

Analyzing pro-poor value chains - Study of post rainy season sorghum in Maharashtra state of India

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Presented at

Global value chains for food and nutrition security
25-26 September 2014, Roma Tre University
Sala delle Lauree, School of Economics and Management
Via Silvio d'Amico 77, 00145, Rome

Organized by

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Center on Globalization, Governance and Competitiveness

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Analyzing pro-poor value chains - Study of post rainy season sorghum in Maharashtra state of India

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Background

Market access is important for wider adoption of new crop technologies more so for dryland cereals like sorghum, pearl millet and finger millet that are mainly grown for home consumption. These dryland cereals are grown in outlying areas where market infrastructure is poor and markets are thin and poorly linked with deficit regions. Second, poor grain quality, unreliable supply and high price to end-users reduce market demand. Third, poor market integration and lack of market information mean that both producers and buyers face higher market risks and thus higher production is difficult to sustain under low and inelastic demand, which often causes prices to collapse when local markets fail to absorb surplus production (example, following good rains or adoption of new varieties). Unless technology promotion is supported by market development, the risk of price collapse and poor access to input and output markets will slowdown adoption of new technologies.

Investments in market institutions, value chains, processing methods and innovations to reduce marketing costs, value addition, value added products and better provision of market information can increase trade and stimulate consumer demand. Value addition and value added products can improve price and income elasticities of demand and expand markets for these crops. But this would require careful understanding of consumer choices, end-user preferences, processing options to improve product quality, reduce family food processing time, and development of suitable models for linking farmers with markets. This should be complemented by options for enhancing competitiveness for value added products and alternative uses and stimulating demand for end uses including food and non-food uses. Competitiveness for alternative uses depends on market prices, availability, consistency of supply and required quality for the specific end uses.

Adoption of improved varieties will also require effective seed production, credit and input marketing systems. Access to finance, value chain upgradation strategies and horizontal and vertical integration are the other aspects of the value chain of agricultural commodities that help

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Acknowledgment. This research work was carried out under the "HOPE" project and as a legacy project under CRP 2 PIM value chains. The funding support from the Bill & Melinda Gates Foundation and CRP 2 PIM is gratefully acknowledged.

in improving market access. In this backdrop, a project on Harnessing Opportunities for Productivity Enhancement (HOPE) funded by Bill and Melinda Gates Foundation (BMGF) was undertaken by International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) with the objective to discover and develop new market opportunities for post-rainy season sorghum (PRSS) in Maharashtra state of India. Under this project market survey's were carried out in two regions of the state of Maharashtra in India; the western region comprising the districts of Solapur, Pune and Ahmednagar and the Marathwada region comprising the districts of Jalna, Beed and Parbhani. The key research activities included understanding of factors limiting demand and competitiveness, identification of market and business opportunities, and evaluating models for improving farmer access to input and output markets. In this paper, the research findings from the value chain mapping to understand the limiting factors of supply, trade and demand are highlighted and opportunities identified along the chain are proposed as upgrading options to enhance the market demand and value chain functioning for post-rainy season sorghum (PRSS)².

Study area and their locations

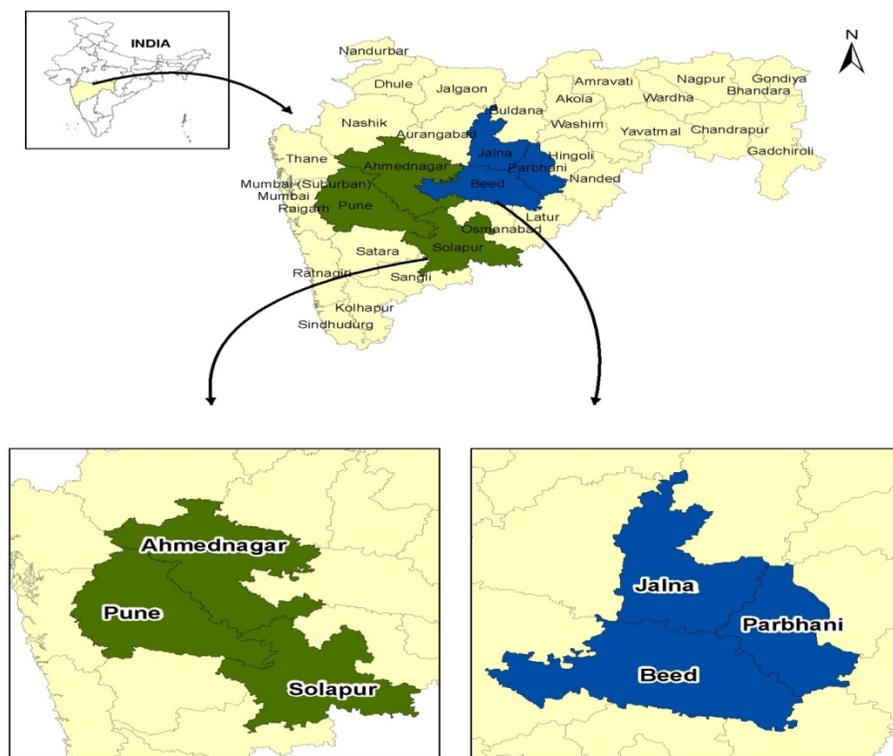


Figure 1. Study locations of HOPE project in Maharashtra, India

² Post-rainy season sorghum will be referred as PRSS in this research paper

Data source, Sampling and Methodology

Primary data: The data on post-harvest marketing and marketing costs incurred by the producer were collected from producers of post-rainy season sorghum. Data pertaining to prices, varieties transacted, quality preferences of sellers and buyers, volume of sales, marketing costs, trade practices, value addition and constraints to marketing were collected from various market functionaries like middlemen, traders, commission agents, brokers, processors and retailers. Data was collected from producers and all market functionaries through a specially designed survey instruments for each of the functionaries of the value chain. For the market functionaries the information was collected from 10 markets.

Secondary data: Monthly data on arrivals and prices of post-rainy season sorghum for the past one decade were collected from the records of Agricultural Produce Market Committees (APMC) for all the 10 markets under study. The data were used to construct seasonal indices of arrivals and prices.

Selection of markets: Markets under the study region were purposively selected based on area and production of PRSS, arrivals to markets and importance of the sorghum in the consumption basket of households. Accordingly, the markets of Jalna, Beed and Parbhani, Ahmednagar were selected in Marathwada while Barshi, Solapur, Ahmednagar, Kholapur and Pune were in western Maharashtra region.

Sample size: A sample of 120 farmers each spread across 6 villages in both the regions were selected to carry out the producer survey. The producer surveys were conducted twice (2009-10 and 2010-11) during the project period. The data pertaining to marketing practices and value chain functionaries was collected from 20 market functionaries (village middlemen, commission agent, trader, retailer) from each of the selected markets adding upto a sample of 160 value chain functionaries in both the regions.

Conceptual framework

The conceptual framework of this study is primarily based on value links approach of the GIZ. The value chain analysis is carried out at 3 stages. In the first stage, PRSS value chain is mapped for various functionaries of the chain. In the second stage constraints are analysed and discussed and upgrading options along with strategies to improve the chain are discussed in the final stage. The analysis of marketing costs facing various functionaries like the producers, traders, intermediaries and retailers along the value chain of PRSS was carried out using tabular analysis and percentages for estimating the marketing costs and margins for different market functionaries. The producer's share (P_s) in the consumer rupee for different marketing chains was calculated as;

$$P_s = \frac{P_p}{R_p} \times 100$$

Where, P_p is the producers price and R_p is the retailers price of post-rainy season sorghum. SWOT analysis is carried out at the end to qualitative assess the options for upgradation of PRSS.

Results

Value chain of post-rainy season sorghum- Analyzing the chain

Post-rainy season sorghum markets in Maharashtra

There are 228 agricultural produce market committees in the State of Maharashtra trading in different agricultural commodities. Of these 228 markets, sorghum trade is concentrated in the markets of western and marathwada Maharashtra. Generally the direction of flow of trade is from primary to secondary and finally to the terminal market.

Barshi, Solapur, Ahmednagar, Mangalwedha are the primary markets³ for PRSS trade in western Maharashtra while Pune and Kholapur being the secondary or the consuming markets. The primary markets for PRSS trade in marathwada Maharashtra are Beed and Jalna while Parbhani and Aurangabad are the secondary or the consuming markets with Mumbai being the terminal market for both the regions. Each market deals in 2-3 varieties of PRSS and each variety is further subdivided into 2-3 grades.

Most of the selected markets operate on daily basis and trading in the primary markets is through open auction or bidding. The produce brought by each farmer is heaped as one lot and transaction between farmer and trader is facilitated through a commission agent who oversees the bidding by traders and accepts or rejects the highest bid on behalf of the farmer. The trader who quotes the highest price takes the produce and the transaction is recorded by the officials of the APMC. The bidding for the produce is based on visual quality parameters like the cleanliness, size of the grain, color, luster and shape. The markets which are a platform for trade, also provide facilities like overnight stay for farmers, common auction platform, common drying yards, grading equipment, canteen, drinking water taps, seating benches, public address system and price display board (Chand 2012).

The main seasonal arrivals of PRSS to the markets are during the months of January to April. The average arrivals of PRSS during the months of January-April for the past one decade is

³ The distinction between primary, secondary and terminal markets is based on arrivals of produce to markets. Primary markets receive most of the produce directly from the farmers from surrounding areas while for secondary and terminal markets the arrivals come from traders from primary markets rather than producers. The secondary and terminal markets are also referred to as consuming markets.

presented in Figure 2. One of the primary indicators of the market share of the commodity is its volume of arrivals. There exist significant intra and inter-state movement of commodity between markets. Hence, for the markets described above for PRSS, low volume of arrivals for a particular market does not indicate low market share due to the movement of commodity directly from primary to secondary and terminal markets. For western Maharashtra region, Barshi and Mangelweda are two major markets where majority of the PRSS is produced, traded and supplied to other major cities across Maharashtra, Karnataka and Andhra Pradesh. Barshi has the highest trade of PRSS by volume in Maharashtra and the trade is highly specialized. The traders after purchase of the grain from the farmers, machine cleans the produce and grades it in to 2-3 types based on the size of the grain. The grade I and II types are bagged, branded and sold to urban localities like Pune, Mumbai, Kholapur, Sangli, Nanded, Aurangabad and to super markets to meet the consumer demand. A similar trend is found in Jalna market of marathwada Maharashtra. The machine clean produce from Jalna market apart from being sold to urban localities is marketed to Gujarat, Punjab and Haryana which meets the requirements of seed for sowing as fodder sorghum.

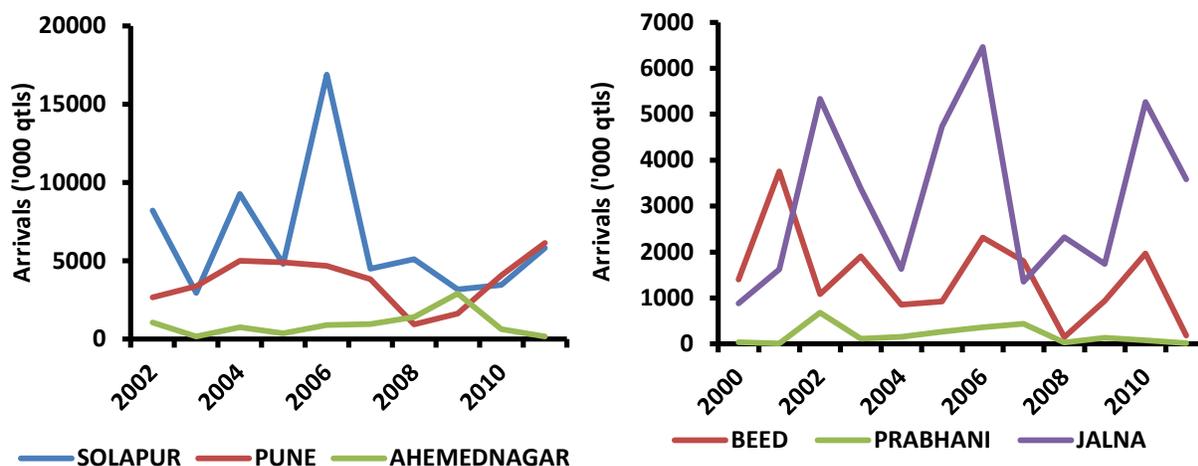


Figure 2. Peak market season arrivals of post-rainy season sorghum in major markets of Maharashtra

Seasonal indices of arrivals and prices of PRSS across markets in Maharashtra

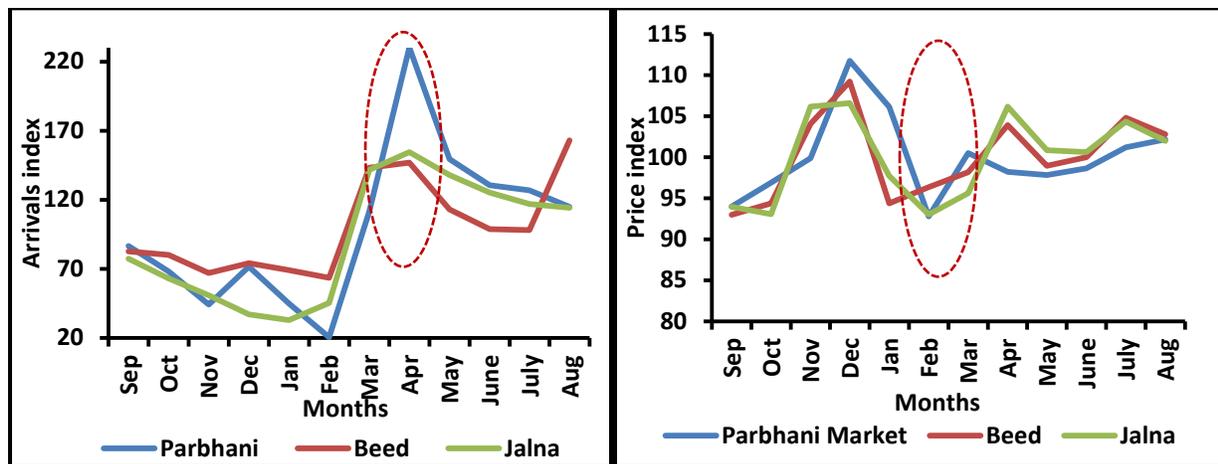
The arrivals of PRSS to the markets peak in the months of April- June after harvest of the crop during February-March. The prices will be ruling low during the peak arrival months. To understand the seasonal variations in arrivals and prices of PRSS, arrivals and price indices are constructed based on the data collected for the previous one decade (2001-2010) from official records of the Agricultural Produce Market Committees' (APMC) on market prices and arrivals across important markets that trade in sorghum in Maharashtra.

Seasonal indices represent the extent of seasonal influence for a particular period of the year. The seasonal indices give a picture of how the average for a particular month or period tends to be above or below the grand average. The harvesting of post-rainy season sorghum is carried out

during end of February and arrivals to the markets start during the months of March and continue till end of May. The indices presented in figure 3 indicate that arrivals peak during the months of March – May in marathwada Maharashtra while it is during the months of February – April in western Maharashtra. Due to the seasonal peak in arrivals the prices drop during these periods and gradually rise thereafter till the harvest of rainy season sorghum. The seasonal index of arrivals in western Maharashtra was the highest during the months of March-April (136-140) in Solapur market. In marathwada Maharashtra, the highest seasonal index of 154 during the month of April was in Jalna. Both these markets are predominantly big markets for trade in PRSS. The highest seasonal index for price (118) was observed for Ahmendnagar market during the month of December in western Maharashtra while in Parbhani market in marathwada Maharashtra the index was 112 during the month of December

Potential trade under PRSS in Maharashtra

Over the last three years the average annual area under PRSS cultivation in HOPE clusters of Maharashtra was 2002 thousand hectares with an annual production of 1515 thousand tonnes. About 90-95% of the marketed surplus of sorghum is traded for consumption while the rest 5% is utilized as seed for sowing. To estimate the marketable surplus of PRSS, data was collected from 120 farmers cultivating improved varieties under the project during 2009-10 and 2010-11. It is observed that during 2010-11 the marketable surplus has declined by almost 20-35% in comparison to 2009-10 in both the regions of Maharashtra (Table 1).



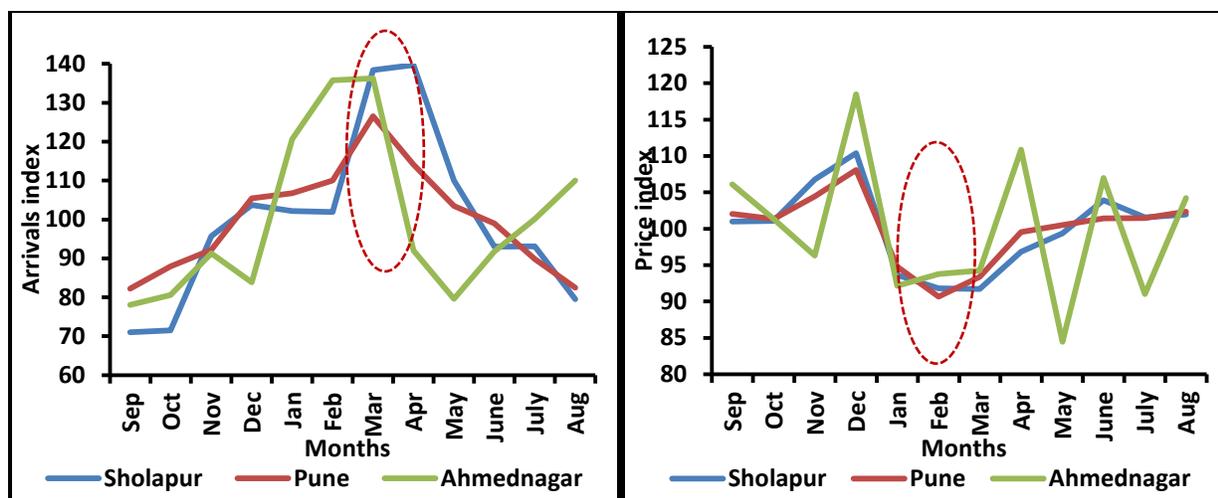


Figure 3. Seasonal indices of arrivals and prices of post-rainy season sorghum in major markets of Maharashtra

Generally, low marketable surplus is observed for small farmer category. However, in study regions, the marketable surplus varied differently between two periods of time for different category of farmers. During 2009-10, the surplus was the highest for large farmer category while during 2010-11 it was highest for small category. Over a two year time period, the decline in surplus was sharper for large and medium category of farmers as compared to small farmers.

Table 1. Marketable surplus across different category of farmers in study regions of Maharashtra

Category	Marketable surplus			
	2009-10		2010-11	
	Western Maharashtra	Marathwada Maharashtra	Western Maharashtra	Marathwada Maharashtra
Small farmers	37	37	31	33
Medium farmers	54	46	12	26
Large farmers	66	58	21	29
Overall	60	51	25	30

Mapping and analyzing the PRSS value chain

A value chain describes the full range of activities which are required to bring a product or service from conception, through the intermediary of production, delivery to the final consumers, and final disposal after use” (Kaplinsky 2000).The value chain mapping for cereal commodity like PRSS is not very complex. Complexity of the chain arises due to the opportunity for product transformation to diversified products, alternative uses of the product and nature of

demand. The value chain functions, the actors and the operators of post-rainy season sorghum is presented in Figure 4⁴.

Value chain operators in PRSS trade

The enterprises performing the basic functions of a value chain are the value chain operators. These include farmers, wholesalers, processors and retailers. What they have in common is that they become owners of the product at some stage of the value chain. The numbers of operators involved in the value chain vary based on the type of commodity and its marketing. Each of the operators performs different functions in the value chain. Producers have the options of selling sorghum directly to the traders in the markets where the trade is facilitated by the commission agent or to the village middlemen in the village. The primary market traders sell the produce directly to the traders in the secondary markets, retailers in the primary market or directly to the consumers in small proportion. Commission agents (CA's) are the ones who facilitate the trade between producer and the trader by charging commission fees for the service rendered. They act as a representative of either a seller or buyer. CA's arrange for sales, collect the price from the buyer, deducts his expenses and commission and remits the balance to the seller. In strict sense CA's are not supposed to own the produce. However, in majority of the markets CA's serve the dual purpose of commission and trade by having both the licenses. On the other hand, retailers buy goods from wholesalers and sell them to the consumers in small quantities. They are producer's personal representatives to consumers.

The participation of the operators in the value chain of sorghum varies across markets. It is generally seen that operator's participation in value chains of staples (cereals) is low because of low margins realized by the operators for trade in staples. For example, in Ahmednagar market of the total traders, only 26% of them dealt with trade in food commodities.

In both the regions Maharashtra only about 20% of the farmers sell the produce immediately after harvest and the rest hold the produce due to various reasons. Class-wise disaggregation of selling practices reveals that in both the regions, small holders holding the produce is maximum at 51% and 20% across western and marathwada Maharashtra respectively (Table 2).

⁴ The study has adopted the valuelinks approach methodology to map the value chain. Accordingly, the symbol  represents the value chain operator,  represents the function of VC and  represents the service provider.

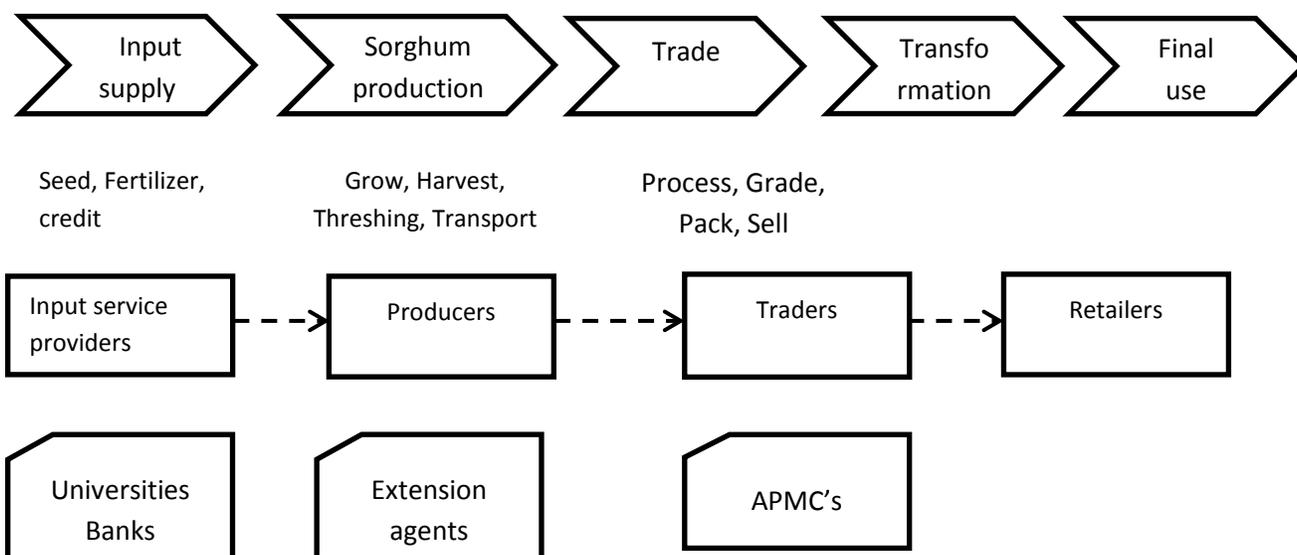


Figure 4. The value chain of post-rainy season sorghum in Maharashtra

Post-harvest practices of producers in the study region

The primary reason for holding the produce is in anticipation of higher prices apart from meeting the future needs. Contrary to the theory that small holders sell the produce immediately after harvest to meet the immediate cash needs and large farmers’ ability to hold the produce, in this study we find that, large and medium farmers sell the produce immediately after harvest compared to small holders. One probable reason could be low marketable surplus for small farmers and the other reasons attributed for immediate sales are lack of money in hand and storage facility by sample households.

Table 2. Farm category-wise selling practices of PRSS in Maharashtra

Category of farmers	Western Maharashtra		Marathwada Maharashtra*	
	Percent of farmers selling the produce immediately after the harvest			
	Yes	No	Yes	No
Small farmers	31	51	16	20
Medium farmers	46	27	3	14
Large farmers	23	22	5	14
Total sample (nos)	13	45	24	48

*Note. In case of marathwada Maharashtra due to one other category “NA” the percentage do not sum up to 100

Grading and cleaning

Grading and cleaning of agricultural commodities before selling to the market is an important activity of agricultural marketing. The agricultural commodities are heterogeneous and hence it is very essential to grade these commodities as per standards to command better price both at

domestic or international markets. However, evidence show that the total quantity of produce graded at producer's level in any year in India has not even reached 10 million tonnes (mt) and did not even cross 1.5% of the total crop value produced (Chand, 2012). Sorghum is no exception to this. Only about 13% of the sample farmers (60) in western Maharashtra graded the produce while none of the farmers of the 120 sampled in marathwada Maharashtra graded the produce. The primary reason for this has been the lack of awareness of producers on importance of cleaning and grading the produce and poor marketing infrastructure. Only about 30% of the total agricultural markets (7566 Regulated Markets as of 2008) in India have the facility of cleaning and grading (GoI, 2010).

Distance to markets

As indicated above most of the farmers sell the commodity in regulated markets. One of the major reasons has been the access to markets. Markets across most states in the country are well spread out. Distance travelled is one of the major criteria for access to markets apart from alternate market opportunities for sales. Most of the villages in both the study regions have good access to market which is reflected through the small average distance travelled by the producers. The average distance travelled by farmers of Parbhani is the least at 12 kilometers across markets while farmers from Beed travel the maximum at 35 kilometers (Table 3). In general, western Maharashtra region farmers have better access to markets as they travel less compared to their counter parts in Marathwada region. A study conducted by World Bank (2007) on Indian Agricultural Marketing Survey reports that wholesale markets in Tamil Nadu and Maharashtra are more distant, with median distances of 16 and 20 kilometers, respectively compared to Orissa and Uttar Pradesh markets.

Marketing post-rainy season sorghum

To understand marketing practices of PRSS, the farmers response on sales during 2012-13 were recorded. A high percentage of farmers 32% and 35% from both western and marathwada region did not report on the sales. In both the regions, regulated market is the primary place for marketing. About 58% of the farmers from marathwada region and 20% from western Maharashtra region sold their produce to regulated markets while selling to village middlemen and within the village market is negligible.

Table 3. Distance to wholesale markets from project locations in Maharashtra

Region	Project locations	Average distance (km)
Western Maharashtra	Sholapur	16
	Ahmednagar	13
	Pune	18
Marathwada Maharashtra	Parbhani	12
	Jalna	34
	Beed	35

Marketing costs of producers

To market the produce, producers incur various charges like transport, labor, bagging, weighment, and commission agent charges. The marketing cost incurred by farmers is presented in Table 4. The highest shares of costs incurred by producers are the commission agent charges that constitute almost 30-50% of the marketing charges of the producer. The charges vary from one market to other due to variation in price received by the farmers across markets. Generally, farmers have to pay about 3-5% as commission charges on the purchase value of the produce to the commission agents. The commission agent facilitates the transaction between the farmer and the buyer/trader through a process of bidding and negotiations. Apart from facilitating the transactions, the commission agent maintains informal relationships with the producer by providing services like credit, storage facilities and market price information for agricultural commodities. Due to these informal benefits the farmer most of the time depends on commission agent for marketing the produce.

The next highest cost of marketing of the producer is the transport costs which forms 16-30% of the marketing charges. The transport charges are in the range of Rs 16- 40 /100 kg of the produce transported. The highest transport charges incurred was for farmers who are marketing the produce to Pune market. Though the distance travelled by farmers (18 km) to Pune market is less compared to their peers in Beed and Jalna (35 kms) higher cost of transport is probably due to higher charges incurred by transporters as Pune being a secondary market and a big city. Many times farmers from the village transport the produce collectively to reduce the burden of high transport cost incurred when transported individually. In spite of the collective transportation, transport charges are the next highest cost of marketing. Hence, innovative solutions are to be evolved to reduce the transport cost of marketing of the producers.

Bagging and stitching charges with 15-31% and labor charges in the range of 8-12% of the total marketing costs are the other costs incurred by the farmers across different markets of the study regions. As the highest cost of marketing sorghum by producers is the commission charges, as a marketing strategy direct marketing, group marketing and bulking are the options for farmers to realize better price for the produce and also reduce the transaction costs. The model marketing act of 2003 introduced by Government of India also recommends for prohibition of commission

agency in any transaction of agricultural commodities with the producers and also provides legislation of establishment of private markets/yards, direct purchase centers, consumer/farmers markets for direct sale and promotion of public private partnership in the management, establishment of a framework for contract farming and development of agricultural markets in the country.

Service providers in the production as a function of the sorghum value chain

The important service providers in the production as a function of the value chain are the providers of sorghum seed, credit, fertilizer, plant protection chemicals and information delivery. For some commodities, components of the value chain, actors of services vary as the services delivered are not homogeneous (example credit- public, private and money lenders)

Table 4. Marketing cost of producers in the study region during 2011-12

Activity costs (Rs/100 kg)	Western Maharashtra			Marathwada Maharashtra		
	Sholapur	Ahmednagar	Pune	Parbhani	Jalna	Beed
Transport charges	16(16)	21 (24)	40 (33)	18 (17)	35 (28)	35 (31)
Labor charges*	8 (8)	13 (15)	10 (08)	13 (12)	15 (12)	0
Stitching & bagging	30 (31)	23 (26)	34 (28)	19 (18)	19 (15)	21 (19)
Weighment charges	03 (3)	0	0	0	0	0
Commission charges	40(41)	32 (36)	37 (31)	57 (53)	54 (44)	57 (50)
Total costs	97	89	121	107	123	113

Note. *Labor charges includes loading and unloading charges of the produce

Figures in parenthesis are % to total costs

Actors of the PRSS value chain

Seed

Seed supply forms one of the major link in the value chain system of any agricultural commodity. The actors of seed supply chain vary based on the type of seed required i.e., hybrid or the varieties. In majority of the cases, private sector dominates in seed supply chain if it is hybrids while both public sector and private sector plays an important role in the supply of varieties. For PRSS, as there is no hybrid technology, public sector (University released varieties) dominate for seed supply to a large extent with a small role played by private seed companies. Apart from the public sector, farmers also save their own seed from their pervious harvest. As the seed was supplied from the project as an intervention, to understand the seed supply chain, data was collected from producers in control villages (where there wereno project interventions). In control villages the farmers purchased the seed within the village or *taluka* (sub-district) headquarters primarily from input dealer shops.

Fertilizer and plant protection chemicals

The fertilizer supply and distribution (nitrogenous) in India is dominated by the private sector with about (45%) followed by public sector (29%) and co-operatives (26%) (GoI, 2008). The fertilizer distribution is done through dealer networks established at *taluka's* (sub-districts) and villages. Across study villages in western Maharashtra about 33% of the farmers procure fertilizer from village outlets, 42% from *taluka* and 23% from districts headquarters. In contrast, only about two percent of the farmers in marathwada region buy fertilizers from village outlets while 98% procure from district level input dealers.

On the other hand, procurement of plant protection chemicals (PPC) is low compared to fertilizers. Only about 35% of the farmers in the sample purchased plant protection chemicals. *Taluka* input dealers are the main source of purchase with 17% of the farmers purchasing from them. The difference between fertilizer and plant protection chemicals purchase from different supply points might be due to the priority between these two inputs utilized. About 33% of the sample farmers were purchasing fertilizer from village outlets while it was only 5% for PPC. This might be due to importance of fertilizer for crop growth as compared to PPC and hence its supply and distribution is ensured at village level itself.

Credit

One other important input for agriculture production is credit. The actors for credit component of the supply chain include several public (formal sources) and private lenders (informal sources). These include commercial banks, co-operatives, regional rural bank on the public side where as money lenders, input suppliers and commission agents dominate from the private sector. For PRSS in Maharashtra, only 20% of the sample farmers availed loan from co-operative banks while 80% of the farmers did not avail any loan. In the study conducted by Fafchamps et al. 2006, found that only one percent of farmers access credit through credit institution, 11% from banks and 23% of farmers access credit from money lenders.

Information delivery system

There are several channels for information delivery on agriculture production. Farmer's dependence for information on a particular source depends on whether it is production related or market related. The information pertaining to agriculture production is delivered primarily through agricultural universities, extension officers, subject matter specialists, input dealers, KrishiVignana Kendra's (KVK's) and neighboring farmers apart from television, radio, newspaper and more recently through mobile phones. On market related information, the primary sources are the market middlemen, farmer friends and newspaper. In the study locations, majority of the farmers relied on input suppliers and Agricultural University for information pertaining to production of PRSS in both the regions of Maharashtra.

Trade as a function of the value chain

The second important function after production in the value chain is the trade. The chain functionaries⁵ involve the traders from primary and secondary markets⁶. The service providers of the chain are the commission agents who facilitate the trade between producers and primary market traders, brokers who facilitate the trade between primary and secondary market traders and market officials of the APMC's who monitor the trading practices. The operational service providers are the laborers, transporters who transport the produce and machine suppliers who supply machine for processing of the produce. The produce is auctioned after it is brought to the market by the producer and the trader/buyer quotes his/her price based on the visual inspection of quality parameters of the produce. The produce will be sold to the trader who quotes the highest price. In general, the commission agents and the traders in the primary market deal with all the notified commodities in the market. However, the percentage of commission agents and traders who deal exclusively in sorghum is very small and is primarily attributed to low margins in the trade of sorghum. Brokers on the other hand serve as a link between secondary and primary market traders. In strict sense both commission agents and brokers are not supposed to take ownership of the produce whereas traders take ownership. However, in the study areas many traders had the dual license of commission and trading. This helps him in earning commission by participating in auctions for other commodities and also quote low prices for commodities when as a trader when he is involved in buying. The traders from the secondary/consuming market contact either brokers or sometimes traders directly in the primary markets for supply of the commodity whenever there is demand. Trader as an operator of the value chain has the option of transforming the produce (cleaning, grading, sorting, packing) and selling it to the local retailer, secondary/terminal market traders, supermarkets, other states or directly to the consumers (Figure 5).

In general, traders regulate the flow of goods by trading with buyers and sellers in different markets by often storing the produce in their own *godowns* (warehouse) and supplying/selling both during peak season and off-season.

Price variations in trade of post-rainy season sorghum

It is observed that there is wide variation in prices of sorghum grain, ranging from Rs⁷. 1,900 / 100 kg to 3,200 / 100 kg across markets in Maharashtra. It was found that the variation in prices were primarily due to varietal preferences and the grading that exists within a variety. *Jute*, *Maldhandi* and *Dagdi* are the three most popular varieties of sorghum that are demanded and

⁵The chain functionaries, enablers and service providers in the figure are represented by different symbols

⁶ The distinction between primary and secondary market is based on produce being auctioned in primary markets and transported to secondary market which are primarily consuming markets.

⁷ During the study period, the 1USD was in the range of Indian Rupees 50-55

traded widely across markets of Maharashtra. Seed size, luster, color and taste of the grain are the key quality parameters that determine the price.

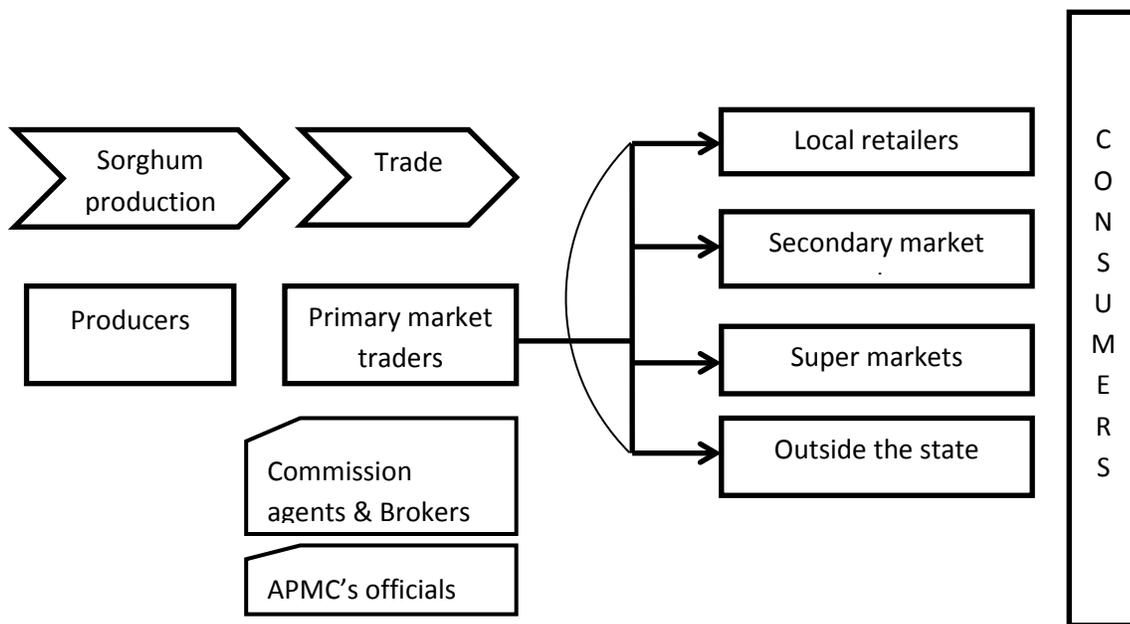


Figure 5. Function of trade in PRSS value chain

The marketing costs, value addition and margins of the trader

The trade of all the agricultural commodities is regulated by agricultural produce market acts and the marketing charges like the market fees, *hamali* (labor), commission, brokerage and weightment are standardized and are common across markets (within a state) but varies across commodities. Though the market charges are standardized across markets, there exists variation in actual charges paid by the producers Vs. the charges fixed by the regulated markets. In the project locations, traders after purchase of the produce have the option of either selling locally to a retailer, to super markets, to a secondary market within a state or to a buyer outside of the state of Maharashtra. The proportion of sales varies from one channel to other. But the most frequent channel observed is trader either selling locally to a retailer or to a secondary market. The sales generally happens after physical processing/value addition to the grain. The physical processing mainly involves cleaning and grading. Cleaning and grading is done by the trader with small sieving equipment or in large scale using big machines. The grading of produce through machines is a specialized activity and requires an investment of Rs 1.5- 2 lakhs for installation of the machines. Grading through machines was observed only in Jalna and Barshi markets which receive huge arrivals of PRSS. Sorghum is cleaned & graded into 3-4 grades based on the size. The top two grades are packed and branded under select brand names like Kohinoor, President and Gold coin and exported to cities like Pune, Vashi, Mumbai, Kholapur to meet demand from

urban consumers. The graded produce is also exported to States of Gujarat, Punjab and Haryana where it is mainly used as seed for sowing as fodder sorghum.

The marketing costs and margins of trader vary based on the prevailing prices (buying & selling) in the markets, variable costs and based on the channel of marketing. Item-wise break-up of marketing costs across the four primary markets (2 markets each for region of western and marathwada Maharashtra is presented in Figure 6. Across markets, cleaning as a value addition (physical form) forms the highest cost of marketing for the trader followed by the market fee and the bagging charges. On an average the processing charges in the form of cleaning and grading during 2012 was Rs. 15-20/100 kg if done manually and Rs. 40-50/100 kg if machine cleaned.

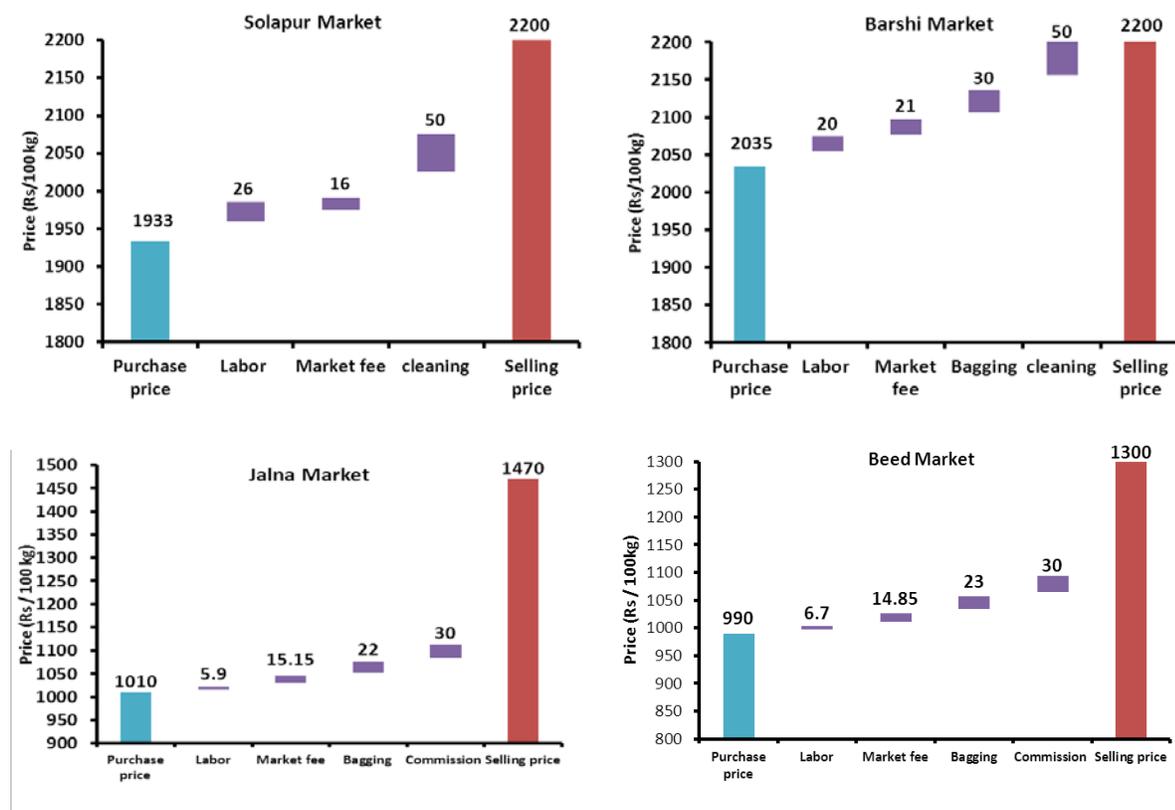


Figure 6. Marketing costs of traders for PRSS across primary markets of Maharashtra

The average marketing costs for trader in the primary and secondary markets in study region vary between 92-126 /100 kg (Table 5). If the trader from primary market exports sorghum to secondary market (Pune), additionally trader has to incur on an average is Rs. 85-100/100 kg transport costs. The margins to variable cost of marketing of traders across markets of western and marathwada Maharashtra shows that, traders of Jalna and Sholapur realize the highest margins by selling sorghum either to the local retailers or to the traders in secondary markets. In both these markets, the transactions cost of trade are low compared to other markets. On the contrary, traders of Barshi market receive the least margins compared to other markets if they

sell sorghum to local retailers. Barshi taluk in Maharashtra has the highest area under post-rainy season sorghum in Maharashtra. Majority of the consumers are producers and hence low demand for local retail sales might be the reason for low margins for traders in Barshi if they trade locally. Communication with traders in Barshi during market surveys had also indicated that traders primarily do business in secondary markets due to high demand and higher margins.

Table 5. Marketing costs and margins of the trader across markets in Maharashtra

Region	Market	Sales to Local retailer		Sales to Secondary market	
		Marketing costs	Net Margins to variable costs	Marketing costs	Net Margins to variable costs
Western Maharashtra	Solapur	92	174	177	274
	Ahmednagar	99	101	177	113
	Barshi	126	41.9	221	197
	Pune	95	197	-	-
Marathwada Maharashtra	Parbhani	76	234	-	-
	Jalna	74	386	102	358
	Beed	81	119	103	97

Note. Both marketing costs & margins are per 100kg. The margins for Pune and Parbhani markets are not indicated as these are secondary markets

The margins realized by traders was as high as Rs 358/100kg in Jalna market to Rs 97/100kg in Beed market if they sell sorghum to secondary markets rather than selling it to local retailers. Traders in markets of western Maharashtra realize higher margins by selling sorghum in secondary markets instead of selling locally while it is vice versa in markets of marathwada Maharashtra. Secondary markets are primarily consuming markets and hence are demand centers for doing business by traders from primary markets.

In the markets of western Maharashtra, of the total trade in sorghum both the channels (with sales to local retailer and selling in secondary markets) have a share of 30% each and the remaining sold outside of the State and super markets. Some of the associated factors for selling produce by traders of the primary markets to local retailers are; more consumption demand in the producing regions and avoidance of risk (payment, transport) for selling to outstation (outside the state) markets.

Retail as a function of value chain

Retailers are considered as personal representative of consumers and are the closest to consumers in the marketing system. Retailer as an operator in the value chain transports the commodity to the place of sales for consumers after purchase from trader. Hence, transport costs are the major cost of marketing for the retailer. The average costs of transport across markets of the study

region are in the range of Rs 15-18/100 kg of sorghum. Apart from transport cost, the retailer also incurs cost of inventory. The marketing costs and margins of retailer were calculated based on the prices (buying & selling) prevailing during 2013. Across the operators of the value chain of agricultural commodities it is generally found that retailers realize the maximum margin from trade (NCAP 2008). This is true for PRSS also. Retailers in the secondary market realize higher margins compared to their counterparts in primary markets. The margins are as high as Rs 385/100 kg of sorghum in Kholapur market and Rs 186/100 kg in Pune market (Table 6). Their margins are also relatively higher in primary markets of marathwada region in comparison to western Maharashtra regions. The maximum margin was observed in Jalna market at Rs 311/100 kg.

Table 6. Marketing costs and margins of retailers for PRSS in Maharashtra

Market type	Market	Marketing costs	Net Margin
Primary markets	Solapur	25	275
	Ahmednagar	60	220
	Barshi	20	130
	Jalna	32	311
	Beed	45	295
Secondary markets	Pune	14	186
	Parbhani	36	309
	Kholapur	16	385

Distributional shares of the operators of the value chain

The previous sections described the cost structure and margins of the operators of the sorghum value chain. In this section, an attempt is made to look at the distributional shares or the price spreads or the margins of sorghum across different value chain operators traded from primary markets to the secondary market to reach its final destination the consumer through the retailer. To capture the variations in price spread which is mainly due to variations in sorghum prices, the price spreads are calculated based on the fortnightly wholesale prices prevailing in the markets during 2013. The flow of trade from primary markets Barshi and Sholapur is to the secondary markets Kholapur and Pune respectively. Hence, to capture the extent of price difference between the primary and secondary markets, the prices prevailing in these markets are considered for the analysis. Varietal differences are found to present substantial difference in prices. APMC's records modal prices for fair average quality and not by varieties. To avoid for the substantial variations in prices due to varietal variation which might distort the price spreads, data on prices were collected for ruling varieties only (based on demand) both in primary and secondary markets by discussing with various value chain operators (traders, commission agents and retailers). Accordingly, the distributional shares are presented for *jute* and *maldhandi* varieties only.

The distributional shares of the operators of the value chain and between markets will help in understanding the reasons behind the high and low price spreads and market efficiency which will help to formulate market strategies that enable improving farmers access to markets.

The margins across the value chain operators indicate that retailers garner the maximum share in the chain. Based on market prices for *jute* and *maldhandi* varieties of PRSS during 2013, the traders share of consumer rupee in the secondary markets was in the range of 1-5% in Kholapur market while it was in the range of 3-4% in Pune market. The retailers share in Kholapur market was in the range of 3-10% while it was in the range of 3-9% in Pune market. Though both the secondary markets (Pune and Kholapur) are equidistant from Sholapur and Barshi, the margins which are marginally higher in Kholapur is due to high demand with higher price realizations for value chain actors as compared to Pune market. Hence, the producer's share in consumer's rupee is higher (81-86%) for the trade from Barshi to Kholapur channel compared to Solapur to Pune channel where the producer share in the consumer rupee is in the range of 76-80% (Table 7& 8).

Table 7. Distributional shares of value chain operators of PRSS value chain in Barshi market of Maharashtra

Sl. No.	Particulars	Fortnight ending prices of post-rainy season sorghum for <i>jute</i> variety- Rs/100 kg		
		08.03.2013	15.03.2013	22.03.2013
1	Primary wholesale Price of sorghum	2100	2200	2200
2	Charges borne by the producer seller per 100 kg of sorghum	65	65	65
3	Producer's Price (1 – 2)	2035	2135	2135
4 a	Charges borne by the trader at primary market per 100 kg of sorghum	123.1	123.1	123.1
4 b	Charges borne by the wholesaler of secondary Market	90	98	98
5	Secondary Wholesale Price	2450	2375	2400
6 a	Margin of Secondary Wholesaler [5 –{1+4(a)+4 b}]	132	22	47
6 b	Percentage to Consumer's Price	5.17	0.86	1.74
7	Charges incurred by the Retailer	25	25	25
8	Retail Price at Secondary Market	2550	2550	2700
9 a	Margin of Retailer [8–{7+5}]	75	150	275
9 b	Percentage to Consumer's Price	2.94	5.88	10.19
10	Producer's share in Consumer's Price (%)	82	86	81

Note. Kholapur was considered as secondary market for analysis

Table 8. Distributional shares of value chain operators of post-rainy season sorghum value chain in Sholapur market of Maharashtra

Sl. No.	Particulars	Fortnight ending prices of post-rainy season sorghum for <i>maldhandi</i> variety- Rs/100 kg				
		08.02.13	15.02.13	22.02.13	08.03.13	15.03.13
1	Primary wholesale Price of sorghum	1650	1600	1700	1675	1750
2	Charges borne by the producer seller per 100 kg of sorghum	67	67	67	67	67
3	Producer's Price { 1 – 2}	1633	1533	1533	1608	1683
4a	Charges borne by the trader at primary market per 100 kg of sorghum	177	177	177	177	177
4b	Charges borne by the wholesaler of secondary Market	15	15	15	15	15
5	Secondary Wholesale Price.	1900	1875	2000	2000	2100
6a	Margin of Secondary Wholesaler [5 – {1 + 4a+4b}]	58	83	108	133	158
6b	Percentage to Consumer's Price	3	4	5	6	7
7	Charges incurred by the Retailer.	30	30	30	30	30
8	Retail Price at Secondary Market.	2100	2100	2200	2200	2200
9a	Margin of Retailer [8–{7 + 5}]	170	195	170	170	70
9b	Percentage to Consumer's Price.	8	9	8	8	3
10	Producer's share in Consumer's Price (%).	79	76	77	76	80

Note. Pune was considered as secondary market for analysis

Constraints of the PRSS value chain and strategies for improvement

Producer's constraints

Input supply constraints of production

Across the value chain of sorghum, the value chain operators (producers, traders, retailers) face many challenges and constraints⁸ in moving the commodity to its final destination the consumer. Production as a function and producers as value chain operators face majority of the constraints in the chain as presented in Figure 7. Seed supply in the production function of PRSS is still a major bottleneck for improving productivity and production. This weak link of seed supply results in non-adoption of improved technologies causing low productivity, low production and increased prices due to low production. The problem is compounded with non-participation of private sector due to low margin business. Seed supply of improved varieties for PRSS is distributed through State Agricultural Universities (SAU's) else farmers use seeds saved from

⁸ In the valuelinks literature the symbol  is used to represents constraints along the value chain

the previous crop for sowing. The other two important constraints pertain to fertilizer distribution and credit availability. Fertilizers in the study location are either purchased through input dealers or co-operatives. Farmers cited shortage of fertilizer as one of the major bottleneck for production. Most often farmers are forced to purchase fertilizer in the black market by paying additional amount of Rs 100-200/bag of 100kg. On the supply of credit for production, farmers most often cannot avail credit from institutional lenders like banks as credit is provided once during a year. Since post-rainy season sorghum is grown under residual moisture under marginal conditions with high risk of crop failure, farmers prefer to avail loans for crops grown during kharif season which are generally cash crops. Because of lack of cash in hand for the cultivation of second crop (post-rainy), farmers are discouraged to adopt better crop production practices resulting in low crop production. On the other side, even if they avail loan from institutional source farmers have to pay commission charges of Rs 3,000 per lakh⁹ of loan availed as documentation fees to commission agents who will help in loan processing etc. In other instances when farmers avail loan from non-institutional sources like money lenders, the interest charges are as high as 36% per annum when compared to interest charges of 6-8% per annum from the institutional source. Hence, due to these constraints only 20% of the sample farmer's availed loan in the study region of western Maharashtra while it is 0% in marathwada region. Hence there is a need for channelizing credit through more efficient and easier operating procedures.

Post-harvest constraints of producers

On the post-harvest front, farmers are constrained by lack of grading and cleaning facilities to clean the produce which will aid in realization of higher prices. Producer's lack awareness on cleaning and grading of the produce and end up marketing poor and inferior quality produce to the markets. In the study regions only about 13% of the sample farmers (60) in western Maharashtra graded the produce while it was 0% in marathwada Maharashtra. Similar findings were obtained from a study conducted by World Bank (2007). The study reports the large discrepancy between farmers' perceived price premiums for quality and actual actions might be result of small volume of produce (which limits grading possibilities); price uncertainty (not knowing whether market prices will cover the cost of additional postharvest activities); and the transaction cost of searching for buyers who will reward quality. Capacity enhancement of farmers in selection of seed of improved varieties, strengthening the extension system of seed supply and participation of private sector for seed production are some of the strategies to improve seed supply chain.

Capacity building of farmers on post-harvest activities (cleaning and grading) and establishment of marketing infrastructure will help in improving the efficiency of the sorghum chain. Farmers are required to be trained on characteristics of grade like the size, color, luster of the grain and handling the processing equipment's. Farmers could also be exposed to firms where cleaning, grading and packing happens to improve the skill sets/ entrepreneurial skills of the farmers. To

⁹ One lakh Indian rupees is 0.1 million rupees

facilitate the process, marketing infrastructure has to be upgraded with provision of simple and small scale processing equipment's in the market yards with nominal charges.

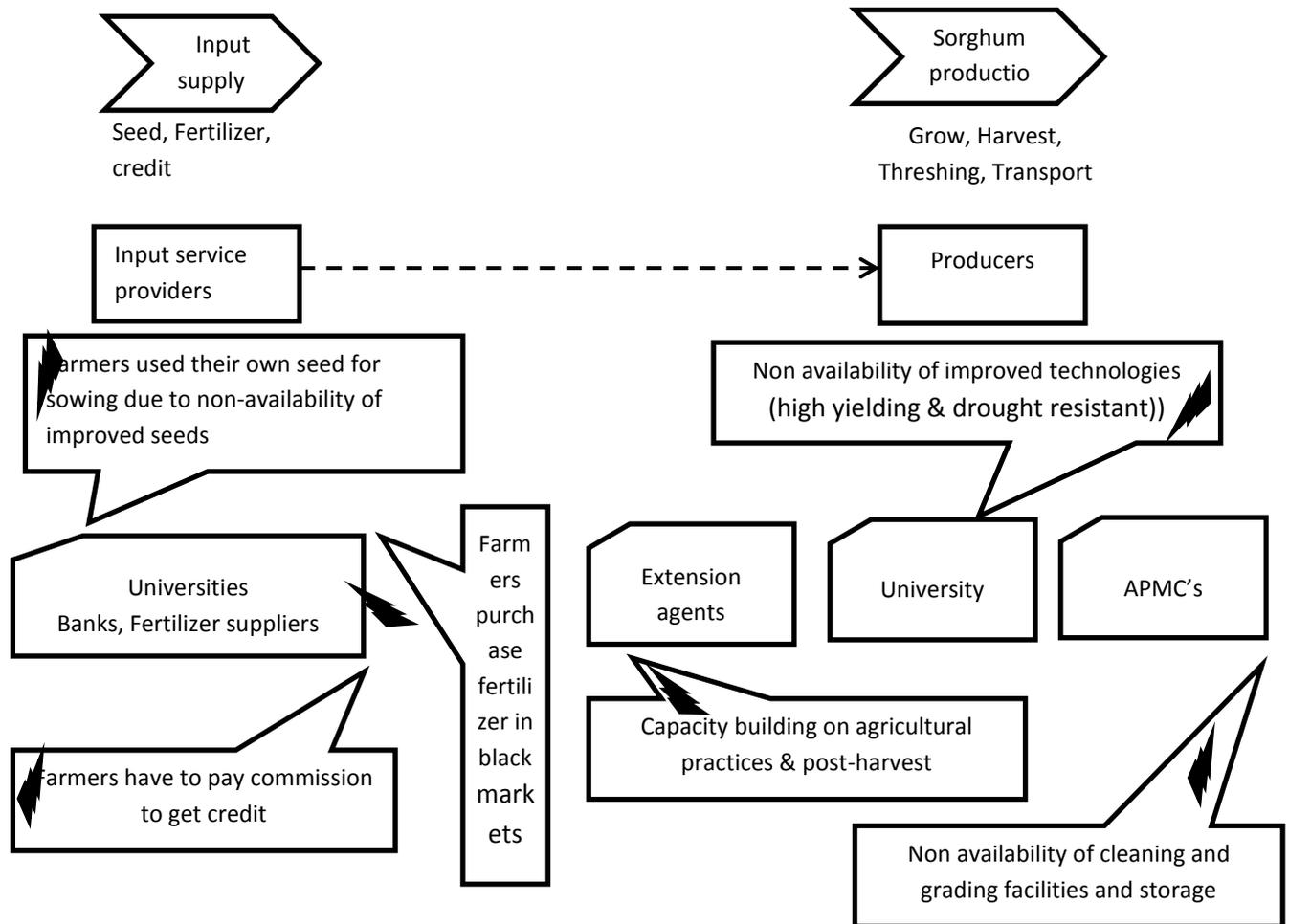


Figure 7. Production constraints of PRSS value chain in Maharashtra

Information delivery

Market information is an essential input for farmers' production and marketing decisions. It helps farmers decide what to produce and when, where and how to market their produce. It also guides their longer-term investments (Kohls and Uhl 1990). Lack of information on market prices was one other major constraint for producers marketing agricultural commodities during 80-90's. With technological revolution, significant progress has been made on information delivery to producers of agricultural commodities in India through Radio, Television, Newspaper and most recently through ICT (Information and Communication Technologies) enabled services such as call centers, and mobile service providers. However, in spite of these efforts only about

40% of the sample farmers enquired about prices before selling sorghum to markets. Also, a national survey of farmers by National Sample Survey (NSS) has found that only 40 per cent of the farmers' households accessed information about modern agricultural techniques and inputs (NSSO, 2005). The most popular information source of these households for accessing information was 'other progressive farmers', followed by 'input dealers'. For farmers who enquired about prices before sales the source of information was either through commission agent, local transport operators who transport produce to markets and neighboring farmers and friends. Hence, in the context of decision making on selling the produce the recent advances on information delivery through mobile phone, Kisan Call Centers, Green Sim Cards, Nokia Life tools and Reuters Market Light (RML) has not been fully utilized. Understanding underlying factors for non-utilization of mobile services will be helpful for realization of its full potential for better penetration in general for all the crops marketed.

In primary markets of both western and marathwada Maharashtra oligopsony type of market structure prevails for sorghum trade. The process of price discovery by the traders/buyers who are very few in numbers are based on the quantity demanded and price at secondary and terminal markets. Often times the price discovery process is not transparent and hence farmers are disadvantaged by not getting their fair share of the commodity sold at a higher prices. Market intelligence and information asymmetry are critical for farmers to realize better prices for the produce. Hence, market intelligence has to be strengthened and awareness need to be created through capacity enhancement of farmers on market intelligence so as to enable them to utilize end market opportunities.

Trader constraints

Constraints to trade of PRSS pertain primarily to operational services¹⁰ of the value chain operators. Operational service bottlenecks stems from transport and labor services. This discourages traders to trade in secondary /terminal markets to meet the end market demand when there exists opportunities. Most often the produce that is brought to the markets is of poor quality (partially blackened grains, ununiform grain size, dust and foreign matter) and has to be cleaned and graded for sales. High cost of transportation to secondary market, lack of storage facilities, scarcity of labor and high wages are the operational constraints that the traders frequently come across which discourages sales to secondary markets. The other associated constraints are the problem of unstable production, unstable market demand, unstable price and low margin of business in staples which limits traders' participation in the value chain trade of sorghum (Figure 8).

¹⁰ Operational services in the literature of value link refers to those services that either directly perform value chain functions on behalf of the value chain operators or directly related to them. Operational services therefore are business-to business (B2B) services.

Role of private sector in the value chain up-gradation through vertical integration as an institutional factor is very critical for crops grown under dryland conditions such as sorghum. The investment by private sector through vertical integration can happen only when there is assured market demand. In case of assured market demand there has to be supply with consistent quality, quantity and reliability. Few other factors that influence this type of vertical integration are information, capacity to invest and knowledge of end market. Hence, institutional support to promote post-harvest processing, creating awareness on nutritive value and health benefits of sorghum consumption, capacity building of farmers, processors are the enabling factors that will help in the value chain upgrading.

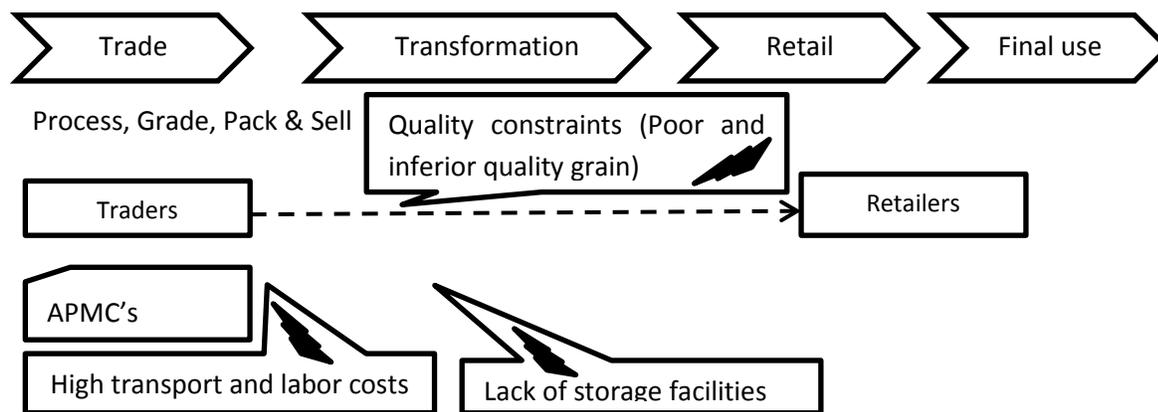


Figure 8. Trader constraints of the post-rainy season sorghum value chain in Maharashtra

Opportunities in the sorghum value chain

Upgrading options of post-rainy sorghum value chain

Across the value chain, the constraints discussed in the above paragraph provide in general opportunities¹¹ for upgrading the chain as shown in Figure 9.

In value chain literature upgrading is understood “as the process that enables a firm or any other actor of the chain to take on more value intensive functions in the chain, make itself harder to replace, and thus appropriate a larger share of the generated profits” (Stamm, 2004). Given the definition, upgrading means that individuals, firms or even a whole country improves its original situation through “changes in the nature and mix of activities, both within each linkage in the chain, and in the distribution of intra-chain activities” (Kaplinski and Morris, 2001). The usual ways of upgrading the value chain is to add value through specific operators in the chain. Generally four types of upgrading are identified; product upgrading, process upgrading,

¹¹In the valuelinks literature the symbol ★ is used to represent opportunities along the value chain

functional upgrading and chain upgrading¹². For post-rainy sorghum value chain upgrading options exist both for product upgrading and process upgrading.

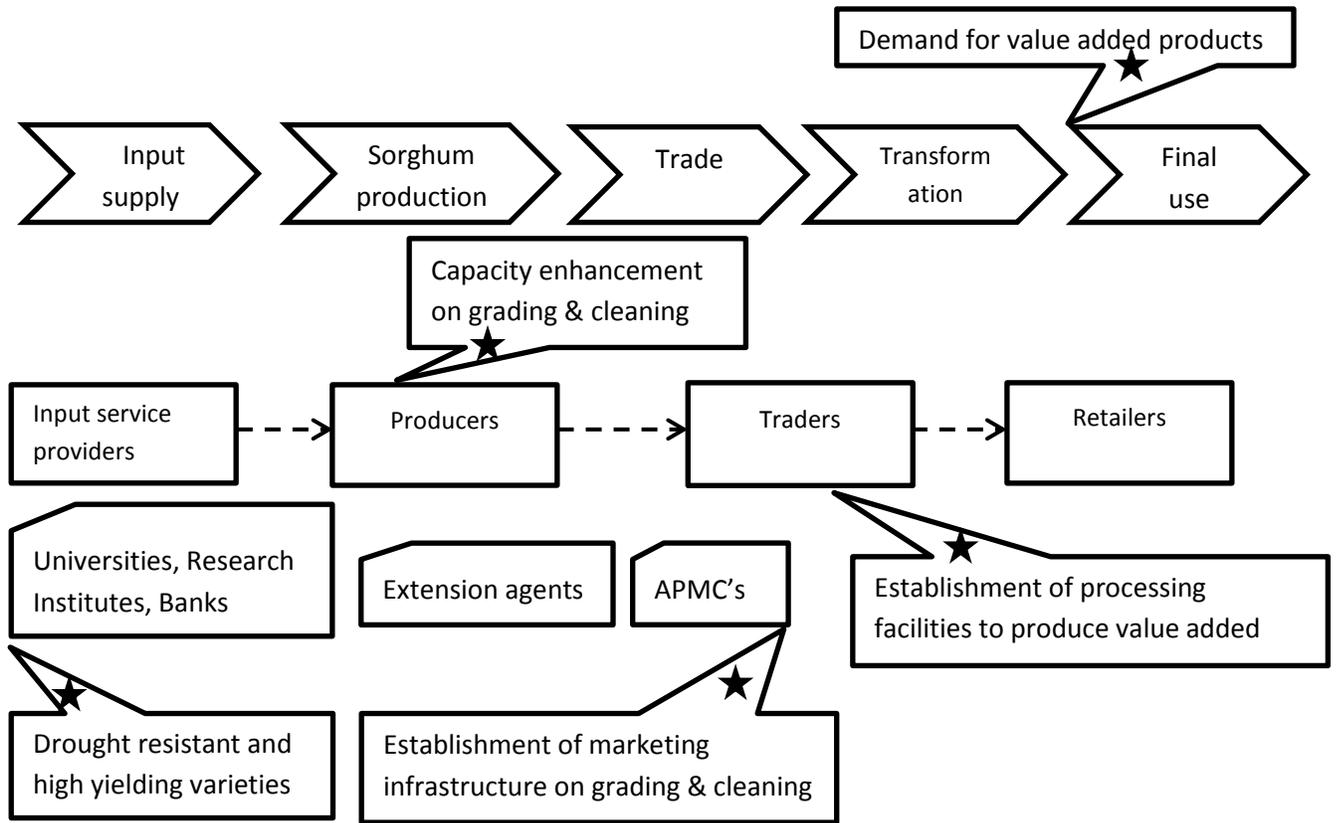


Figure9. Opportunities for upgrading the post-rainy season sorghum value chain in Maharashtra

Options for process upgrading

Input supply

A large proportion of sorghum production is still under local varieties and majority of the farmers are still using the grain produced on farm as seed for sowing. Though the local varieties are preferred over improved because of the quality, the productivity of local varieties is low. Hence, there is a huge potential for release and supply of improved varieties of seed of PRSS. The potential intervention on the backward linkages of the value chain is through supply of seeds of improved varieties which meet the quality requirements through public and private institutions.

¹²Product upgrading refers to improving existing products and or developing new ones while process upgrading deals with improving efficiency of internal and external processes within the chain. Changing one’s position within the chain to add value refers to functional upgrading and finally moving to a new VC altogether will lead to chain upgrading.

Grading and cleaning

As indicated in the earlier only about 13% of the sample farmers in study region of Maharashtra graded the produce. Some of the factors for not grading the produce have been lack awareness by producers on grading and cleaning leading to low prices for their produce and non-availability of cleaning and grading facilities in the market yard forcing farmers to sell the commodity without processing.

Presently, the cleaning and grading activities are carried out in few markets (Barshi and Jalna) s by the traders. The demand for cleaned, graded and packed produce in small quantities is increasing from urban localities. Opportunities for cleaning and grading exist for both the value chain operator's producers and traders in the value chain. The drivers of change include capacity enhancement of farmers on post-harvest processing through physical processing of the grain on cleaning and grading and establishment of marketing infrastructure that will help in improving the efficiency of the sorghum chain. Farmers are required to be trained on characteristics of grade like the size, color, luster of the grain and handling the processing equipment's. Farmers could also be exposed to firms where cleaning, grading and packing happens to improve the skillsets of the farmers. To facilitate the process, marketing infrastructure has to be upgraded with provision of simple and small scale processing equipment's in the market yards with nominal fees. Currently such type of market infrastructure hardly exists in markets yards. Process upgrading will help farmers realizing higher prices for their produce and enhance their incomes.

SWOT analysis of the process upgrading (grading and cleaning)

SWOT analysis was carried out to assess the opportunities and constraints of process upgrading of PRSS value chain and is presented under table 10.

Table 10. SWOT analysis of process up-grading the PRSS

Strengths	Weakness	Opportunities	Threats
<ul style="list-style-type: none"> ▪ Strong demand for cleaned and graded produce of sorghum in small packing's ▪ Willingness of the buyers to pay for cleaned & graded produce 	<ul style="list-style-type: none"> ▪ Lack of awareness on grading and cleaning at producers level ▪ Investment needs to enhance farmers capacity ▪ Infrastructure constraints both at producers level and at market yards ▪ As processing equipment's are expensive it will be difficult for farmers to invest individually ▪ Traditional systems of trade ▪ Lack of interest in innovations 	<ul style="list-style-type: none"> ▪ Only small proportion of the farmers grade the produce ▪ Farmers can enhance their incomes by adding value through grading and cleaning 	<ul style="list-style-type: none"> ▪ High cost for infrastructure upgrading ▪ Traders/wholesalers might still exploit producers by not paying premium for the quality produce (under quoting price) ▪ Existing processors might feel upgrading options for farmers as threat to their business

Options for product upgrading

Opportunities that exists for product upgrading the chain is primarily through traders and processors as operators in the value chain. This is described below

Development of ready to use products sorghum

Choice of product is an important determinant of consumption. The last two decades have seen significant changes in consumption habits in India. Urbanization, growing numbers of working women, diversification of diets, and the growth of the middle-class have increased demand for ready to use (RTU) food products or convenience foods. The value of the market for processed food in India is growing at 25 % per annum, and will reach \$ 330 billion by 2015(Chetty 2012). Other cereals (maize, wheat, oats, rice and barley) are already used to make RTU products which include flakes, flour, frozen flat breads, vermicelli, rava, upma, idli, and dosa.

RTU products from sorghum are not available, however. The primary constraint is low storability of the flour (sorghum can be stored for a maximum of 15 days under good conditions). The storability constraint on flour presents processing industries with an opportunity to develop RTU products which solve the problem of storability while also increasing consumer choice. Sorghum also provides health benefits that will attract diabetic and health conscious consumers. Sorghum and millet are rich in micro nutrients Fe and Zn, dietary fiber, antioxidant nutrients and starch and also one of the cheapest sources of these nutrients (Parthasarathy Rao et al 2006).

Value addition in the existing value chain of sorghum is limited to physical processing and processing as a specialized activity for product development in still in small proportions. Thus, product upgrading through production RTU products as an option to grow the value chain will provide benefits across different stakeholder's of the value chain and more importantly with the potential to benefit small and marginal farmers growing sorghum.

SWOT analysis of product upgrading

Table 11. SWOT analysis of product up-grading the post-rainy season sorghum value chain in Maharashtra

Strengths	Weakness	Opportunities	Threats
<ul style="list-style-type: none"> ▪ Demand exists for ready to use sorghum products ▪ Willingness of the buyers to pay for value addition ▪ Awareness of consumers about health benefits of sorghum 	<ul style="list-style-type: none"> ▪ Inability to supply consistent volume and quality sorghum at stable price ▪ Low keeping quality ▪ Industries skepticism about initial investments ▪ Lack of information on the demand for RTU products 	<ul style="list-style-type: none"> ▪ Farmers can enhance their incomes through increased supply due to increased demand for developing value added products ▪ Increased investment opportunities for processing industry ▪ Enhanced income for input service providers (machinery, packing industry and marketing) ▪ New sorghum products on shelf for consumption ▪ Increased employment opportunities (labor demand) 	<ul style="list-style-type: none"> ▪ Collapse of value chain if there is no consistent supply ▪ Existing processors might feel upgrading options for farmers as threat to their business

Conclusions

The valuelinks methodology of GIZ was adapted as a conceptual framework to study the post-rainy season sorghum value chain in Maharashtra. The study through mapping the value chain analyzed the access to markets, the marketing costs and distributional shares, bottlenecks and opportunities at each stage of the chain starting from input supply as a backward linkage to the end consumer. Strategies are proposed for the identified bottlenecks at each stage of the value chain.

Process and Product upgrading are found to be two critical areas that need to be addressed as priority areas for post-rainy sorghum value chain interventions. Choice of product is an important determinant of consumption and its acceptance. The last two decades have seen significant changes in consumption habits in India. Urbanization, growing numbers of working women, diversification of diets, and the growth of the middle-class have increased demand for ready to use (RTU) food products or convenience foods. The value of the market for processed food in India is growing. Among cereals, maize, wheat, oats, rice and barley are already used by food processing companies to make RTU products, which include flakes, flour, frozen flat breads, vermicelli, *rava*, *upma*, *idli*, and *dosa*. RTU products from sorghum and millet are not available, however due to various constraints. Opportunity exists to address constraints and develop RTU products of post-rainy season sorghum. Sorghum is rich in micro nutrients Fe Zn, dietary fiber, antioxidant is also one of the cheapest sources of these nutrients. Sorghum also provides health benefits that will attract diabetic and health conscious consumers. Thus, RTU products as an upgrading option can elevate sorghum the value chain and benefit small and marginal farmers by improving market access.

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