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VALUE CHAIN ANALYSIS OF MAIZE IN MAHABUBNAGAR DISTRICT OF TELANGANA STATE, INDIA

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ABSTRACT: *India is the sixth largest producer of maize in the world, and contributed about 2 per cent to the global maize production of 855.72 million tonnes (Mt) in 2012-13. Karnataka and Andhra Pradesh are the corn belts from South where Karnataka alone occupies 12% of the total area (one million ha) and contributes nearly 16% of its total production. Nearly ¾ of the produce is being processed as animal feed and remaining for human consumption and industrial use. There is a huge demand for maize and maize products because, it is rich in lysine, tryptophan, amino acids and low fat content and it is a good product for diabetic and obese disorders. Now a days there is a more demand for maize value added products in urban and peri-urban areas, indicating a vast scope for fortification as nutritional supplementation at all the stages right from farmer's field to consumer's plate. The rich nutri-maize is available in abundance to the consumers at relatively cheaper price (compared to other cereals) can be further commercially exploited for nutritive health foods by value addition and making available them at affordable price for the advantage of vulnerable groups and other consumers at large. The main objective of the study was to carry out value chain analysis of maize in Mahabubnagar district and environs with a view to identify potential production, demand and supply, value chain, value additions, key sector constraints and opportunities and appropriate interventions.*

Keywords: *Cereals, Consumer, Commercialization, Good agricultural practices, Maize, Market Channels, Value Chain, Value Additions.*

INTRODUCTION

Maize is the third most important cereal, after rice and wheat, for human food. It directly contributes almost 10 per cent to the Indian food basket and 5 per cent to the world dietary energy supply. It is the most versatile crop and is grown in more than 166 countries across the globe, including tropical, subtropical and temperate regions, from sea level to 3000 m above sea level. In India, it is cultivated throughout the year in most of its states for various purposes that include grain, feed, fodder, green cobs, sweet com, baby corn, popcorn, starch and industrial products. It is grown in all the three seasons - Kharif (rainy), Rabi (winter) and laid (summer). In some of the regions, spring maize (February - April/May) is also becoming popular with short-duration varieties (<100 days). It is cultivated in all the soil types (except in sandy soil) and agro-climatic conditions. Being a photo-insensitive crop, maize has been adopted in different seasons and in different regions, with crop duration ranging from < 90-130 days. The conjunctive use of

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organic manure and chemical fertilizers can augment the nutrient use efficiency and also enhance the productivity of quality protein maize (Kumar *et al*., 2005). Rao (2004) reported increase in cropping intensity of rainfed maize to 200% through inter cropping of field bean in paired rows of maize. The diversified usages of maize grain make the crop very special for different stakeholders. However, spikes in its price since 2007-08, have raised concerns of food security in the regions where it is largely consumed as a food commodity. During the past 5 years (2007-2011), its production has registered an impressive annual growth (6.4%), the highest among all food crops in India. Despite yield of rain fed maize (grown in rainy or Kharif season) being less than half of the average yield of irrigated maize (4 T/Ha), grown in winter or Rabi season, it occupies four-fifth of maize acreage. In terms of production, about one-fourth is produced in Rabi and summer season, and three-fourths in Kharif season. Since 1990s, a regional shift in maize production has taken place in India in big way, as southern states emerged as the largest maize-producing states, while maize area started tapering in the traditional major maize-growing states.

Maize Expansion in India:

Traditionally, maize is a Kharif-season crop, but more than 60 per cent of its production in Andhra Pradesh and Bihar comes from Rabi (winter) crop. In fact, in Bihar the area is larger under Rabi maize than Kharif maize. The shifting to Rabi maize shows obvious comparative advantages of low insect, pest and diseases infestation as well as slow growth of weeds. The maize area in Karnataka has almost doubled during the previous decade and has become the leading producer and exporter of maize in the country. Rajasthan has the second largest maize area (13% of total maize area), but contributes only 9 per cent to the total production in the country. On the other hand, Maharashtra and Tamil Nadu are the two new emerging states, where the area under maize crop has increased almost 2.5 times due to the growing maize demand for feed and industrial purposes. Small and marginal formers cultivate about half of the maize area in the country, with an average allocation of 0.30 - 0.67 ha area to the crop. From inputs-use point of view, the overall seed replacement rate in maize crop in India is about 60 per cent, although the Government of India has set a goal of 100 per cent seed replacement in hybrid crops like maize. There has been a significant up-gradation of seed in many states, while farmers in Chhattisgarh, Madhya Pradesh, Himachal Pradesh, Rajasthan and Uttar Pradesh still prefer to grow local or composite varieties. In maize production, the seed cost constitutes less than 10 per cent in the total cost, but if popular hybrids are considered, the current seed-to-grain price ratio of about 15-20 seems to be quite high for the farmers, when needed in lump sum, at the time of sowing.

Production and Demand Point of View:

The maize output supply is very much fragmented, as the marketed surpluses of millions of small and marginal farmers are too small to be economical. They grow different varieties/hybrids of maize with different cropping periods. The produce arrives in the market with varying moisture content sometimes as high as 18-19 per cent, making it susceptible for fungal infection. Since the demand of maize for poultry feed and starch remains almost continuous round the year, the supply of grain is also consistent in India, with about 5 month's windows of no fresh arrivals in the months of July-September and January-February. As the consumption centres (feed or starch manufacturers) are located in different parts of the country, maize stocks are transported mainly

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by time-consuming poor rural roads and in some cases by rail-rakes, mostly packed in 50 Kg gunny bags. Thus, transportation of maize from production to consumption regions makes the transaction cost quite high. It has also been observed that storage of maize grain takes place at two major points in the supply chain: (a) at the farm level for few weeks, which is mostly done in an unscientific way, and (b) at the consumer level, by feed millers or starch manufacturers for 4-6 months. In between, the traders involved in the supply chain stock the grains in gunny bags at flatbed storehouse for a few days. Thus, the chance of rising moisture content and developing myco-toxins are quite high in the upstream of the chain. However, with the advent of commodity exchanges and futures market in the maize sector after 2003, the entire gamut of handling, storage and transport system of the grains is slowly changing. In future, with necessary policy changes, an efficient and integrated bulk handling and storage (silo) system is expected to increase the shelf-life of grain, reduce the wastages and cost of handling and make the commodity export ready.

Drivers of Maize Demand:

There are many drivers of maize demand in India, the most important being 1. Growing demand from poultry sector, consuming more than half of the domestic production; 2. Growing urbanization, leading to increased demand for processed foods like corn flakes, bakery products, etc; 3. Growing organized dairy sector, requiring more of fine cereals or maize-based concentrates; and 4. Rising international price due to diversion of maize grain towards bio-fuel production. In India, the consumption of maize as a food commodity has significantly declined in all the states, thus reducing the share of maize demand for food to only 10 per cent, much lower than the presently reported figures of 20-25 per cent. The demand of maize for poultry and livestock feed constitutes 59 per cent and rest goes to industry for manufacturing starch or other products and exports. Under different economic growth scenarios, considering the high-income elasticity of livestock based products, it is expected that the demand for maize may increase up to about 30 Mt by 2020. Against this, the production outlook exhibits that there would be surplus maize production in the country under all the three growth scenarios, even with no expansion of maize area, provided the adoption of hybrid increases considerably from the current level. Thus, the total maize production is expected to touch 38-44 Mt by 2020 under aggressive hybrids adoption scenario. This will give a modest surplus of 5-10 Mt of maize for export.

Investment Opportunities in Maize Sector:

The maize sector in India has several investment opportunities to ensure food and feed security in the country. The factors such as adoption of modern technologies, particularly hybrids, soil-test based fertilizer applications, improving irrigation efficiency through micro-irrigation, etc. will increase crop productivity significantly in all the regions. Further, development and introduction of customized form mechanization, storage and grading facilities would help in value creation and capturing in the domestic as well as export market. On the other hand, the up-gradation of rural basic and market infrastructure would help in reducing the transaction costs for all the players in the sector. There is a need to focus more on resource conservation technologies for reducing the cost of cultivation and improving farm profitability from the producers' point of view. Most importantly, the public research and development institutions need to work more coherently with the private sector for overall development of the maize sector. To sum up, the Indian maize sector has several opportunities in all its sub-sectors like seed, non-seed inputs,

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farm mechanization, processed foods, industrial products, market-related infrastructure, storage and processing, etc. It has also enormous potential to provide food security, feed security, nutritional security, and enhanced income to maize growers. The need is to make higher investments on maize R&D to address the problems of technology, inputs, post-harvest management, processing and marketing constraints at upstream levels.

DATA AND METHODOLOGY

The present study was conducted in Mahabubnagar district of Telangana State. It is the most important maize producing district in the State. The study based on the Primary and Secondary data. The study focuses detailed value chain of maize covering the full range of production and marketing activities required to produce maize cobs and value addition to the corn grains and finally, product delivery to final end users of the selected area. Examination of value chain not only includes the pre requisites of production but also the post harvest movement of the produce. Further, Value chain of Maize creates opportunities of employment and income generation for people in the process of marketing and value addition of maize. The study will attempt to work out the costs and returns of the maize cultivation and price spread in captured through different channels of field survey. Apart from this, detailed investigation of value addition and products, processes are also obtained.

Objectives of the study:

1. To work out the costs and returns of Maize and the existing operations/channels of marketing.
2. To analyze the potential of particular commodity and value added products of that commodity.
3. To identify Bulk consumer and Beneficiaries in the market of particular commodity for linkage.
4. To document constraints to eliminate middle men to benefit farmer and consumer.

Methodology and approach:

Field interviews in and around the study area with respondents being drawn from a wide range of stakeholders including but not limited to smallholders including but not limited to smallholder maize farmers, processors, local administration, traders, and transporters among others.

Collection of data:

The stratified random sampling method was used for selection of farmers and snowball sampling method for other stakeholders. The data used in the study to fulfill various objectives were collected with the help of well structured pre tested interview schedules, through survey method for the agricultural year 2011-12. Participatory techniques and Focused Group Meetings were conducted to track the value chain in the selected region.

Statistical Tools and Techniques:

Producer's share in consumer's rupee: It is the price received by the producer as a percentage in the consumer's price. If P_c is a consumer's price and P_F is the producer's price then the producer's share in consumer's rupee (P_s) may be expressed as follows.

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$$Ps = \frac{P_F}{P_c} \text{ X } 100$$

Marketing margin of a middleman: This is the difference between the total payments (cost + purchase price) and receipts (sale price) of the middleman (j^{th} agency). Three alternative measures may be used.

a) Absolute margin of the i^{th} middleman (A_{mi})

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

b) Percentage margin of the i^{th} middleman (P_{mi})

$$(P_{mi}) = \frac{P_{Ri} - (P_{Pi} + C_{mi})}{P_{Ri}} \text{ X } 100$$

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

P_{Pi} = Purchase value of goods per unit (purchase price)

C_{mi} = Cost incurred on marketing per unit

The margin thus calculated include the profit of the middleman and the returns which accrue to him for storage, the interest on capital and overhead, and establishment expenditure.

Total cost of marketing: The total cost incurred on marketing either in cash or in kind by the producer-seller and by the various intermediaries involved in the sale and purchase of commodity till it reaches the ultimate consumer, may be computed as follows:

$C = CF + C_{mi} + C_{m2} + C_{m3} + \ldots\ldots\ldots + C_{mn}$

C = Total cost of marketing of the commodity,

C_F = Cost paid by the producer from the time the produce leaves the farm till he sells it

C_{mi} = Cost incurred by the i^{th} middleman in the process of buying and selling the product

Marketing efficiency (Acharya Approach): According to Acharya, an ideal measure of marketing efficiency, particularly for comparing the efficiency of alternate markets/channels is

$$MME = FP \div (MC + MM)$$

Where, MME = Modified measure of marketing efficiency

FP = Price received by the farmer

MC, MM = Marketing costs and Marketing margins

RESULTS AND DISCUSSIONS

Maize Production Scenario of Andhra Pradesh & Telangana States:

Andhra Pradesh continued to be the largest maize-producing state during last decade, however, in recent past, has been overtaken by Karnataka. In the year 2011-12, maize was cultivated on 833 thousand ha area, i.e. 7 per cent of the total cropped area, producing 3.65 Mt of maize grain. In recent years, several farmers have also got interested in winter maize, consequently, the state maize acreage in Rabi season has increased to 334 thousand ha in 2012-13, up by 21.45 per cent from the previous year. As a result, 59 per cent of production in the state was coming from the winter maize, which was cultivated on about 40 per cent of the maize area. Maize yield differs widely between Rabi (about 7.0 t/ha) and Kharif (about 2.8 t/ha) seasons. In the state, maize is grown mainly in the Telangana region (Karimnagar, Nizamabad, Warangal, Mahabubnagar, Medak and Khammam districts), while highest yield is harvested in the Coastal Andhra region

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(Guntur and West Godavari districts), where it is grown as an irrigated crop. These 8 districts together contribute more than 80 per cent to the total maize production and area in the state. Maize yield in the Guntur district has more than doubled from about 3.85 t/ha in TE 2000-01 to about 10 t/ha in TE 2009-10, which was also the highest yield harvested in any district of the country. Similarly, area under the crop as well as productivity have increased manifold in several districts of the state during the previous decade. In the Guntur and Mahabubnagar districts, maize area was added by 7000 ha every year during the past 5 years (replacing sorghum), whereas in the Karimnagar district, it has started declining. The largest change in maize area was observed in Guntur and West Godavari districts in the past five years.

Maize Cost of Cultivation:

The total cost of cultivation was high recording Rs. 32041.23 per hectare. The high cost of cultivation found was on account of costly Human labour, Bullock labour, Machine labour, Seed, Farm yard manure, Fertilizers and Pesticides. Among all operational costs, human labour recorded the maximum share of 25.75% followed by fertilizers 22.67% of the cost of cultivation. The operational cost items contributed about 84.41 per cent and fixed costs 15.59 per cent to the total cost. The increase in cost of production is mainly due to increase in prices of labour and inputs used, the government should come out with clear polices that stabilizes the prices of the inputs and encourage the use of machinery so that the farmers can cut down the expenses on labour to cultivate maize on profitable basis. Hybrid maize is fertilizer intensive crop as farmer has to spend 22% the cost of cultivation on fertilizer only. The operational costs include the costs of human labour, bullock labour, tractor power, seed material, farm yard manure, fertilizers, pesticides and interest on working capital. The fixed costs include the rental value of owned land, depreciation charges and interest on fixed capital. The particulars of cost of cultivation are presented in Table 1.

Table 1. Cost of cultivation of maize (Rupees per hectare)

Particulars	Costs	Percentage
Operational costs	27046.23	84.41
Human labour	8250	25.75
Bullock labour	1775	5.54
Machine labour	4500	14.04
Seed	1150	3.59
Farm yard manure	1755	5.48
Fertilizers	7262.5	22.67
Pesticides	1571.55	4.90
Interest on working capital	782.175	2.44
Fixed costs	4995	15.59
Rental value of owned land	3750	11.70
Depreciation	875	2.73
Interest on fixed capital	370	1.15
Total cost (Rs)	32041.23	100

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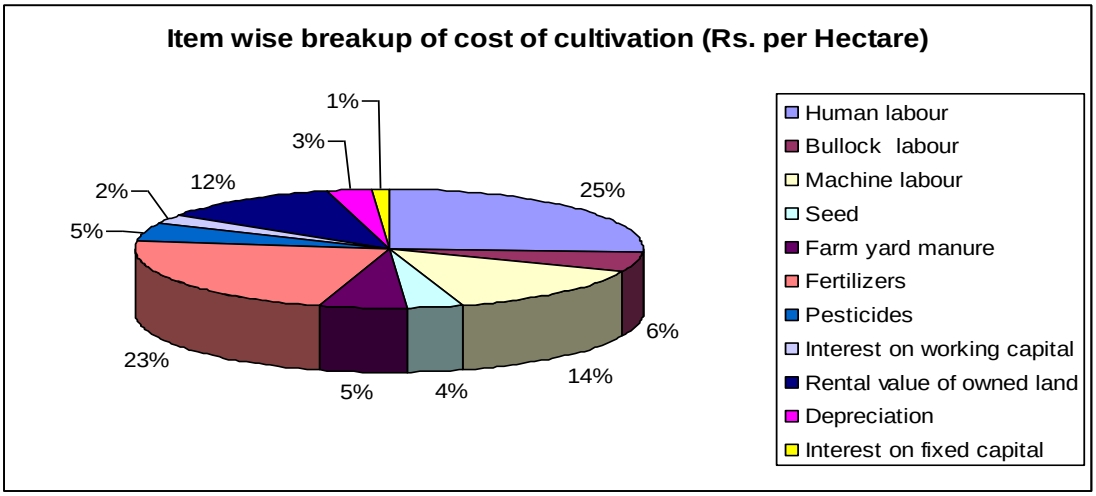
Fig 1. Item wise break up of cost of cultivation



Cost concepts and income measures:

The cultivation expenditure of maize is dealt by analyzing the cost concepts used in farm management studies. i.e., Cost A1, Cost A2, Cost B and Cost C were worked out. Cost C (Rs. 32041.23 per hectare) is computed by adding the imputed value of family labour to Cost B. The cost concepts were worked out for maize and are presented in Table 2. It is evident from the details that there was no leasing activity among the sample farmers and hence Cost A1 was Rs 26421 per ha and cost A2 was Rs 27318.23 /h. Cost B was estimated to be Rs. 30541.23. The variation from Cost B to Cost C has reflected the own family labour contribution in maize cultivation.

Table 2. Cost concepts of maize producer farmers on per hectare basis (Rs/Ha)

Particulars	Costs (Rs/h)
Cost A1	26421.23
Cost A2	27318.23
Cost B	30541.23
Cost C	32041.23

Table 3. Farm Income measures of maize producers on per hectare (Rs/Ha)

Particulars	Costs
Gross income	50000
Farm business income	23578.77
Family labour income	19458.77
Net income	17958.77
Farm investment income	22078.77
Benefit cost ratio	0.56

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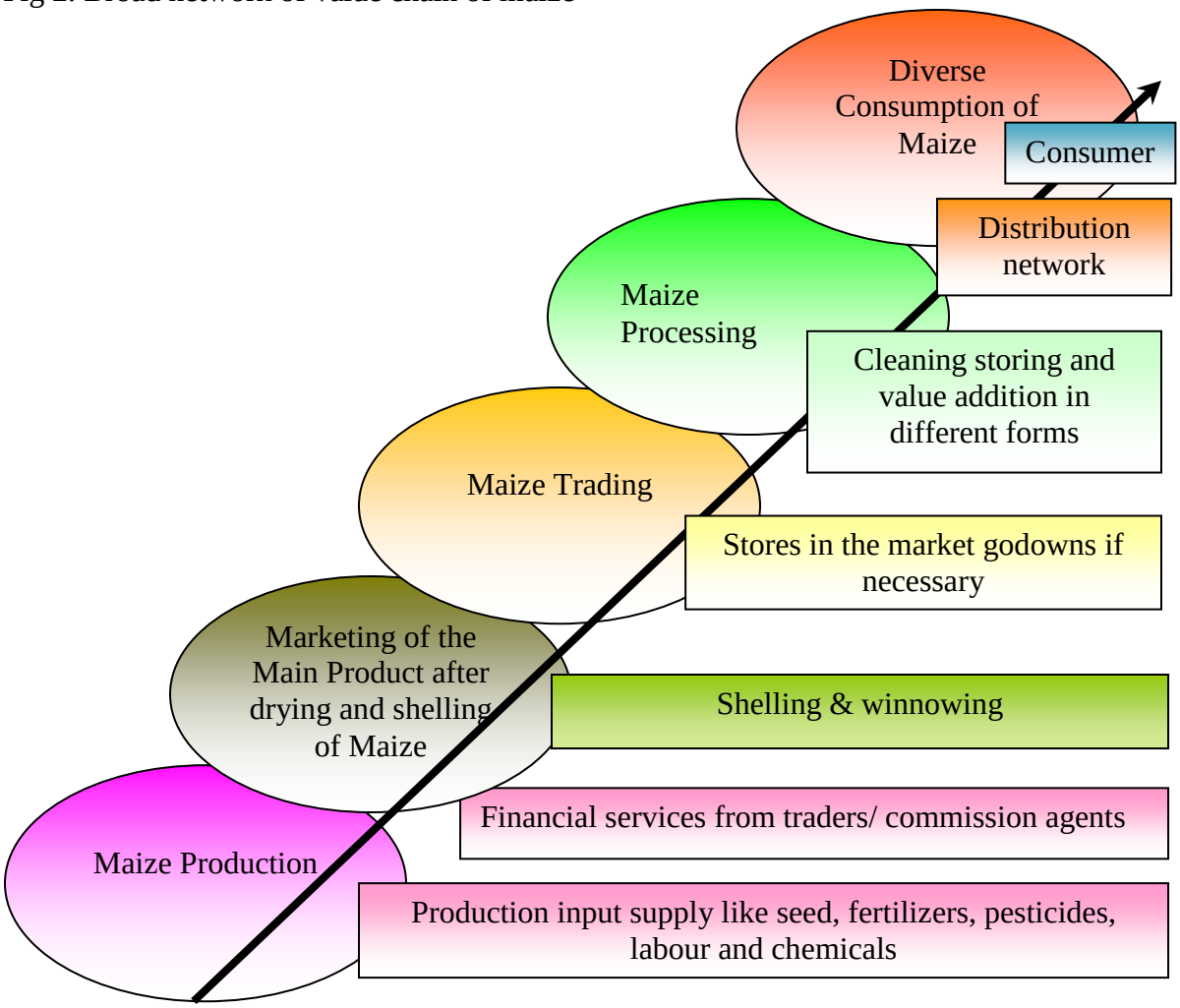
Farmers were able to secure a net benefit cost ratio of Rs. 0.56; the ratio of net return to the total costs was Rs.0.56 as shown in Table 3. This implies that for every rupee invested in maize cultivation 0.56 is the profit. This shows us the sustenance of the value chain of maize and ensures the supply of maize to the poultry industry, contractual arrangements may be tried to have forward contracts with poultry growers and backward contracts with maize growers, largely depend on the costs involved.

Maize and Maize products Value Chain:

The market channel through which the produce is delivered to consumers includes traders and processors. The maize produce is the basic unit traded. It is usually categorized into three types.

1. *Primary product:* the basic unit harvested from the farmers field. Eg: maize cobs.
2. *Secondary product:* these are the sub products derived from maize cobs such as grain.
3. *Tertiary product:* further differentiation or processing of secondary products including snack foods and processed animal feeds. With this preliminary view the broad value chain of maize is conceptualized figure 2.

Fig 2. Broad network of value chain of maize



Source: Authors (2012)

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The value chain is conceptualized and presented in figure 2, which included maize production with the input supplies like seed fertilizers, pesticides, labour and chemicals. Since maize is single crop where farmers adopted hybrids and depend on external seed every year, therefore quality seed supply is crucial for the bumper yields of the crop. Similarly, supply of fertilizers in time also largely influences the yields in maize crop. Financial services or credit is obtained from the traders and commission agents who are the regular money lenders to us. Thus production logistics are worked out by the farmers and once the produce is dried for 3-4 days and shelled using maize shellers for the farmer uses the labour for drying shelling and winnowing operations.

The produce is then transported to traders in the agricultural market where he goes for selling the produce immediately and sometimes stores the produce in the market godowns for want of high price, and sells when the prices are remunerative. The produce is then sold to the processors where the feed and food processing unit which first goes for screening and cleaning of foreign material like sand particles, agricultural waste if any, later add value to the produce like poultry feed and snack products. These diverse value added maize is distributed to all the areas wherever needed and reaches the ultimate consumer. Thus broad network of value chain tracked revealed the production arrangements, production process, marketing, agents involved, value addition, distribution networks etc and even tried to gauge the complexity in terms of value addition at the industry level. The flow of raw maize produced by farmers into various channels and margins and the level of vertical integration is attempted. The constraints for the value chain are identified.

Marketing Channels and Value Additions of maize:

Market functionaries or middle men move the commodities from producers to consumers. Every function or service rendered by them involves some cost. The middle men take some profit after meeting the cost of performing the marketing functions, which is called middlemen's margin. In marketing of agricultural commodities, the difference between the price paid by the consumer and price received by the producer for an equivalent quantity of the farm produce is often known as farm retail price spread or price spread. Sometimes it is also known as marketing margin. The total marketing includes the cost involved in moving the product from the point of production to the point of consumption. *i.e.*, the cost of performing various marketing functions and the profits of various market functionaries involved in moving the produce from the point of production till it reaches the ultimate consumer.

Marketing costs and margins incurred by the cultivator, trader and processor were worked out. The value chain prompts existence of two major products prepared out of maize in study area namely

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1. Poultry feed manufacturing –channel-1 has two sub channels

1. Farmers – Commission Agents –Poultry Feed Manufacturers – (Poultry Feed) - Poultry Farmers
2. Farmers – Commission Agents- Poultry Feed Manufacturers – (Pellets) - Poultry Farmers

2. Snack manufacturing – channel-2 has three sub channels

1. Farmers – Commission Agents – Snack Manufacturers (Corn Sev) – Wholesalers/Retailers – Consumers
2. Farmers – Commission Agents – Snack Manufacturers (Corn Balls) – Wholesalers/Retailers – Consumers
3. Farmers – Commission Agents – Snack Manufacturers (Corn Sticks) – Wholesalers/ Retailers - Consumers

The price spread and market margins are worked out for these two major channels, first channel pertaining to feed industry and the other is the food manufacturing industry.

The value chain shows that the farmers take their produce for sale to the nearby regulated markets i.e., Badepally agricultural market rather than selling them in villages or unregulated markets. In regulated markets farmers are not required to bear many of the marketing charges. In the market they follow close tender system; the bids are invited in the form of a close tender rather than by open announcement. The produce is displayed and the commission agent is allotted lot numbers.

Fig 3. Mapping of value chain in maize

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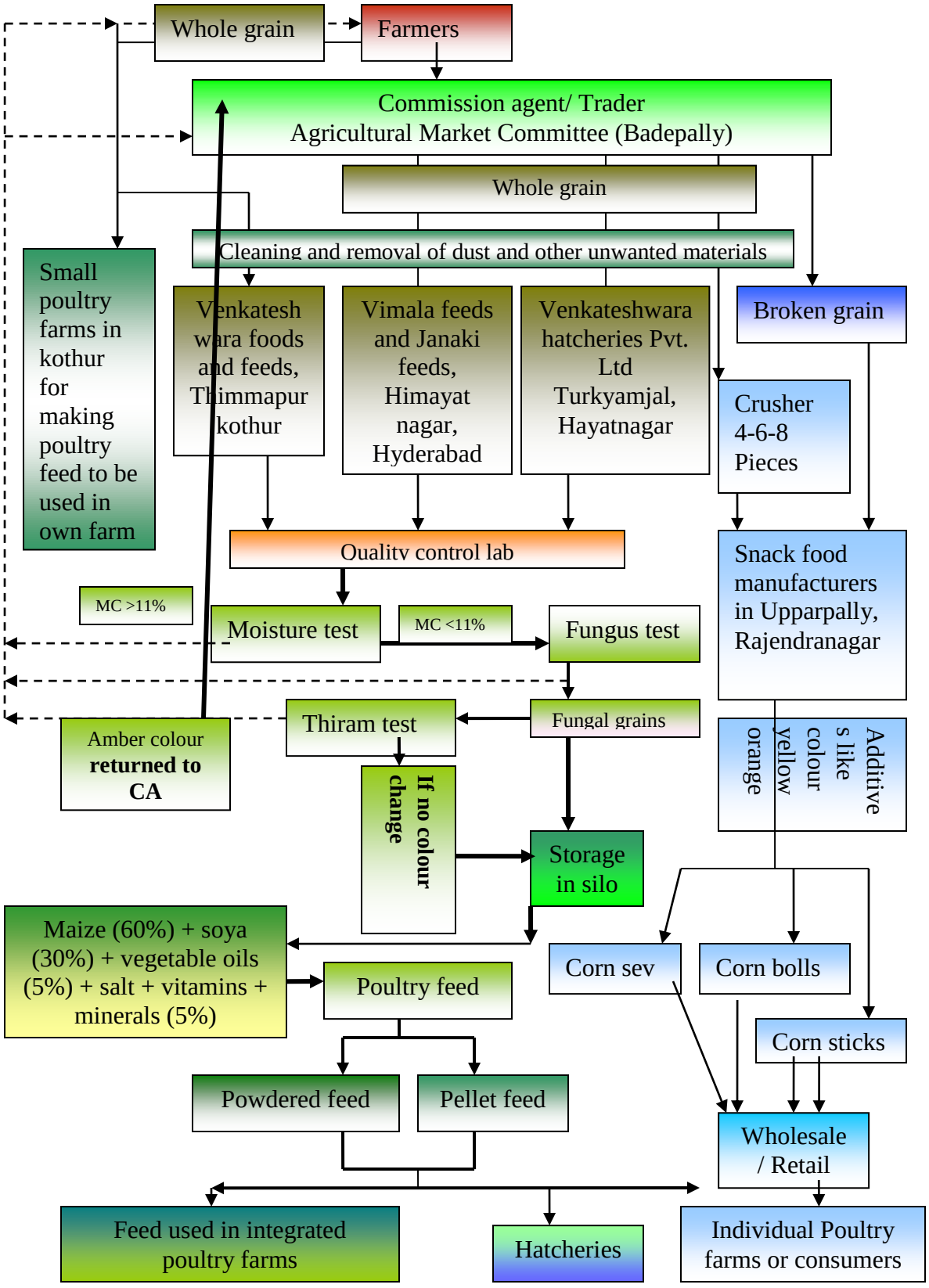

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Market margins and price spread in various channels of value chain:

The results pertaining to price spread and marketing margins are presented in Table 4. The total cost of handling is worked out by including the raw material and other ingredients used if any in the course of value addition done by the processors. In the major poultry feed channel of maize the producer's share in the consumer's rupee is 36 rupees for powdered/granular poultry feed and 39 rupees for pellet feed in major channel 1 where as in major channel 2 i.e., snack manufacturing channel it is 40 rupees for corn sev, 36 rupees for corn bolls and 33 rupees for corn sticks. The margins received by the commission agents and traders are found to be about Rs. 24 to 53 per quintal while the margins received by the processors are Rs 161.5 and Rs 191.5 for powdered feed and pelleted feed respectively. The margins for snack processors is Rs 1310 for con sev, Rs 1610 for corn bolls and Rs 1795 from corn sticks per quintal across the various products. This area of using the maize into making of sev, bolls and sticks is not receiving ample attention, but if proper marketing arrangements are done to facilitate the contracts with farmers, the share of farmer in the value addition would go up. The sale price of one quintal of poultry feed is Rs 2350- 2500 and snack foods is Rs 2500-3000 showing the potential of diversity of uses and the amount of value addition done to maize.

Table 4. Price Spread in two different value chain activities

S. No		Particulars	Channel-1 (Rs/Qt)		Channel- 2 (Rs/Qt)		
			Poultry feed	Pellet feed	Corn sev	Corn boll	Corn sticks
1		Net price received by producer/cultivator	976	976	1080	1080	1080
2		Expenses incurred by the producer					
	A	Loading & unloading charges (Hamali charges)	5	5	3	3	3
	B	Transportation cost	15	15	12	12	12
	C	Bagging costs	4	4	5	5	5
		Sub total	24	24	20	20	20
3		Producers sale price/ Trader purchase price	1000	1000	1100	1100	1100
4		Marketing costs incurred by trader					
	A	Fixed costs	6	6	4	4	4
	B	variable costs	53	53	30	30	30
	C	Cost of holding produce	67	67	13	13	13
		Sub total	126	126	47	47	47
5		Traders margin	24	24	53	53	53
6		Trader sale price/ processor purchase price	1150	1150	1200	1200	1200
7		Marketing costs incurred-processor					
	A	Fixed costs	50	120	25	25	35

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	B	Variable costs including raw material costs	1808.5	1808.5	1150	1150	1150
	C	labour costs & miscellaneous costs	330	380	115	115	120
	D	Subtotal excluding the cost of maize	1368.5	1158.5	175	160	195
8		Sub-total including cost of maize	2518.5	2308.5	1375	1360	1395
9		Processors margin	161.5	191.5	1310	1610	1795
10		Total marketing margins	185.5	215.5	1363	1663	1848
11		Consumers purchase price	2680	2500	2685	2970	3190
12		Producers share in consumer's rupee	36.41	39.04	40.22	36.36	33.85

Marketing Efficiency:

The marketing efficiency is calculated and presented for the two main channels and found to be 2.66 and 2.77 which is high compared to other cereal crops.

Table 5. Indices of marketing efficiency in the selected Maize channels

S. No	Particulars	Poultry Feed manufacturing Channel	Snack food Channel
1	Price received by the farmer (FP)	980	1080
2	Marketing costs + margins (MC+MM)	2614	3001.33
3	Index of Marketing efficiency (MME)	2.67	2.77

Value Addition in each sub channel of maize:

The amount of value addition done for manufacturing poultry feed in both forms and snack manufacturing in three forms has been calculated and presented in the table 6.

Table 6. Economics of Value Addition per quintal for manufacturing different maize products

Particulars	Type of Manufactured product	Cost of Raw material of Maize) (Rs/Q)	Marketing costs (Rs/Q)	Marketing margins (Rs/Q)	Value Addition per quintal (Rs/Q)
Channel-1 (Rs/Qt)	Poultry Feed Powdered or granular	976	2518.5	185.5	1704
	Poultry Pellet feed	976	2308.5	215.5	1524
Channel- 2 (Rs/Qt)	Corn sev	1080	1375	1363	1605
	Corn boll	1080	1360	1663	1890
	Corn sticks	1080	1395	1848	2110

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It can be concluded that corn sticks the value addition done was Rs. 2110 per quintal of maize but the sale price was Rs. 3190 per quintal the most popular snack food. Even though marketing costs are high for poultry feed manufacturing the ranging from Rs. 2300 to 2500 per quintal of maize value addition was comparatively less Rs. 1704 and Rs 1524 respectively.

Constraints faced by the maize producers:

The major constraints and challenges faced by the farmers in the study area are observed as farm inputs, weed management, labour availability and cost, Pest management, fertilizer cost and seed quality are the major constraints in cultivation of the maize. Weed management occupies first place followed by labour availability and cost. Being a non-traditional maize growing area the maize production rate was very much higher and there is a huge demand for labour especially in *kharif* season, one of the reasons for hike in labour cost. Improved marketing would improve producer prices or increase volume of marketed farm produce, resulting in higher cash in-flow. This action would have the tendency of relaxing the household capital constraint.

Observations and Suggestions:

One outstanding observation about the suggested solutions is that most respondents view government as the source of solutions to most of their problems. This view is not conducive to development. It encourages people to sit and wait for the government to provide solutions to problems that they themselves can solve or do something about. People ought to be educated "by the government" about the need to find or initiate solutions to constraints facing them by themselves rather than wait for the government to provide the answers. Admittedly, many of the constraints identified would require government action such as improvements in infrastructure and marketing, research and extension as pre-conditions or pre-requisites for any significant development initiated by the people themselves.

Challenges and opportunities:

The increase in maize productivity depends on several factors, which are more than simply increasing the adoption of hybrids. The increase in profitability, though slow, from maize cultivation has helped thousands of small and marginal farmers in ensuring food security. It is one of the reasons that the marketed surplus of maize crop has increased in all the states, and slowly this crop is moving towards becoming a cash crop. However, this crop faces several challenges, where urgent attention is needed. The wider adoption of modern production and post-harvest technologies, reduction in post-harvest losses, biomass management, dissemination of best production practices, improvement in access to domestic and international markets with economy of scale, value-creation and capturing, etc. are some of the areas in which future investments are warranted from both public and private sectors. The majority of farmers view the government as the major source of solutions to most of the constraints. Admittedly in infrastructure and marketing, farm inputs, research and extension services as prerequisites for any significant development initiated endogenously. This is not good for any development, therefore People ought to be educated about the need to find or initiate solutions to constraints facing them by themselves.

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CONCLUSION

The demand for maize is increasing for various usages - different types of food, livestock feed, poultry feed, beverages, starch, etc. The change in production trend has brought a change in its pattern also. Currently, two states Andhra Pradesh and Karnataka, account for 25 percent of the total maize area of about 8.7 M ha (million hectares) and contributing roughly 35 per cent to the total maize production with average yield of more than 3 t/ha. The maize production is expected to reach 28 Mt by the year 2020, as yield would improve slowly to 3.2 t/ha from the current level of 2.5 t/ha, while area under the crop may not further expand to a great extent. However, if the adoption of hybrids progresses to cover 75 per cent of maize area with average yield of 5 t/ha by 2020, then the total maize production would increase to about 38 Mt in 2020. Besides, if maize area seizes at current level but hybrids are adopted on 90 per cent of the area, the total maize production would touch the mark of 44 Mt by the year 2020.

The study reveals that producers adoption of high yield hybrid seeds, application of improved farm technologies, value added products there by enhanced income and food security. Maize has potential for product diversification under a new economic regime. Demand for maize is shifting from food to feed for livestock and poultry. New types of maize based products are in demand among people in the higher income group. New opportunities need to be tapped by providing appropriate technologies to farming communities. Future maize production will largely depend on how markets are developed. Maize production marketing linkages are extremely weak and need to be strengthened. There is a need to develop mechanism for strengthening the maize production- processing-marketing system.

Policy Reforms:
In the Long-run Productivity enhancing investments like Expansion of irrigation; roads & railway infrastructure; R&D should be considered. In the short-term to stimulate production fertilizer/seed support for short rains season should be targeted and land under irrigation be expanded. The government should improve access productivity enhancing inputs by working with private sector to improve access to seeds and fertilizer by farmers. Support training programs to enable smallholders to develop more effective marketing strategies and to negotiate more effectively with traders, in order to raise the prices that they receive for their maize. It should also explore options for improving public and private extension programs to enable farmers to adopt farm technologies generated by research.

The technical know-how about better crop management practices should be disseminated across the maize growers. They largely depend on the seed and input dealers, for such information, which in most of the cases is not scientific. Creating market reach for the maize farmers is badly needed. With maize being a highly traded commodity, the state governments should encourage developing modern markets at the district level in the major maize-growing belts to help the farmers in accessing latest market information and decision making on profit maximizing. The integration of production system with futures markets' will also help the farmers on these aspects. Under the changing consumption pattern, the demand for maize as a food commodity has been protected to come down. But, recent innovations in the form of multi- grain atta and

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multi-grain biscuits along with the increasing interests in specialty corns like baby corn, mainly in the urban and peri-urban areas will help in bringing back the maize commodities to the food basket. Moreover, the production and demand forecasts of maize have provided clear indication that there will be a net surplus of maize produce, which can be exported. India should plan now to produce maize for export and develop an efficient marketing channel to provide a better price to the growers.

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