodal agencies like SFAC has come up to support FPOs. In case of dal mills, several schemes are available through Ministry of MSMEs.

B. Existence of Functioning FPOs – There are many co-operatives operating in the area, however no one is in the business of value processing or trading in the market.

C. Availability of Training Institutes – There are no pulses specific training institutes available in the district. But Shroffs Foundation Trust (SFT) through its farm school is offering crop specific knowledge and input services to the farmers.

Chapter – 7 Understanding the Horticulture Value Chains in Chhotaudepur district, Gujarat

7.1 Introduction

"Future growth in agriculture, it is argued, can only be achieved by increase in yields of traditional crops or by transition to high value crops like Fruits and Vegetables".

Horticulture is defined as a science of growing and management of fruits, vegetables including tubers, ornamental, medicinal and aromatic crops, spices, and plantation crops their processing, value addition and marketing. The crops like mushroom, bamboo and bee keeping etc. are also included in the category of horticulture crops. Government of India sees a vast scope for expanding the list of horticulture crops grown in India.

Initial decades of independent India, seen priority of self-sufficiency in food grain production, which was the immediate need at that time, however down the period horticulture has emerged as an indispensable part of agriculture.

7.2 Key features of horticulture crops:

The horticulture crops have some of the key advantages as compare to food grain crops which can be listed as below.

1. Horticulture offers a wide range of choices to the farmers for crop diversification.
2. It has also created opportunities for generating substantial employment through development of agro-industries.
3. The horticulture sector contributes around 28% of the GDP from about 13.08% of the area and 37 % of the total exports of agricultural commodities.
4. The characteristics of horticulture crops put farmers with smaller landholdings in advantages (Dr. Sukhpal Singh and Mr. NareshSingla (2010) relevance of F&V crop sector in India).
5. These crops are found to be more labour intensive. They provide recurring income and have high value in market terms. There are a lot of possibilities for value addition.

In the context of the Indian farming dominated by smallholders (average operational holding was around 1 hectare in 2003) and high potential of creating secondary & tertiary employment opportunities- the horticulture cultivation becomes one of the important area for growth of Indian agriculture and achievement of sustainable development goal.

7.3 Role of Horticulture in Indian Agriculture

India is the second largest producer of fruits as well as vegetables in the world, and aimed to double horticultural production by 2020, through the National Horticulture Mission (NHM), a special purpose vehicle.

In India, 15.3% of farmers grow vegetables and 4.6% grow fruits. The percentage of small and marginal farmers growing vegetables is higher than medium and large farmers. The F & V production provide many competitive advantages to the small producers including

- Lower cost due to labour abundance,
- Higher flexibility in their working capability,
- Availability of family labour, and
- Plenty of traditional knowledge which can be harnessed for better productivity.
- Cultivation of F&V crops provides the farmers with a mechanism of risk management against field crop failure risk.

Against these advantages, there are challenges faced by them are

- Standardisation of products in global, national and regional markets;
- Large volume requirements of modern markets.
- Control post-harvest losses. It requires more post-harvest handling.
- Immediate needs of market due to lack of storage facilities and perishable nature due to this they are also prone to high wastage/rejection. As a result profitability is dependent on market acceptance.
- They are more input intensive,
- F & V crop do not gets Minimum Support Price (MSP) declared by the government for other crops.
- Thin local markets for such crops only aggravate the marketing issues for such crops.

Thus cultivation and marketing of F&V crops is a high risk business and it requires good market linkage to make farming of such crops financially viable.

7.4 The future of F & V in India

The F & V cultivation is seen as a vehicle to achieve future growth in agriculture sector in India. The demand for F & V is increasing by the drivers such as changing age structure of the Indian population, rising incomes, increasing number of employed women, changing food habits and growing health and food quality consciousness among food buyers and consumers help primary producers diversify their production away from cereals. The growth of large food retailing outlets has contributed to this change from the supply side (Cygnus, 2007).

7.5 Food retail chains-An important Game Changer for Indian agriculture

Food retail chains are new addition to the institutional framework for agriculture/agribusiness sector in India. They have opened up the opportunity in terms of providing new market linkage for the primary producers of F&V crops.

Many corporate players are operating in food retail sector since last few years, who have set up systems of interface with primary producers which vary in design and practice across food retail chains which has brought major modification in F & V value chain and its benefits and concerns on farmer livelihoods as well as on traditional retailers.

7.6 A Statistical snapshot of Horticulture

China accounts for 16% of world production of fresh F&Vs and India comes second with 9.4% of global production.

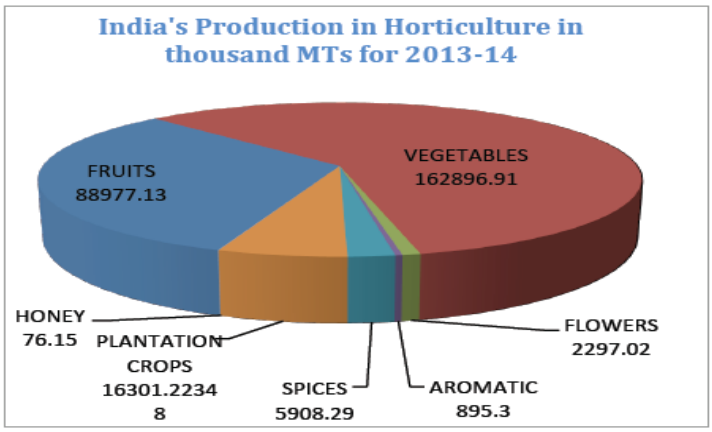
Fig-7.1 Fruit production in the major countries of the world

Production Million Tonnes

Country	1991	% contribution to global production	2004	% contribution to global production	Increase in production during '91 to '04	% increase
Global	353.32	100	511.04	100	157.72	44.64
China	24.08	6.8	83.24	16.3	59.16	245.68
India	28.04	7.9	49.29	9.6	21.25	75.78
Brazil	31.59	8.9	36.01	7.0	4.42	13.99
USA	24.7	7.0	30.19	5.9	5.49	22.23
Italy	17.52	5.0	17.92	3.5	0.4	2.28
Spain	12.79	3.6	16.69	3.3	3.9	30.49
Mexico	9.63	2.7	14.76	2.9	5.13	53.27
Indonesia	6.61	1.9	14.75	2.9	8.14	123.15
Iran	7.58	2.1	13.14	2.6	5.56	73.35
Philippines	8.21	2.3	12.37	2.4	4.16	50.67

Source: Planning Commission of India

However, it is worth notice here that, India was having higher production in 1991 but during 1991 to 2004, China has almost doubled its F & V production than India with growth of 245% as compare to Indian growth of 75%. This indicates that, India still have scope for increasing productivity of F & V.



Source: Netherlands Enterprise Agency- Sectoral overview for Horticulture in India, 2015.

India due to availability of large area accounts for 10% of fruits and 13% of vegetables global production. Total area under horticulture cultivation in India during 2013-14 was 24198.48 thousand Hectares producing total of 277352.04 Thousand MT of horticulture produce. The production of some of the vegetables has earn India first three position in world production. India is global leader in Okra production, stand 2nd in brinjal, cabbage, cauliflower,

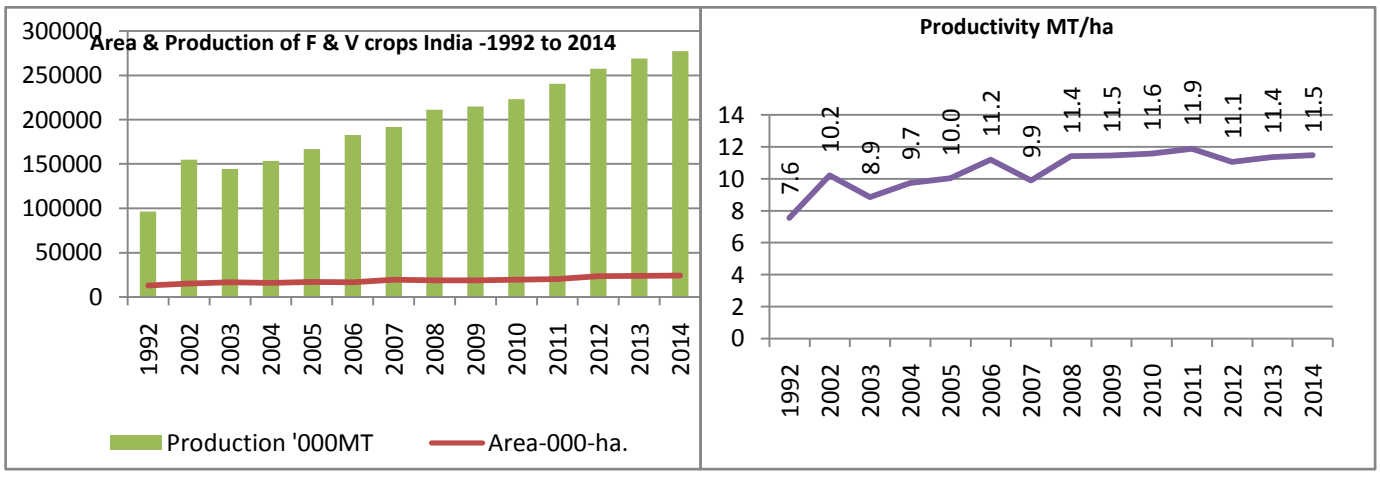


Fig-7.3 Area, Production and Productivity of Horticulture crops in India (1991-2013)

pea, onion and tomato and 3rd in potato.

According to an estimate, over 60 per cent of Indian population depends on horticulture in order to survive and build their career in life. The breakup of various categories of horticulture crops produced in India is shown in the Fig.5.2. Fruit and vegetables constitute the largest chunk of the overall horticulture production in India.

The horticulture scenario at national level indicates stagnancy in growth of the area and productivity and hence a factor that has brought the stagnancy has to be identified and addressed through the NHM programm.

7.7 Horticulture in Gujarat

The state of Gujarat is blessed with eight agro climatic sub regions within small geographical area of 196 lakh hectares accounting for six percent of the country. The wide variety of agro-climatic conditions like soil, rainfall pattern, temperature regimes and irrigation availability favours for development of horticulture crops. Fresh fruits like; Kesar- alphanso mangoes, Sapota, Banana, Aonla and Dates. The vegetables like; Okra, Beans, Cucurbits, Onion, Potato, the spices like cumin, Fennel, Chilly, Coriander, Garlic and Flowers like Rose, Lily, Marigold, Jasmine and Tuberose. Grape, Cashewnut, Medicinal & Aromatic crops like Aloevera, Palmarosa are emerging as potential new crops in suitable areas of the state.The detail information on landuse pattern in Gujarat is given in the Figure 7.4.

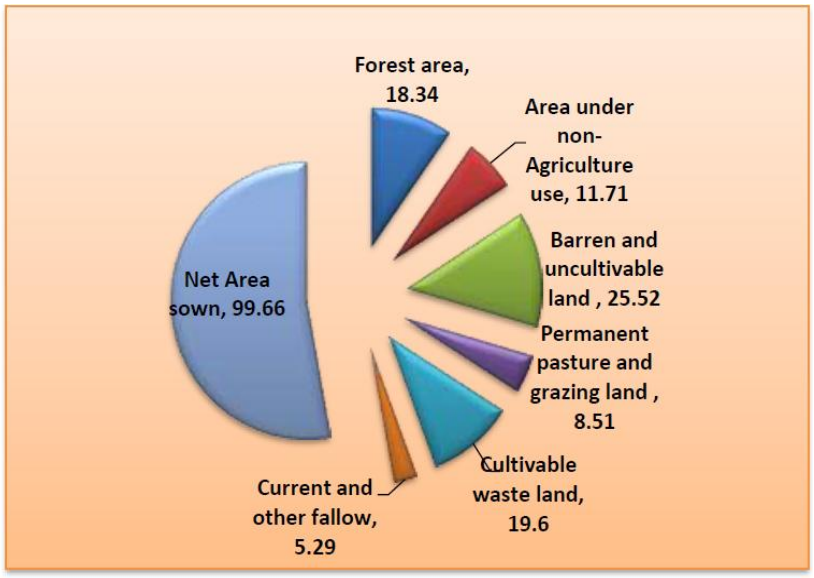


Fig-7.4 Land-use pattern of Gujarat state
Source: Central Mission for Reviewing Horticulture Schemes in Gujarat

The F & V crop productivity of Gujarat state is much higher than the average national productivity of around 12 MT/ha. The average fruit and vegetable crop productivity of the Gujarat was 21.18 MT/ha and 19.90 MT/ha. The high productivity of F & V along with good availability of infrastructure has resulted in establishment of large number of horticulture based agro-processing industries, which is contributing to generation of skill full employment and self-employment opportunities both in rural and urban areas.

Fruits	Vegetables	Medicinal & Spices	Flowers
Mango, Banana, Pomegranate, Dates, Sapota, Lime, Guava, Aonla, Papaya	Potato, Onion, Brinjal, Tomato, Okra, cabbage, Cauliflower, Cucurbitaceous vegetables	Cumin, Garlic, Isabgul, Fennel, Turmeric, Ginger, Chilli, Aloevera, Senna	Rose, Mogra, Marigold, lily, Gaillardia and Others

Fig-7.5 Horticulture crops produced in Gujarat
Source: Netherlands Enterprise Agency- Sectoral overview for Horticulture in India, 2015

Major fruit crops grown in Gujarat are Banana, Mango, Citrus, Papaya and Sapota, while the major vegetables grown are Onion, Garlic, Potato, Brinjal, Tomato, Okra and Cucurbits. The

summary of various horticulture crops produced in the state of Gujarat is shown in Fig. 7.5.

Gujarat state is a key producer of Onion, Potato, Banana, Mango and Pomegranate in the country. The area under such crops has increased over the years. Vegetable production has been graphically shown in Fig. 7.6.

7.8 Research Study for developing innovative Value Chain management strategies

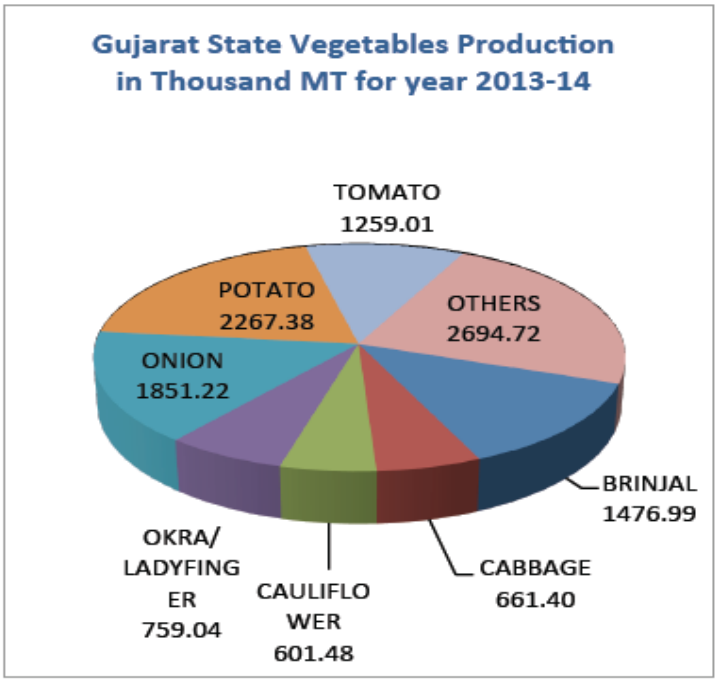


Fig-7.6 Vegetable production in Gujarat

As discussed in the beginning of this chapter, Indian agriculture is dominated by innumerable small farms which are highly dispersed and unorganized. Further, the nature of agricultural produce which are highly perishable and supply is erratic owing to seasonality and biotic and abiotic stresses, calls for innovative Value Chain management which can address these issues and facilitates higher value addition.

Given the significance of the horticulture crops in the overall growth of agriculture in the state of Gujarat, it is imperative that Value Chains of such crops are studied in depth. Such a study becomes all the more important for a tribal district like Chhotaudepur as the entire socio-economic fabric of the district revolves around agriculture in general. It would be useful to see the role played by horticulture crop cultivation in the overall agriculture based economy of the state. Hence it was decided to carry out this study covering three important crops viz. Brinjal, Okra and Mango in Chhotaudepur district.

7.9 Objective of the collaborative study of three horticulture crop Value Chains in the tribal district of Chhotaudepur in Gujarat

The present study is an effort to look at the status and scope of some of the currently existing F&V crop Value Chains in brining socio-economic changes in favour of tribal farmers in Chhotaudepur by understanding:

- Factors associated with pre-production, production and post-production of horticulture crops like okra and brinjal among vegetables; and Mango in fruit category
- Identify areas/factors which lead to improvements in value chain performance
- Suggest the value chain that offers the most promising prospects for economic growth of farmers

As discussed in the methodology section of the report, it was decided to conduct an in-depth study of two vegetable crops (Okra and Brinjal) and one fruit crop (Mango) in 10 villages of Chhotaudepur and PaviJetpur blocks of Chhotaudepur district.

7.10 Cultivation of Brinjal

Brinjal is one of the most commonly grown vegetable crop of the country. India produces about 7.676 M mt of brinjal from an area of 0.472 M ha with an average productivity of 16.3 mt/ha. The brinjal producing states are Orissa, Bihar, Karnataka, West Bengal, Andhra Pradesh, Maharashtra and Uttar Pradesh. Brinjal has ayurvedic medicinal properties and white brinjal is good for diabetic patients. It is also a source of vitamins A, C and minerals.
It is a hardy plant and may be grown on different soils. However, it grows best on soils with silt loam and clay loam texture. A well-drained fertile soil is desirable for the brinjal crop. The deep ploughed, properly drained and leveled soil free from weeds mixed with FYM is essential for development of crop.

7.10.1 Climatic conditions

Brinjal requires a long warm growing season. Daily mean temperature in the range of 13 C to 21 C is favorable for its successful production. Special care is required to protect the crop from frost.
Planting of brinjal is done at the end of April, end of July and end of September on 6-12 mm raised nursery beds covered with plastic or straw mulch till seeds germinate. The seedlings of 4 to 6 weeks old are transplanted adding a small quantity of super phosphate. The spacing should be 50 to 60 cm and 75 to 90 cm respectively for the bushy and spreading type varieties respectively.

7.10.2 Irrigation requirement:

The crop requires adequate moisture during the initial 70 days of its growing season. It can withstand drought in the later part of the growing season. Drip irrigation is ideal for the irrigation of brinjal crop. The daily water requirement of one plant is 0.75 liter at the initial growth stage and 3.25 liters at the peak growth stage. This water requirement of brinjal can be met by applying irrigation on alternate days or at 3 days interval with drip.

7.10.3 Pest

The main pests and diseases of brinjal are described below –
Shoot and Fruit Borer: This is the most serious pest of brinjal. In the initial stages it attacks the terminal shoots and bores inside. Later, it also bores into the young fruits as soon as fruits start setting.
Damping off: This disease is caused by soil borne Phytophthora or Pythium species occurs generally during the nursery stage. The affected seedlings dry up at the ground level and topple over.
Wilt: This is caused by fungi and characterized by yellowing of the foliage. The lower leaves turn yellow and then brown between the veins. The control measures include use of resistant varieties, long crop rotations and periodic spraying of fungicide.

7.11 Okra Cultivation

Okra, or Ladies finger, which is also known as '*Bhindi* ', is one of the important vegetables of India. It is grown throughout the tropical and sub-tropical regions and also in the warmer parts of the temperate regions. Okra has a good potential as a foreign exchanger crop and accounts for 60% of the export of fresh vegetables. It is cultivated in 0.349 M ha area with the production of 3.344 M mt and productivity

of 9.6 mt/ha. The major okra producing states are Uttar Pradesh, Bihar, Orissa, West Bengal, Andhra Pradesh and Karnataka. The crop is also used in paper industry as well as for the extraction of fiber.
Okra can be grown on a wide range of soils, having good internal drainage. Soils with high organic matter are preferred.

7.11.1 Climatic conditions

Okra is a warm-weather crop. It can be grown in the temperature range from 22 to 35 degree C. Okra is susceptible to frost and cold injury below 12 o C temperature.
Sowing is done in two seasons: end of January for the summer crop and end of May for the rainy season crop. The seed rate for the summer crop is 18 to 20 kg /ha and 10 to 12 kg /ha for the rainy season crop. A spacing of 60 x 45 cm or 60 x 30 cm is generally adopted.

7.11.2 Irrigation requirement

The crop requires adequate moisture in the soil during summer months for faster growth. Drip irrigation is most suitable to the crop as it provides uniform moisture throughout the season. The daily water requirement of Okra crop is 2.4 l/day/4 plants during early growth stage and 7.6 l/day/4 plants during the peak growth stage. Irrigation on each day or on alternate days with On-line type of drippers is preferred.

7.11.3 Fertilizers requirement

In order to maximize the yield about 30 t of FYM, 350 kg Super phosphate, 125 kg Murate of Potash and 300 kg Ammonium sulphate should be applied in the rows before sowing for one hectare of land. Nitrogen should be applied through fertigation in three split doses.
As Okra is harvested over a long period, weed control happens to be an important cultural operation. Shallow rooted inter-row cultivation and hand weeding may be used to minimize weeds in the inter row zone. Use of Black plastic mulch is useful to suppress weed growth and keeping the soil warm.

7.12 Mango cultivation

Mango is one of the most important fruits of India. It is the choicest fruit and known as the king of fruits. It is grown in 39.16 per cent of the total area under fruits and contributes to 23.09 percent of the total fruit production in the country. The state Andhra Pradesh ranks first with respect to area and production. However, the state Karnataka has the highest productivity. Mango fruits are used for preparation of pickle, chatani, amchur, jam, squash, nectar and many other delicious products. Mango is one of the major fruit crops of Gujarat.

1. It is being cultivated in 1.41 lakh Ha with total production of 10.04 lakh MT.
2. Gujarat accounts for 6% of the total production of Mango and Gujarat is the fifth largest mango producing state in the country.
3. Kesar Mango is the prominent variety of the state. State has "GI status", Gir area of saurashtra region is main cluster for GirKesar. Saffron colour of flash, pleasant aroma and fiberlessness attracts national and international market.
4. State of the art infrastructure for packaging, grading, Sorting, ripening, pulp making and canning has been established in a cluster of the Mango.

5. High Density Plantation is the emerging trend for new cultivation of mangoes to fetch the higher productivity in Mango.

Mango can be grown on a wide range of soils. However, deep (1.75 to 2.0 m) and well drained soils are favourable for its cultivation. The favourable soil pH varies from 5.5 to 7.5.

7.12.1 Climatic conditions

Mango thrives well in tropical and sub-tropical climates. The ideal temperature for the crop ranges from 24 to 30 C along with high humidity. Temperature below 10 C and above 42 C retards growth and adversely affects the flowering time of mango. A cool and dry period, which slows or stops the growth, is essential for flower induction. Rainfall during the flowering period adversely affects the fruit setting. Fog and cloudy weather at the time of flowering from November to February also result in poor setting of fruits and favours the pest attack and diseases.

7.12.2 Fertilizers requirement

Phosphorus should be applied twice a year i.e. at the beginning (June-July) and end (September-October) of monsoon season. Nitrogenous and potassic fertilizers are usually applied in split doses in June-July, September-October, January-February and March-April. For adult mango trees (10 years or above) 1 kg N, 1.5 kg P2O5, 1 kg K2O and 100 kg FYM per year should be applied. Application of micronutrients such as Zinc and Boron helps the cell elongation process and increases the total sugar, ascorbic acid and total solid contents of the fruit pulp.

7.12.3 Irrigation

The daily water requirement of mango varies from 28 to 85 l/d/plant. The total annual water requirement of the crop is 6400 m3/ha for the planting geometry of 5 m x 5 m. Soil moisture stress from end November to end January is recommended for good flowering. The crop wise summary of production system is described in Fig.7.7

Fig.7.7 Crop production details of horticulture crops

Crop name	Brinjal	Okra	Mango
Sowing period	July-Aug for Kharif& Jan-Feb for Rabi	June-July for Kharif& Feb-March for Rabi	During monsoon
Seed requirement (Kg/ha)	0.30 to 0.40	4 to 6 for transplant & 8 to 10 for sowing	100-200 plants
Manure (tonn/ha.)	10 to 12	12 to 15	10 to 20
Chemical fertilizer (NPK kg./ha)	50-50-50	50-50-50	2 Kg-Ammonium sulphate, 1 Kg-single super phospahte, 1.25 Kg-Potash, 2 Kg-ammonium sulphate
Irrigation (No.s)	10 to 12	14 t0 15 in summer (weekly)	6 to 8

Crop name	Brinjal	Okra	Mango
Potential pest & diseases	Little leaf of brinjal, thrips, fruit borer, mites, sucking pest	White fly, powdery milidew,Warm, suking pest, mite	Fruit fly, warm, millybug, powdery milidew
Production (Kg/ha)- Certified			9000-18000
Production (Kg/ha.)-hybrid	30000 to 35000	16000 to 17000	

7.13 Horticulture cultivation in Chhotaudepur- Study Findings

Most farmers in the study villages cultivate **vegetables** to meet their household needs. In case the farmer has irrigation facility, they may opt for commercial cultivation of vegetables. The three main vegetables cultivated in Chhotaudepur are Brinajl, Okra, and Tomato. Recently SFT has introduced drumstick and chilies cultivation among the farmers and facilitated processing of mangoes and custard apple fruits available in the villages of Chhotaudepur.

7.13. 1 SWOT analysis of vegetable production in Chhotaudepur

Horticulture crops	
Strengths	**Weaknesses**
1. Suitable agro climate 2. Can be cultivated on small land round the year provide petty income to family. 3. Higher availability of family labour 4. Knowledge in cultivation of vegetables among farmers 5. Acceptance of hybrid seeds by the farmers 6. *Haat* markets system for retail sales	1) High cost of seeds and inputs need credit support. 2) Higher harvesting cost. 3) Availability of irrigation facilities 4) Use of drip irrigation is limited resulting in increasing cost of weeding. 5) Dependency on outside market for bulk sells. 6) Lack of transport facility for bulk marketing. 7) Lack of grading and quality management practices among the farmers. 8) Lack of proper packing material and collection center result in quality problem.
Opportunities	**Threats**
1. Local adaptability 2. Popularity in the farming community. 3. Vegetables are important food intake for nutrition 4. Source of regular income from vegetables and mango can help in reduce debt and support cash needs.	1) Availability of quality seedling and seeds. 2) Delay in onset of monsoon result in loss of nursery. 3) Sudden outbreak of pest and disease 4) More water requirement 5) Fluctuation of Market price

Fig 7.8 SWOT analysis of horticulture crops in Chhotaudepur

The horticulture cultivation is most suitable for the farmer from Chhotaudepur mainly due to high market value and small area required for its cultivation. However, high level of initial investment, lack of quality management, recurring expenditure for harvesting and infrastructure for irrigation, transport and packing reduce profitability.

Provided required infrastructure, the horticulture cultivation can be source of boosting economy of the area. The threats mentioned above can be overcome by organizing farmer groups for cultivation of various varieties of same crop and awareness about quality management and facilitating bulk buyer to procure directly from farmers.

The other important findings are

- In the study villages, Okra and Brinjal covers about 7% of the cropped area during Kharif and Rabi crop season and about 20% of the cropped area during summer.
- About 23% of the total 221 farmers cultivate vegetables during Kharif season, but less than 5% in Rabi and summer season. Both Brinjal and Okra are cultivated round the year, but mainly during Kharif season due to water availability. It is more popular among small landholders.
- In study villages farmer cultivate vegetable crop on an average about 0.5 acre of land under Brinjal and Okra respectively in each season.

Fig 7.9 Details of horticulture crops production in study villages of Chhotaudepur district

Season	Brinjal					Okra				
	No. of farmers	Area acre	Production Mann	Sales Mann	Ave price Rs./Mann	No. of farmers	Area acre	Production Mann	Sales in Mann	Avg price Rs./mann
Kharif	46	25.2	1206	1046	217	41	20.9	608	537	391
Rabi	18	7.7	357	344	231	16	6.0	340	330	463
Summer	15	5.1	169	128	214	16	6.4	235	213	461

The Mango orchards are established mostly under "Wadi" programme by the farmers. Each Wadiconsists of 1 acre plot cover 40 trees of Rajapuri variety of Mango. In study area about 10% farmers have Mango orchards. However, it was found that survival of the mango tree is low in the area and only seven farmers out of 28 farmers are able to get mangoes enough for market sales. On an average about 38 mann/acre of mangoes are sold in the market.

7.13.2 Vegetable harvesting:

Brinjal and Okra plucking is done on every 3rd day. 10 labourers are required for this work in an acre between mornings to noon. One labour charge Rs.100 to plucks around 1.5 to 2 Mann okra in half day. On an average the seasonal plucking expenditure of Okra from one acre is about Rs. 10,000. According to the farmers, even after these high plucking expenditure and other expenses, Okra cultivators can earn anything between Rs. 60,000 to 70,000 per acre.

In case of superior quality of Okra produce, income can reach up to Rs. 100,000/- farmer. Okra fetches anything between Rs. 200-500/Mann. If farmers sell their produce in retails, they can earn much more than the figures mentioned above.

7.13.3 Concerns about Seeds

The vegetable crops production is highly dependent on the seeds and seedling used for the production. In the study area more than 90% farmers use hybrid seeds dominate in all season for production of Brinjal and Okra, while in case of mango graft is used for plantation.

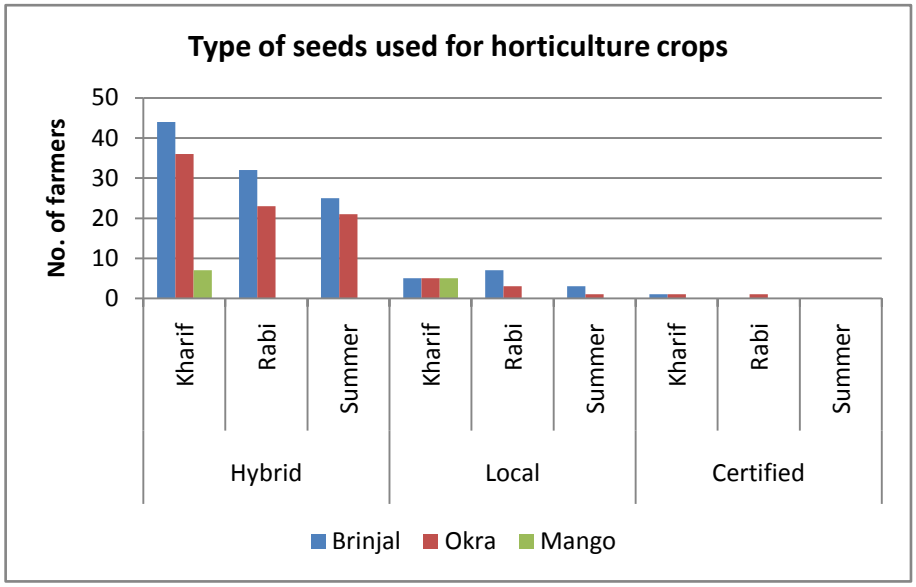


Fig 7.10 Details of type of seeds used for horticulture crops in study villages of Chhotaudepur district

Seeds for the vegetables are bought from the private shops and the saplings are bought from outside. Local farmers also grow saplings but they are made using local variety of seeds which give less production. Hybrid seeds are very costly. A packet of 10 gram seeds costs anything between Rs. 600-700. Compared to this the bringing of saplings from Gulab farm is cheaper and the production gets doubled. Other than this, the seed for brinjal and okra is also brought either from PaviJetpur or Bodeli. The cost for 1 Kg seeds of okra is Rs. 2800 and the cost for 10 gram seeds of brinjal is Rs. 250.

7.13.4Higher irrigation water requirement:

Okra cultivation requires 2 hours of irrigation on every 5th day, whereas Brinjal is relatively less water intensive crop. In case of established Mango tree farmers do not irrigate trees and also do not provide any fertilisers and pesticides.

7.13.5 Market sales of horticulture products

The vegetables and mangoes are cultivated to fulfill family needs as well as for sale in the local market. More than 75% of the produce is sold in local market at weekly *haats* directly to consumers. When it comes to sell of the vegetable to traders in this area, mostly there is an established relationship between farmers and traders. Hence, the traders give these farmers fair price for their produce. Farmers are not pressurised for selling their produce. Grading of the farm produce is not done by neither the farmers no by the traders. Traders directly supply farmers produce to the dealers and if dealers want, they do the grading. Theses traders are also independent and they do not work on behalf of any dealers or any company.

The farmers from villages in Jetpur-pavi area are having facility of the daily vegetable market at PaviJetpur town, where farmers from villages around Jetpur-pavi& traders from outside participate. Apart from this local market, the farmers from Jetpur-pavi taluka also transport & sell daily around 100-150 Mann of the best quality of Okra in the vegetable markets in Vadodara city.

Brinjal is produced at very small scale hence the production is to the tune of one or two baskets on every 3rd day which is sold by the women in the local retail market. The analysis of the APMC rates and the average annual rates of the vegetable and mango sales by the farmers indicate that farmers selling Brinjal directly to consumer are able to earn profit as against rates of APMC, while in case of Okra, the rates of the APMC are higher than that of local markets. The rates of Okra vary from season to season and from year to year. In case of Mangoes, the local varieties of Desi and Rajapuri are low values mangoes and are not traded in the nearby APMC in Chhotaudepur, Jetpur-pavi or Bodeli.In one of the study of village Narvaniya in Jetpur-pavitaluka, farmers cultivate Okra and Brinjal. The village is not having good road connectivity. Initially they got good returns but later they have to sell it to a village level buyer who used to pay them Rs. 50/Mann. Farmers shared that labour cost for plucking the vegetables is highest investment in vegetable cultivation.

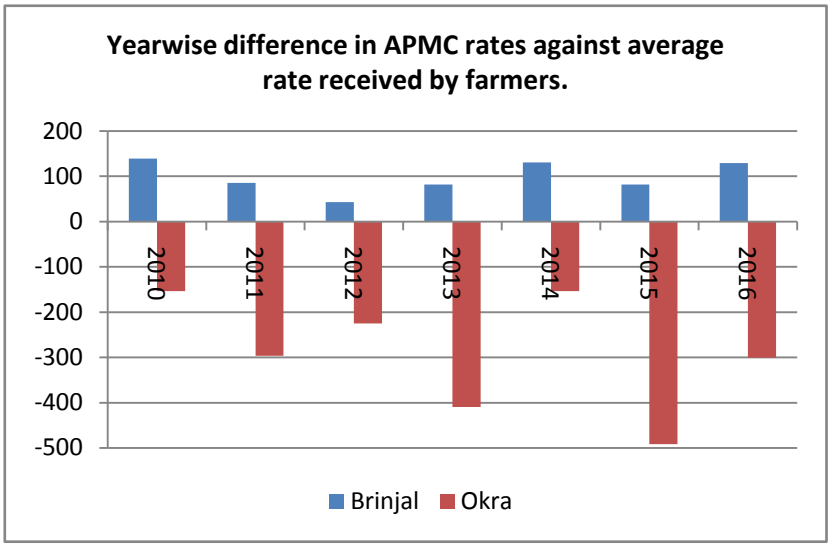


Fig 7.11 Yearwise difference in APMC rates against average rate received by farmers

Thorny fibres in the crop of brinjal also hurt the farmers. If they go to sell it in PaviJetpur market, usually the brinjal fetches them Rs. 150/Mann. But for that they need to wake up and start for PaviJetpur at 4 am so that they reach there at 5 am. If they use their own vehicle the fuel cost for this travel is Rs. 50/-. So effectively they earn almost less than Rs. 100/Mann. Even if all farmers come together and hire a vehicle to sell their produce in the major urban centres like Vadodara, then also it becomes very costly affair and they don't get the rates to make it a profitable business.

The biggest limitation of vegetable crops is, it can't be left in the farm once it is matured. At times farmers are forced to sell the produce even at throw away prices due to this reason.

There are no established and known markets for Mangoes sell in and around Chhotaudepur. Additionally, there is very little production of mango in the area and hence there is no mango market. The mangoes are sold in small quantities by the farmers in the *Haat bazaar* only. Recently SFT has started procurement of *Rajapuri*mangoes for pickle production. This activity of pickle making has provided a window for the farmers to sell their mangoes locally.

7.14 Value Chain process

As the Fig-7.12 indicates, first player in the value chain is farmer. Farmer plays the role of primary producer. After harvesting, a farmer has a choice of three players to approach to sell his/her vegetable produce, but in case of Mango they have one more player in form of co-operative promoted by SFT procuring mangoes for pickle making.

The first such player farmer approaches is trader. Most of the farmers take their produce to mandi (an unorganised one) and sell it to traders over there. The second option for the farmer is to approach to the agent in the APMC in Padra and Vadodara or vegetable market where the agent help farmer group sell their produce to retail/wholeseller. The last option that a farmer has is to sell directly to retail consumers through *selling in local haat*.

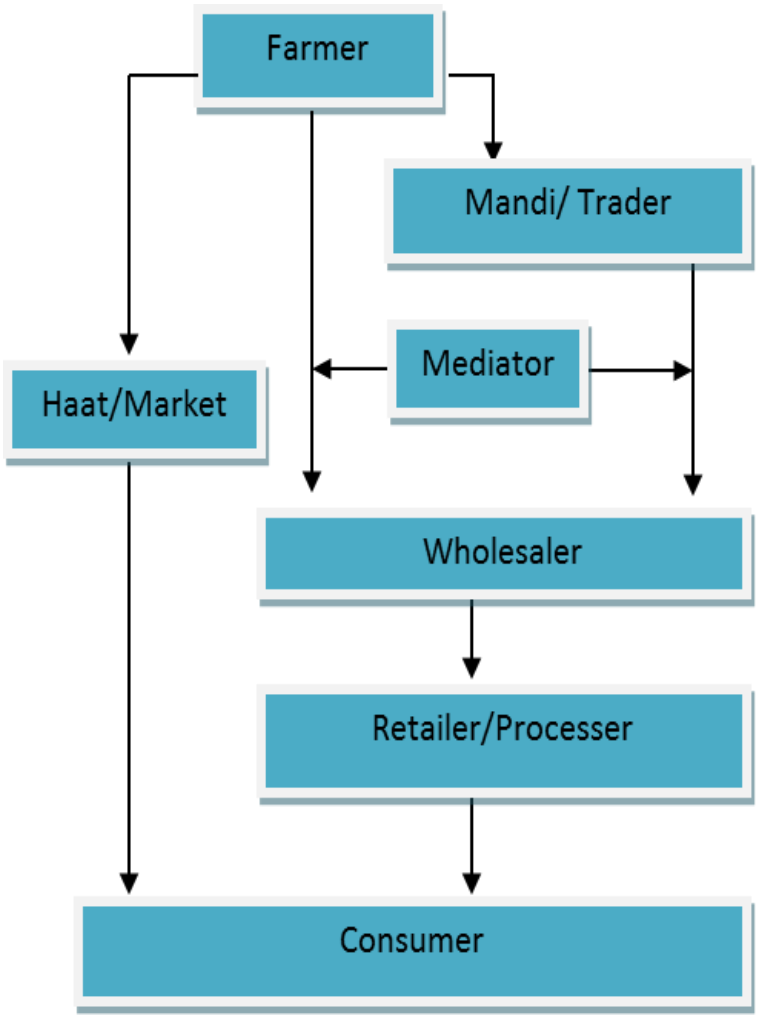


Fig 7.12Horticulture value chain

Out of these channels selling to traders is the easiest option for farmers but it is also the channel wherein farmer is being exploited the most. Traders, who procure from farmers, sell to the next player in the channel i.e processor or exporter. Generally, these traders sell it to bigger traders located outside.

Selling through agent to the big trader earns the highest value for farmers but it is highly cumbersome and time consuming for a farmer since they procure only in bulk quantities and also due to presence of mediators in this channel.

The third option of selling directly to the consumer is the best option available to the farmers and also earns highest price but this chain is suitable only for sell of small quantities.In case of Mango, the farmers have only two selling options i.e. directly to the consumer and second option through SFT co-operative.

The produce procured by big trader is further reach to end consumer via small retailer in cities, exporters and processors to end consumer. In case of mangoes, it either sold to end consumer or to processes of pickle and pulp makers. Thus the F & V produce passes through many more hands than food grain and hence there is big difference in the price realisation by the farmers and the price paid by the end consumer.

The numerous intermediaries makeup for weak infrastructure, and deliver critical value in each leg at very low cost. But many times, by blocking flow of information & market signals, they are able to extract more profits for themselves than the value they are delivering. A more effective business model must be able to leverage the physical transmission capabilities of these intermediaries, yet dis-intermediate them from the flow of information and market signals. This is possible by use of Information Technology. The second option of using emerging corporate buyers system (though not reached in the area) will also help in increasing farmers' stake in agri. Produce value.

7.15 Existing value Chain for Vegetables and Fruit (Mango) production at Farmer's end

A. Supplementary Activities

A.1 Infrastructure – Major infrastructure farmer is using at his end are tractor for ploughing, sprayers and irrigation water which are either own or hired (in most of the cases). The farmers do not use high-tech infrastructure like green house or net house for horticulture production.

A.2 Human resources – The labour requirements for horticulture crops is very high for nursery preparation, weeding and harvesting. Small land holders manage with the family labour but in many operations farmer require hiring labour. In the tribal society, the concept of community help is still in practices and hence for operations like harvesting, it is used by the community. The members of the extended families or neighbours work in turn by turn in each other's fields. There are no modern equipments available for vegetable and mango harvesting; farmers are still going for manual labour only.

A.3 Technology – Farmers are making use of advanced agricultural technologies particularly adopting improved seeds and fertiliser, pesticides in vegetable cultivation. Use of weedicides is increasing to reduce manual labour expenditure. But use of high technologies in packaging and transportation is lacking which lead to quality deterioration and lower price realisation.

SFT supported co-operative provide hiring services related to land development & preparation. The two co-operatives-one in each in Chhotaudepur&Jetpur-pavi blocks cover about 1000-1500 farmers each. The major services of land preparation is opted by the farmers. Though the co-operative is having all equipments, the demand for ridge builder and land leveller is negligible as compare to tractor with plough and thresher. The co-operative is successfully able to provide services to the members of the co-operatives members at rate lower then market rate.

A.4 Procurement – Farmers are procuring most of their inputs from the local markets like Chhotaudepur, Alirajpur, Jetpur-pavi and Bodeli. Though there are co-operatives in the area not all procurement is done from Co-operatives. Procurement from Co-operatives need cash transactions and hence only fertilisers are largely procured from Co-operatives, while seeds and pesticides are procured from private suppliers who provide credit. Because of this, farmers are spending more on their inputs thereby losing a significant share of their returns.

B. Primary Activities

B.1 Inbound Logistics – Thus procured inputs are shifted to their places using local modes of transport.

B.2 Processing – In case of vegetables, some farmers do primary processing of grading and sorting before taking produce to the market for sell, but majority farmers are not doing any type of processing before selling.

B.3 Outbound Logistics – Farmers pack their produce in regular bags and transport them to *haat*, local traders using own or hired transport facilities depending on the quantum. In many villages in Jetpur-pavi where large No. of farmers cultivate vegetable crops, the carry their produce in hired vehicle to places like Vadodara, Padra and Surat. At this stage, they are incurring loading charges and unloading charges.

B.4 Marketing and Sales – Most of the farmers are selling their produce to traders in local mandi at bigger village within radius of 20 Km. This mandi being a completely unorganised one, has no regulation of prices. Due to lack of awareness regarding marketing prices and having lower yields in their hands, farmers are enjoying no leverage in terms of prices.

In case of mango sell to co-operative farmer receive rate according to declared rate based on quality and grading.

C. Exploring the External Environment for Maize (3-E Exercise)

C.1 Factor Conditions

1. Availability of Inputs – All inputs required for vegetable and mango cultivation are adequately available in the region, except irrigation water and hence the rabi and summer vegetables are cultivated only by the farmers who are having adequate facilities for irrigation. Almost 90% of the vegetables produced is sold in the market. Since it is produced in all three season the availability is round the year.

2. Availability of Human Resources – Being a drought prone region, Chhotaudepur district has a good share of unemployed people migrating to other part of Gujarat for employment. So there is no dearth for human labour to initiate a processing unit for mango pickle and pulp making which can provide local market too. At present co-operative promoted by SFT is the only player running pickle making unit in the region. The scale of pickle making by co-operative can be expanded by adopting decentralised functioning of chopping and preparing unprocessed brine soaked pickle mango, which can also be supplied to other pickle makers in surrounding areas.
3. Availability of Capital – Since amendment in the 1956, companies act in 2006, the companies act has created space for primary producers in the market participation. In present days, farmer organised under formal institutionalised registered structure do not face problem of finance. Both NABARD and PSBs have attractive products for FPOs for both fixed and working capital requirements. Besides this, Small Farmers' Agri-Business Consortium (SFAC) also provides loans under several schemes like Enhanced Credit Guarantee Fund (ECGF)etc.
4. Availability of Infrastructure- Chhotaudepur to Dhar railway line is already laid and is likely to get started in a year or two. This is going to change the trade opportunity in this area soon. So do farming community should get benefit of same. The area will get easy connectivity with several big markets like Vadodara, Surat and Padra known for vegetable market.

D. Demand Conditions

1. Size of Demand – The demand for vegetables and fruits is increasing with increasing GDP. It is said that vegetable of any quality has potential to be sold. The market for frozen vegetables and ready to eat vegetables is also developing gradually in big cities. Similarly the market for store and consume products like pickle and pulp is also emerging very fast due to time constraint.
   The Indian pickle making art has spread all across the globe and made itself a part of almost every cuisine in the world in one form or other. India's export of pickles is around 3% of total APEDA

exports (Agricultural and Processed food products Export Development Authority of India), making it around 371.62 Crores INR in 2014-15.

2. Number of buyers – Due to round the year availability and daily dietary consumption Okra and Brinjal are always in demand. Additionally, the increasing export potential for Okra and popularity of mango as fruit and mango pickle and pulp, buyers are always available for all three produce.
3. Sophistication of buying process – Though buying process is not technologically sophisticated; buyers value transparency in quality and follow strict weighing measures.

E. Industry Conditions

1. Number of Firms – There are no processing industry in Chhotaudepur district for vegetables.
2. Existence of competition among firms – There is only aggregators and traders operating locally. They are acting as an agent for bigger traders and industries located in cities. Since the scale of the produce and market size is low, there is very limited opportunity to operate. But in most of the cases, like in vegetable markets at Jetpur-pavi or Vadodara these agents exploit producers and do not offer rates by creating doing syndicate for carteling.
3. Possibilities of setting up new firms – Entry barriers in pickle making industry is low.

F. Institutional Conditions

1. Presence of efficient promotional agency – With increased focus on producer organisations, several effective nodal agencies like SFAC has come up to support FPOs. In case of frozen food, oil mill and cattle feed, human food, several schemes are available through Ministry of MSMEs.

2. Existence of Functioning FPOs – There are many co-operatives operating in the area, however no one is in the business of value processing or trading in the market.

3. Availability of Training Institutes – The KVK at Golagamdi operating under Anand Agriculture University conduct farmer training and published literature regarding vegetable and fruit cultivation. Shroffs Foundation Trust (SFT) through its farm school is offering crop specific knowledge and input services to the farmers.

Chapter – 8 Recommendations & suggestions for improvement in Value chain scenario

8. Crop specific recommendations

8.1 Maize:

Maize production is affected by a number of biotic and abiotic factors including others like inadequate marketing facilities and less recovery of Maize due to use of conventional practices and machines at the farm level. Some of the important suggestions for improving Maize value chain are as under:

1. Mechanization of Maize production, processing and handling is very important in order to increase production and saving of losses. It also helps in timeliness of operations, better utilization of resources, reduction of drudgery, increasing production and productivity leading to economic benefits.
2. At present, more than 80% area of Maize is rainfed so, arranging irrigation at critical stage by micro irrigation devices (Sprinkler set and Raingun etc.) may increase production by about 10-15%.
3. It has also been observed that most of the farmers do not follow proper crop rotations, besides, growing Maize in less fertile lands. There appears a need for creating awareness among the farmers to grow Maize following pulses crop or intercropping for increasing production by restoration of soil fertility and biological nitrogen for long life of soil.

Area/ Organisation specific Recommendations :

1. The Chhotaudepur region is suitable for Maize promotion programme focusing on increasing Rabi-Maize cultivation, reduction of crop diseases and quality management of harvest. The increase in rabi Maize cultivation will facilitate animal rearing and diary due to increased availability of fodder round the year.
2. Authentic agromet advisory and crop insurance services are required to be promoted for Kharif Maize. It is observed that due to lack of information regarding on set of monsoon farmers end sowing Maize as per traditional period which do not germinate due to lack of rainfall.
3. Use of sprinkler/rain gun for Maize irrigation is missing in the area. To increase Rabi-maize cultivation it is essential to promote water saving device leading to expansion of the cultivated area.
4. Maize is most suitable and popular crop for the area. However, for achieving better returns per unit land Maize cultivation with pulses intercropping needs to be promoted.
5. Strengthening and increasing use of machine for harvesting and threshing is required for maintaining physical appearance and quality of Maize produced.
6. The expenditure on pesticides and fertiliser make up major cost in Maize cultivation. The pesticides use can be replaced by soil health management & seed treatment awareness and use of “Amrutpani”, “Bramhastra” and “Vermicompost& compost”.
7. While more than 45% of the maize is sold in the market and the market for value added products of Maize is growing very fast; there is no player in the local market for this value added maize products. The farmer can have better share in market price if they are organised for marketing of Maize by backward integration for improving production.

8. A detail market rate study should be conducted to understand why farmers are selling Maize at a rate below MSP and to understand the market dynamics.
9. Small scale value addition to Maize is possible for catering both rural as well as urban markets. Frozen foods, ready to cook/eat (packed corn flour, pop-corns, Makai Vada), fresh Maize karnels during season can be profitable options with small investment and decentralised production. This will generate additional employment particularly women in the families.
10. Organising Maize festival is another way of promoting Maize based tribal delicacies to Urban folk.
11. Credit support scheme for purchase of seeds and pesticides will help in getting out of exploitative practices of money lenders who purchase crop in return of credit at rate lower than MSP.
12. Awareness and linkages to Kisan credit card is required to cover large section of small and marginal families have access to credits from formal banking sector.

8.2 Paddy:

Paddy production is affected by a number of biotic and a biotic factors including others like inadequate marketing facilities and less recovery of rice due to use of obsolete processing machines. Some of the important points demanding attention to resolve constraints in paddy production, market and value addition are given as under:

1. The rain fed paddy lands remain uncultivated during rabi season due to lack of cultivation knowledge of field crops in non-availability of irrigation water. Hence, the farmers of such areas are required to be guided to grow pulses in Rabi season on residual moisture, chickpea / Barly in medium and lowlands as pulse crops provide better production in the aforesaid conditions.
2. Mechanization of Paddy production, processing and handling is very important in order to increase production and saving of losses. It also helps in timeliness of operations, better utilization of resources, reduction of drudgery, increasing production and productivity leading to economic benefits.
3. Paddy is rainfed crop under Kharif and therefore, arranging irrigation at critical stage by micro irrigation devices (Sprinkler set and Raingun etc.) may increase production by about 10-15%.
4. Maintenance of genetic purity of old popular high yielding varieties of Paddy (Kulthi, Ragi etc.) may also support in development of special market.

Area/ Organisation specific Recommendations:

1. The Chhotaudepur region is suitable for promotion of SRI method of paddy cultivation.
2. Paddy crops are very sensitive to temperature variation during its growth stage and hence authentic agromet advisory and crop insurance services need to be integrated.
3. Rice base small enterprises like rice papdi, puffed rice, murmura etc. can be promoted for increasing employment opportunities and local market.
4. The rice husk has huge potential for value added productivity of this agri-waste. The risk husk though is low value by-product is having huge potential for value processing. However, the local farmers and rice millers who act a procurement agent for further user do not have knowledge about the end use of the rice husk. The knowledge about value of rice husk needs to be understood and appropriate technologies can be adopted for value addition of husk at local level for generating products which can be used by the local resident. Some of the potential value addition from the rice husk like extracting rice brane oil, cattle feed production is possible at local level. The potential of rice husk

use in power generation can revolutionary measure for resolving power crisis which can help in boosting other enterprises. The present and future potential technologies of rice husk based value added products is shown in diagram below for reference.

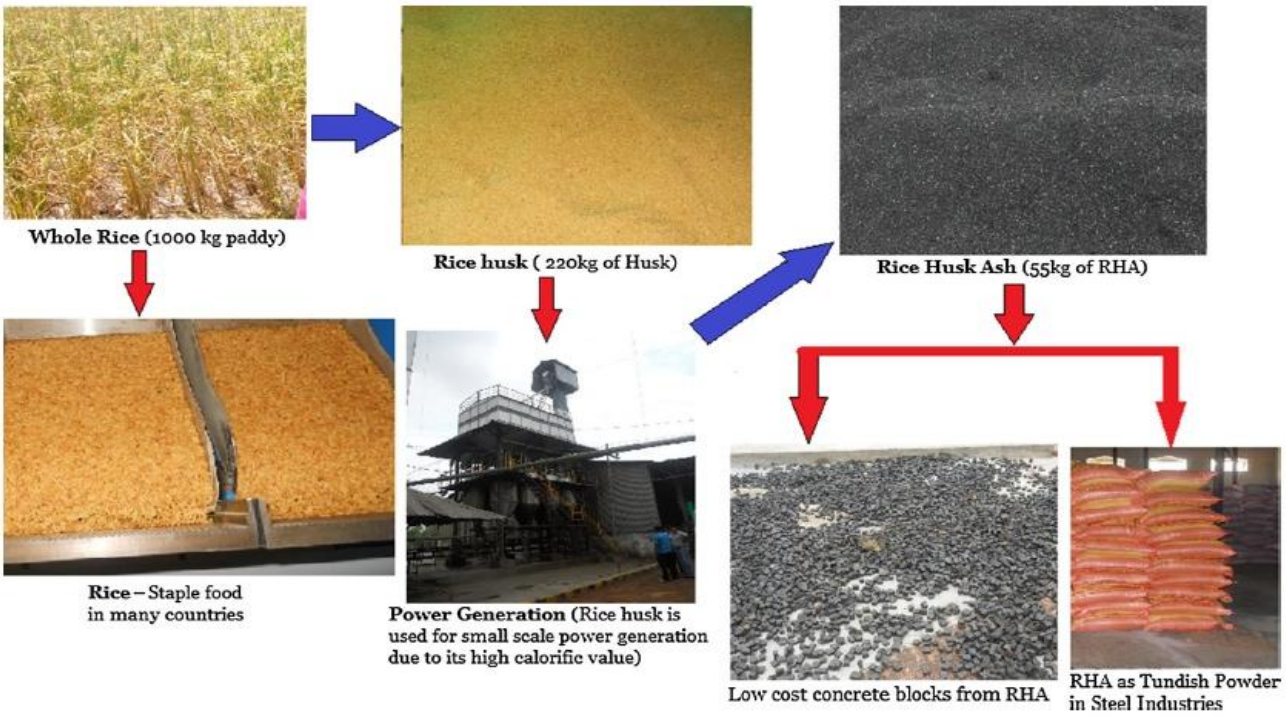


Fig. 8 Present day scenario of utilization of rice and RHA

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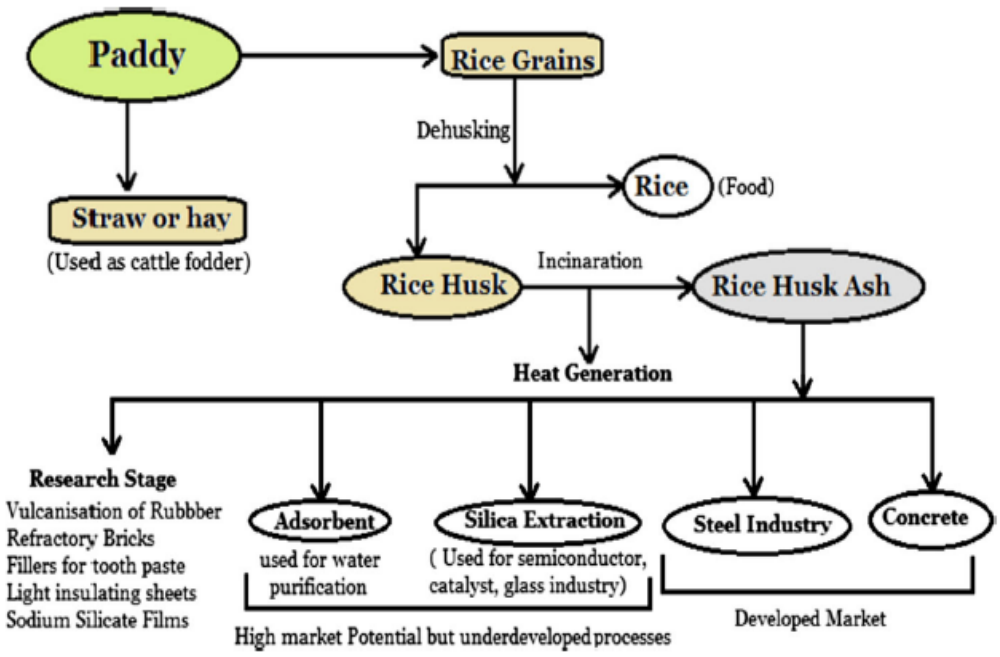
Fig. 9 Possible value added products from rice husk ash and their potential in market and stage of development



management along with seed treatment awareness is very crucial for better production of pulses crops.

6. The Paddy is one of the popular crops in the study area. It is feasible to use ridges in the Paddy fields for plantation of pigeon peas.
7. Create awareness about kisan credit cards and Govt. scheme.

8. Since price realisation is below MSP, SGS co-operative should run procurement center with support from SFAC for Paddy during prices go low.
9. Promote Farmer Producer Company (FPC) for collective marketing of Paddy.

8.3 Pulses:

Pulse production is affected by a number of biotic and a biotic factors including others like inadequate marketing facilities and less recovery of pulses due to use of obsolete processing machines. Some of the important points as constraints in pulse production and necessary suggestions to resolve them are given as under:

1. A total of 101 lakh quintals of seeds of pulses are required at 100% SRR. About 20-25% area is sown with certified / quality seeds and the remaining is sown with seeds of farmers. It is understood that about 10 - 20% pulses production may be increased by increasing distribution of certified / quality seeds covering 50 % of the total area under pulses. To sow this area, 50 lakh quintals of certified seed is required. It will be a positive approach in the direction of increasing pulse production by increasing supply of quality seeds maintaining multiplication chain involving nucleus, breeder and foundation seeds.
2. Pigeonpea and chickpea are major pulses, which contribute about 60% of total pulses production. Among the insect pests and diseases, Helicoverpaarmigera and wilt are the major pests, damaging about 20-30% of the productivity. To minimize the losses by the above and other pests to pulses, aggressive implementation of IPM and INM technologies is required. In addition, development of pulses varieties resistant to pests, especially podborer and wilt of Arhar and gram are urgently required.
3. The rain fed paddy lands remain uncultivated during rabi season due to lack of cultivation knowledge of field crops in non-availability of irrigation water. Hence, the farmers of such areas are required to be guided to grow pulses in Rabi season on residual moisture, chickpea / Barly in medium and lowlands as pulse crops provide better production in the aforesaid conditions.
4. Mechanization of pulse production, processing and handling is very important in order to increase production and saving of losses. It also helps in timeliness of operations, better utilization of resources, reduction of drudgery, increasing production and productivity leading to economic benefits.
5. At present, more than 80% area of pulses is rainfed and therefore, arranging irrigation at critical stage by micro irrigation devices (Sprinkler set and Raingun etc.) may increase production by about 10-15%.
6. Pulse crops require well drained soils. During south west monsoon, it has been observed that most of the crops affected are in lowlying areas. This may be minimized by growing pulses in well drained soils or making well drainage system. This apart, crops are also affected by high and low temperatures, especially when crop of pigeonpea, chickpea and lentil are in flowering to pod development stages. Farmers are to be guided to cultivate varieties tolerant / resistant to these problems.
7. It has also been observed that most of the farmers do not follow proper crop rotations, besides, growing pulses in less fertile lands. There appears a need for creating awareness among the farmers

to grow pulses following crop rotations for increasing production by restoration of soil fertility and biological nitrogen for long life of soil.

8. Maintenance of genetic purity of old popular high yielding varieties of pulses may also support in increasing production.
9. Seed treatment with rhizobium culture is very useful as it enhances yield level. However, the availability of rhizobium culture is constraint and there is a need for mass multiplication and should be promoted for extensive use by farmers.
10. To get higher prices, there is a need to improve post-harvest technology to recover maximum dal from grain.
11. Improper fertilizer use in intercrop, poor plant stand and proper plant protection measures are very important to realize higher yields in pulse crops.
12. Value addition by fortification of pulses with other food items to enhance food value.

Area/ Organisation specific Recommendations:

1. The Chhotaudepur region is suitable for promotion of a complete Pulses promotion programme focusing on reducing climatic crop losses, reduction of crop diseases and quality management of harvest.
2. Pulses crops are very sensitive to climate variation and hence authentic agromet advisory and crop insurance services need to be integrated.
3. Pulses are most environmental friendly crops contributing to fixing of the nitrogen requirement of the soil and also less water requiring crop. It is suggested to increase the area of pulses production under inter-cropping and mono-cropping.
4. The Rabi and summer pulses are much better option than cereal crops. It is required to explore other pulses which can be grown during Rabi and Summer.
5. The pest and diseases in Pulses crops are mainly due to poor soil health management. Soil health management along with seed treatment awareness is very crucial for better production of pulses crops.
6. The market demand for pulses is going to remain in Indian food habit. The farmer can have better share in market price if they are organised for marketing of pulses by backward integration for improving production.
7. The Pulses crop especially Blackgram and Tuar has very high potential to be promoted as non-pesticide pulses. A small group of 5 to 10 farmers per villages should be intensively associated with this programme.
8. The tribal culture with its local food crops prepares many delicious dishes which provide ample opportunity for agriculture base tourism for the urban population.
9. Production technology for a pulse crop has to be soil type/region specific, tillage and seeding device/gadgets. Kharif pulses in black soil region (for which ridge planting is most relevant and recommended) require ridge planter to grow kharif pulses, this agri-mechanisation will help in protecting crop during heavy rainfall.
10. The Paddy is one of the popular crops in the study area. It is feasible to use ridges in the Paddy fields for plantation of pigeon peas.

11. Credit support scheme for pulses grower farmer is feasible in present situation where demand for pulses is rising and Government is assuring Minimum Support Price (MSP) and facility for procurement.
12. Promotion of shorter duration crops and crop variety which fitting between two main seasons is feasible to increase production of Pulses.

8.4 Horticulture

Horticulture provides ample opportunities to increase profitability from the agriculture sector. However, the highly perishable nature of the produce and high input and labour makes it high risk crop. In context of the Chhotaudepur, the potential of the horticulture cultivation is not fully realised due to many constraint related to infrastructures, markets and value processing. Based on present study of Brinjal, Okra and Mango crop, the following recommendations will be useful for strengthening value chain process for benefiting tribal area.

1. Irrigation facilities- enabling conditions for promotion of horticulture

The study revealed that presently only those farmers having irrigation facilities are able to cultivate horticulture crops. The irrigation facility is the first condition for promotion of horticulture crop. In current situation, only flood irrigation is used for cultivating irrigated crop.The area under vegetable cultivation is restricted to 0.5 acre/ farmer, mainly due to high demand amount of water. Adaptation of low water consuming micro irrigation system (MIS) for vegetable cultivation will help in increasing the area under vegetables round the year. The cost benefit analysis of using MIS for brinjal and Okra is shown below.

Description	Brinjal	Okra
Area/ Planting geometry	**1 ha/75cm x 60cm.**	**1 ha./ 60cm x 30cm**
Fixed cost of drip system :	**Rs. 75,263**	**Rs. 99,366**
Life of drip system :	**7.5 years**	**7.5 years**
Annual cost of drip system :	**Rs. 10,822**	**Rs. 14,287**
Cost of cultivation :	**Rs. 12,750**	**Rs. 11,500**
Expected yield :	**47 t/ha**	**17 t/ha**
Expected Benefit-Cost ratio	**3.2**	**: 2.2**

Source :http://www.ncpahindia.com

2. Promoting entrepreneurs for planting material nurseries

The procurement of quality seeds/plants is the major constraint of the farmers. They are highly dependent on the local nurseries or have to bring seedlings from distance of 100-120 Km. from Avakhal in Dabhoitaluka and from Karjan. There is no fruit plant nursery in close vicinity. Due to long distance transport the chances of seedling damages is high. This can be avoided and facilitated by promotion of local youth as a entrepreneurs for seedling and fruit plant nursery business. This needs training of the youth in nursery at Chhotaudepur. The easy availability of quality seeds will also help new farmers to adopt horticulture crops.

3. Quality production- packaging

The packaging of the vegetables and mango for transportation is done using available cloths or sags and plastic bags. The lack of proper packing also damage the produce during transport and affect its quality by the time produce reach to market. Proper packaging crates for vegetables and fruits needs to be used for its transportation. The linkages of farmers growing horticulture crops with Govt. Project for providing crates should be taken up or else they should be made aware about losses due to transportation in cloth and local packaging material so that they are encouraged to buy it.

4. Increasing scale of cultivation

The current scale of daily vegetable production per village restrict outside traders to procure it directly from the villages. It is very essential to increase the daily vegetable production from the village to make it feasible for the farmer to sell it outside.

5. Small producer linkages with respect to Marketing of Horticulture crops

Linking small primary producers with markets has been identified as one of the major issues in policy and practice in improving livelihoods for millions of poor. More recently, there have been many corporate attempts at linking farmers with markets including those by food retail chains in India. Retail chains can be viewed as new institutions in agriculture/agribusiness sector providing a new market linkage for the primary producers of F&Vs which is characterised by use of Information and Communication Technology (ICT) (mobile phones), new quality standards and cash transactions besides direct sale of produce. Thus, retail chains bring in quality culture, instant demands and supply and, more commercial nature of production and marketing at the farmer level.

Fresh F&V produce in India is marketed mostly either through regulated Agricultural Produce Marketing Committee (APMC) markets or totally unregulated local F&V markets. Marketing through these traditional channels is characterized by very little attention to grading, sorting and storage, weak regulation, poor handling during loading, unloading and transport resulting in loss of 30–40% of production.

Value Chains for fresh F&Vs tend to be multilayered which has implications for the farmers' share in the final consumer price; the quality of produce due to multiple handling; and for the marketing cost as the various agents add their costs. In contrast to fragmented Value Chains in traditional market, Value Chains developed by organized retail chains are supposed to be well coordinated (Punjabi and Sardana, 2006).

6. Training regarding quality demand and handling during transportation

The vegetable and mango producer farmers have lack of understanding about the quality norms in the market. The farmers willing to sell his entire harvest avoid sorting and grading and sorting due to which the traders gets an opportunity to cut price towards damaged material and finally pay less than market price to the farmer. Simple orientation and guidance of sorting and grading as well as packaging and handling during transport would help farmer get market price.

7. Credit support

Due to high investment and risk nature of horticulture crops, the tribal farmers having small and marginal land holding are cultivating it only on part of the total land available. The assurance of market for the produce and credit support during production season will help in encouraging farmers for cultivation of these crops. With assured and increased production will also attract more traders and also make its transportation feasible to the markets located at far distance. This will also help in direct sales to the processing units or exporter who can provide better price to the farmer. The model of micro finance by a private company DISHA is already operational in village Padharvant where women joint liability groups (JLG) are offered one year credit support ranging from Rs.5000 to Rs.25,000 payable in EMI. SFT already working with women SHG and groups should generate product under its co-operative for micro-finance lending for vegetable and horticulture cultivators.

8. Mango processing

Though mango is produced in small quantity, it has potential to create local employments by promotion of pickle and other ready to eat produce like Aampapad. The business model of pickle making and marketing adopted by SFT's women co-operative ensure alternate market channel as well as encourage household industries among the Mango growers. The families of Mango growers can supply mango cutting pieces stored in brine water to the co-operative instead of raw mangoes. This will reduce co-operative's process and at the same time provide additional income of well as the mango producers. Since mango pickle making season is during summer when there is no agriculture work for the women, it helps women use their time for earning additional income.
This model has a potential to create independent entrepreneurs but a lot of training inputs are required to get a standardized product to be sold under the same brand name. Also, the initial investment for raw material and equipments, though low, is required.

There is a scope for improvement in their forward linkages. A larger section of market can be captured by improving marketing strategies and increasing the customer base to spread it to shops in the nearby cities.

Additional products like mango pulp and mango papad which is having potential for providing local employment can also be added once market for pickle is well established.

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