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Pulse Value Chains in India- Challenges and Prospects: A Review

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ABSTRACT

Pulses assume special significance in the cropping systems and daily diets in India. Traditionally pulses are used for human consumption as dehusked seed splits after minimal processing. They are also the important ingredient of popular Indian snacks. The present paper reviews the research studies done on various components of value chain of pulses and draws upon the learnings. The value chains of pulses in India are long and complexed with a number of actors performing specific roles. The input providers, farmers, aggregators, wholesaler, commission agents, retailers, processors, millers, consumers, financial institutions, ware houses, researchers and policy makers together work to build the pulses value chains in India.

Key words: Pulses, Stakeholders, Value chains.

The concept of Value Chain (VC) was introduced by Porter (1985), as the entire range of activities involved in bringing out products or services from initiation to different phases of production to distribution, reaching the consumers and final disposal after use, thus ensuring both value creation and value capture (Zamora, 2016) by involving the related actors and action as the linking chain (Norton, 2014). These actors produce, store and transmit the materials, information /services, *etc* for end-market effect collectively and simultaneously (Perez and Oddone, 2016). The product assumed to gain value as it moves from one player to another in the chain (Hellin and Meijer, 2006). Besides flow of products, the knowledge and information, finances, payments and the social capital also move between the actors (Norton, 2014). The concept was initially applied in business perspective (GTZ Value Links, 2008) involving all the above elements (Brown, 1997; Kaplinsky and Morris 2001; Kumar and Sharma, 2016).

Value Chain Analysis (VCA) extends traditional supply chain analysis by identifying value being added to the product or service at each stage of the chain thus addressing the weaknesses of traditional system (Kaplinsky and Morris, 2003). VCA also analyze the degree of relationships among the actors and coordination mechanism (Trienekens, 2011) with focus on the dynamics of complex linkages within a network involving suppliers, distributors, partners and collaborators (Zott *et al*., 2011). Value chain analysis includes both qualitative and quantitative approaches (Zamora, 2016) using market mapping, observation, semi-structured interview schedules and focus group meetings (Hellin and Meizer, 2006).

Agricultural value chains (AVC) and need to anlayse them

Abdulsamad *et al.* (2013) emphasized the preproduction, production and post production stages in AVC. Value chain framework helps to enhance the efficiency, productivity and profitability of agriculture because of their increased use of knowledge, data and information communication technologies (Kumar and Sharma, 2016) thus, reduces costs and losses (Kumar *et al.,* 2016). Hence, the integrated food supply chains is one of the most visible market occurrences (Kumar *et al*., 2016) as it reduces the intermediaries in the chain and reinforce the value-addition activities by improved technology and inputs, advanced infrastructure, processing and exports facilities (Miller and Jones, 2010; Pabuayon *et al*., 2009). In the developing countries also, modern food value chains have turned out to be beneficial for the small land holders (Dries *et al*., 2004; Minten *et al*., 2007; Maertens and Swinnen, 2006; Birthal *et al*., 2007) and actor to actor relationship is improved as they often interact while choosing different market channels ofthe products (Trienekens, 2011). Strengthened value chain is an effective instrument against inequality, lesser income and inappropriation of value added products (Perez and Oddone, 2016). The VCA is increasingly used in decision-making processes to enable poor households, small farmers, micro-entrepreneurs or target groups to play a larger and more lucrative role in agri-value chain.

The present paper reviews the status of value chains of pulses in the country along with its associated enabling and hindering factors. Paper highlights the pulse value chains consisting different marketing channels utilized for

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movement of pulses from farmers to the ultimate consumers with insights into the marketing costs, profit margins, price spread and market efficiency.

Pulses production and consumption: The status

The total pulse production in India was 22.08 million tonnes in 2018-19 from an area of 29.16 million hectares as per the annual report (2017) of Department of Economics and Statistics, Ministry of Agriculture and Farmers'welfare, Government of India. Pulses share 11 per cent of the total cropped area of country and contribute about 8% to the total food grain production and accounts for 10 per cent of daily protein intake in rural India and 11 per cent in urban India (Joshi and Saxena, 2002; Kumar *et al*., 2017) besides supplementing iron, zinc, calcium, magnesium and many vitamins (Singh, 2017) and contributing for food security (Singh, 2018) and offering the ecological services (Kumar and Yadav, 2018). Owing to the huge demand of pulses to meet the domestic consumption, India imports large quantity of pulses (Singh *et al*., 2015) and wide range of value-added products with longer shelf life (Verma *et al*., 2019). Pulses are the preferred crops in rainfed areas and resource challenged production conditions (Verma *et al*., 2019). About 56% of the pulses area is rainfed contribute 83% to the pulses production (Suresh *et al*., 2014). The pulses value chains is long involving farmers, researchers, market intermediaries like aggregators, wholesaler, commission agents, retailers, processors, millers and so on (Sah *et al*., 2014).

Enablers: Research and policy support

Through national agricultural research system(NARS), more than 500 region specific improved pulse varieties with matching production technologies are developed (Chaturvedi and Sandhu, 2019). The technological developments is also supported with 150 pulse seed hubs established in major pulse growing regions and 60,000 pulse villages (Singh and Praharaj, 2020) and further outreach by cluster front line demonstrations (about 34000 nos. annually) (Singh,2021). The exim policy has been caliberated to encourage pulse growers of this country. The removal of prohibition on export of all types of pulses since November 2017 has offered greater choice to farmers in marketing of their produce (Anonymous, 2019). Further imposition of quantitative restrictions on imports of pulses and restriction on import of yellow peas and imposition of import duties on different pulses (10-50%) (Anonymous, 2019) are supporting the pulse growers. Consequently, pulse production increased (about 35%) from 17.15 MT (2014-15) to 23.15 MT (2019-20) (Singh, 2021).

Available marketing channels for pulses

In India, pulse farmers prefer selling large proportion of produce immediately after harvest, while keeping a small portion for consumption (Gupta and Mishra, 2002) and seed purposes. The marketing channels used vary irrespective of the purpose. Presence of different marketing channels for chickpea in Andhra Pradesh (Suhasini *et al*., 2009) state, use of commission agent by pigeon pea growers in Karnataka (Sidaram *et al*., 2010), Haryana (Tuteja, 2002), other states (Upadhyay *et al*., 2013) and selling chickpea and pigeon pea in Bihar to village traders in local market for meeting the expenditure (Kumari and Singh, 2018) are few among others. In Assam, middlemen like village traders, shopkeepers, commission agents, secondary market wholesalers and retailers (Borah and Chetia, 1998) and also the market *fariah* (traders) were linked with medium and large farmers. Similarly, the tribal farmers of Chhotaudepur and Gujarat, with small quantities of the produce, were forced to sell the produce to local aggregators (Rajput and Gaikwad, 2017) as these aggregators were the major source of annual credit for household requirements of families. In contrast, farmers with higher quantity preferred bigger markets for selling the produce. The conceptual model of pulses value chain has been depicted as in Fig 1.

Economics of processing and value addition of pulses

The cost of pulses processing was observed to vary widely among the pulse producing states and also with respect to the type of pulses. Banerjee and Palke (2010) worked out the total processing cost of pulses to be Rs. 23,586 per 1000 kg. Further, the investement in establishment of pulse processing unit together with working capital constituted around 85 to 90 per cent of overall operational cost. In Maharashtra state, processing cost was highest for mungbean (Rs. 1668.78/q), followed by pigeonpea (Rs. 1508.09/q) and chickpea (Rs. 1379.42/q) (Gulve *et al*., 2009). In contrast, Singh *et al*. (2003) reported the average cost of processing of pulses was Rs. 800.61 with variations from Rs. 752.05 to Rs. 831.67 per quintal in Bundelkhand region of Uttar Pradesh. Wankhade *et al*. (2010) reported that the cost of value addition of pigeonpea to be 19.0 per cent of cost of raw material. The *dhal* recovery from processing of pulse grains was 75% in major states of India (Gupta and Mishra, 2002; Sharma and Athavale, 2003) with 2% damage to grain.

Challenges of pulse value chains

High technology and yield gap in pulse production

Poor adoption of the production technologies translates into poor productivity of pulses at farmers level (Singh, 2018) and limit pulse production in the country (Nain *et al*., 2015). High technological gap in adoption of pulse production technologies have also been observed across India (Rai *et al*., 2019; Pal *et al*., 2014; Burman *et al*., 2010). In most of the pulses, huge gap exists between the potential yield and the realized yield (Ahlawat *et al*., 2016; Singh *et al*., 2019; Tewari *et al*., 2020), thus there are lower state level yields of pulses than national average (Rimal and Kumar,

2015; Kumabhare *et al*., 2014) in many cases. Wooing further, limited access to quality seeds (Sinha *et al.,* 2019; Nain *et al.,* 2015; Narayan and Kumar, 2015; Kumbhare *et al*., 2014; Pal *et al*., 2014; Burman *et al*., 2010), coupled with poor conversion of breeder seeds into foundation and certified seeds (Narayan and Kumar, 2015) usually leads to poor yield at farmers' level. Damage to crops by stray animals also deter to a large extent (Kumbhare *et al*., 2014; Nain *et al*., 2015; Rai *et al.,* 2019) in certain pockets of the country.

Low allocation of production resources

Inadequate adoption of production technologies, associated production risks and low level of irrigation limit the productivity levels in the country (Tewari *et al*., 2020). Farmers tend to allocate their best land for crops other than pulses, due to poor and uncertain yields (Gowda *et al*., 2013), thus, generally grown with sub-optimal input applications (Reddy, 2009) with limited use of production inputs like fertilizers, irrigation, weedicide in pulse crops (Nain *et al*., 2015; Anonymous, 2019). On contrary the availability of irrigation coverage poses a negative influence on pulse acreage (Sadavatti, 2007). This in turn, forces pulse growers to continue to grow pulses under sub-optimal conditions.

Marketing of pulses

Though the market price of pulses are generally higher than that of cereal crops like rice and wheat, farmers fail to receive reasonable profits owing to poor yield levels (Sekar *et al*., 2017). Distress sale, lower prices compared to cost of production, non-accessibility to market, were identified as major market related constraints (Anonymous, 2019). Lack of assured markets is an important issue related to pulse production in India (Ahlawat *et al*., 2016; Tewari *et al*., 2020). The pulse growers have limited choice for selling the produce (Borah and Chetia, 1998; Rajput and Gaikwad, 2017) in case where the quantity of produce was comparatively smaller.

Market intermediaries targeting higher profit margins

Long marketing channel of pulses with higher number of intermediaries (Reddy and Amarender, 2005; Rao *et al.,* 2010) dominates the traditional marketing system of pulses in India. Thus, aggregators, wholesalers, commission agents, processors and retailers operates between pulse farmers and consumers (Jitendra, 2016). Processing contributes to highest marketing cost for pulses and highest profit margins (50%) in India (Shailendra, 2013) and usually 25-30 per cent profit over the price of pulse grains (Gupta and Mishra, 2002). Processing mills mostly earn Rs. 350/q

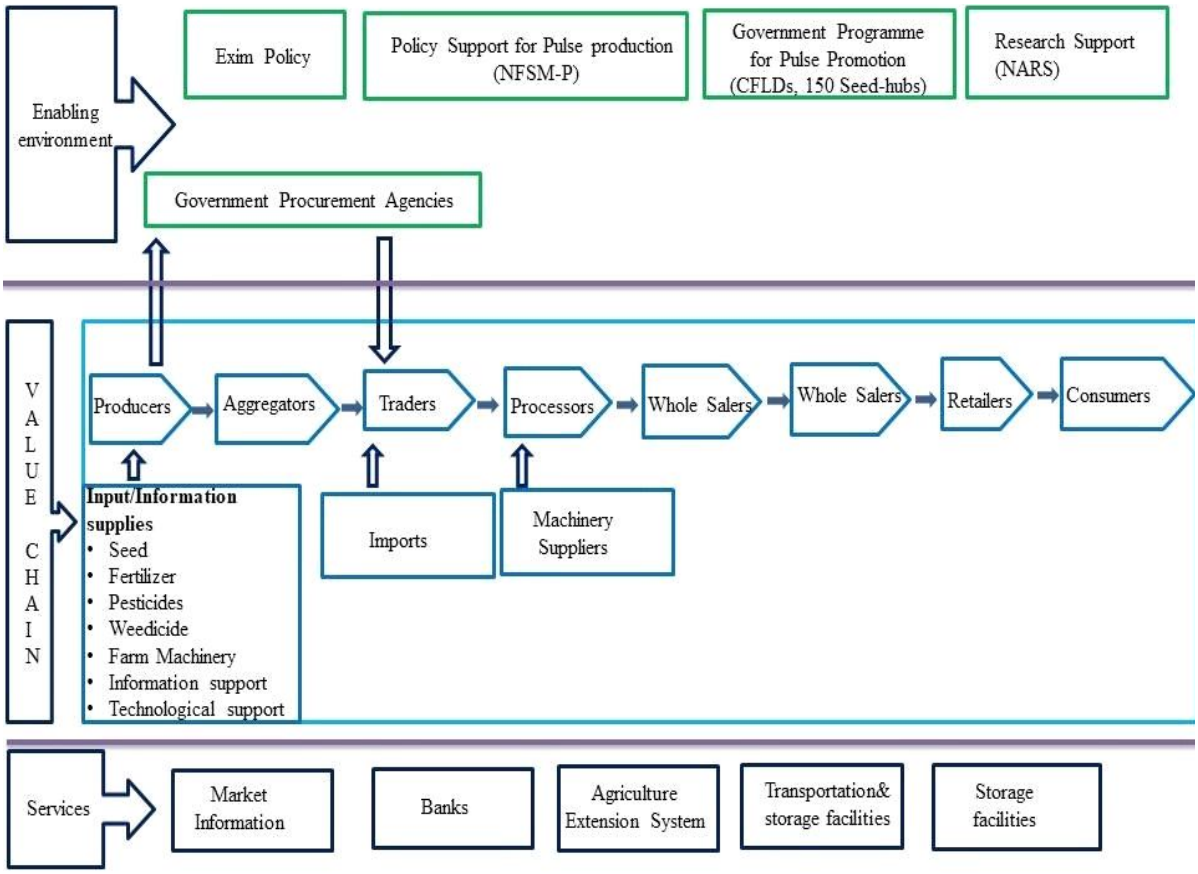


Fig 1: Schematice presentation of value chain of pulse in india.

as gross income over the purchase price (Rs 1400/q) (Sharma and Athavale, 2003).

Higher profit margins for market intermediaries as compared to pulse producers are reported by many researchers. Rao *et al*. (2010) reported that in traditional marketing system of chickpea and pigeonpea in Asia, uneven price transmission dominates. Market intermediaries specially retailers takes substantial part of marketing margin (Shailendra, 2013). As far as 40-50% reduction in producers' share was observed due to higher marketing margins to intermediaries in chickpea and pigeonpea in Bihar state (Singh *et al*., 2016 ; Kumari *et al*., 2018). Similarly in Karnataka, commission agents at government regulated market and wholesale markets along with retail vendors derive higher profit margin than farmers (Hedge, 2012).

Though, the long chain of intermediaries makes up the weak infrastructure and add critical value at each stage at lesser cost but blocks the market information to extract more profits (Rajput and Gaikwad, 2017). Huge post harvest losses up to 25-30% of pulses (Lal and Verma, 2007) is also a challenge *e.g.* in green gram (losses upto 9.5%) (Grant Thornton, 2016). Whereas in Bihar, this loss was to the extent of 30% (Kumari *et al*., 2018). Greengram value chain also reflects that farmer shared 60% of the money spent by consumers while the share of traders, processors, wholesalers and retailers were 2.66%, 20.65%, 3.74% and 13.04%, respectively.

Nonavailability of processing units and related infrastructural facilities

Lack of large scale pulse processing units at production sites is a major concern (Kumari *et al*., 2018) which includes nonavailability of suitable varieties, lack of storage facilities as well as reliable market information system (Shailendra 2013). Absence of quality grading mechanisms was also an issue in pulse markets (Rao *et al.,* 2010) however, the processors claim that non-availability of enough raw materials for processing, shortage of electricity, seasonal variation in raw materials arrival, fluctuation of market prices and high government charges levied (Malik *et al*., 2009) as the major issues.

Lack of market intelligence at level of farmers

Too many middlemen manipulating the market information and creating fake demand thus, influence the current traditional value chain of pulses in India (Vijayalakshmi, 2015) are frequently observed. Lack of reliable market information system at producers level is the major issues related to pulses marketing system in India (Shailendra, 2013). Provisions of good exposure of commission agents to the markets and better contact with buyers translate into good price and more demand in the markets (Sidaram *et al*., 2010). The Producers usually ascertains the market price through personal visit to market or over the phone (81.67%) followed by consulting the fellow farmers who had visited the market (68.33%) (Sidaram *et al*., 2010). The multiplicity of extension system on IPM, esp., pesticide dealers *etc.* and no adequated advisory sevices on nutrient management, disease and insect pest management were few extension education related constraints (Anonymous, 2019).

Low marketing efficiency

Most of the marketing channels of pulses in India have low marketing efficiency due to high marketing cost and greater margins (Shailendra, 2013). Chahal *et al*. (2004) reiterated that quantum of producers' share in consumer rupee was 55.32 to 64.57 per cent in different marketing channels depending on the number of intermediaries involved as in case of green peas in Punjab. The marketing efficiency index ranged from 1.24 to 1.82 in different marketing channels. In same state, Sidhu *et al*. (2011) reported three supply chains, producer-wholesaler (through commission agent)-retailer-consumer (I); producer-retailer (through commission agent)-consumer (II) and producer-consumer (III) in marketing of green peas. The net price received by the producer was 67, 69 and 94 per cent in supply chains I, II and III respectively. The supply chain III was the most efficient with highest marketing efficiency (14.83%) as compared to supply chain II (2.70%) and supply chain I (2.38%).

In Chandauli district of Uttar Pradesh the total marketing cost of gram was Rs. 149/q due to more number of intermediaries and higher processing cost. The producer's share in consumer's price varied from 96.72 per cent and 77.61 per cent in different marketing channels (Govind Pal, 2002). Functional analysis of the factors affecting marketing efficiency of different channels of green peas in Punjab also confirmed that with one per cent increase in marketing margins and costs, the marketing efficiency declined by 0.45 per cent and 0.44 per cent, respectively. The margin of the retailer was higher in supply chain where the wholesaler was not involved Sidhu *et al*. (2011). With particular case of chickpea, there was no integration of supply chain elements and each element functions discretelyin chickpeas industry in India (Vijayalakshmi, 2015).

Strengthening the pulse value chains: Propositions

Addressing the hindering factors

Adoption of improved pulse production technologies was estimated to increase pulse production by at least 13-42 per cent in the country (Ali and Gupta, 2012). It has been, therefore felt for evolving and adapting improved pulses varieties to suit the varied agro-climatic conditions (Narayan and Kumar, 2015). The concerted efforts made in pulses research for development of improved varieties and technologies led to enhaced pulse productivity in the country (Singh and Praharaj, 2020) and it chennelise the output, regional level seed hubs (150 nos) have been created (Chauhanetal, 2016). Leveraging the Information communication technology mediated approach for improving the access of pulse growers to improved production tehnologies could work towards reducing the information gap (Sah, 2018).

Promoting linkages between producers and markets

Stronger linkages between farm and processing unit has been recognized to ensure efficient traditional value chains in pulses (Malik *et al.,* 2009). Moreover, the actors involved in it must cooperate each other to bring effectiveness and efficiency for all participants in the chain (Norton, 2014). Kakkar (2014) also reiterated for strengthening the market linkages between chickpea farmers and traders for development of mutually beneficial contractual arrangements in the state of Andhra Pradesh which would shield both against widely fluctuating prices and guarantying an outlet for the surplus production. The processors may open own retail store for efficient distribution of pulses and efficient procurement of the raw product by presence in mandies. This could ultimately lead to cost reduction for customers as well (Shailendra, 2013). Also, establishment of pulse processing centers (*dhal* mills) by the cooperatives or organizations of farmers will shorten the pulse value chains and maximize the profit margins for pulse producers (Sidaram *et al.* (2010).

Market innovations for more profitable value chains

Most of the pulses in India are primarily sold in loose form without any branding, while only about 10-20 per cent of urban consumption and a negligible share of rural consumptions are being marketed in packaged form (Shailendra, 2013). Major trade in chickpea in Andhra Pradesh state of India is handled by unorganized sector as identified by Suhasini *et al*. (2009). In contrast, Sinha and Kumar (2010) assessed that NCDEX SPOT market helped pigeonpea growers of Gulbarga district of Karnataka to reduce the marketing cost by 50-70 per cent and realized them about 5-10 per cent higher price as compared to the traditional APMC market. Positive role of regulated markets in the development of value chains of agricultural commodities was also highlighted by Gauraha *et al*. (2010). Therefore, for strengthening the value chains of pulses in the country, Reddy (2005) emphasized on the urgent need to improve market infrastructure such as storage, warehousing, credit and processing facilities in and around production centers.

Learnings on value chains of pulses in India

Value chain analysis identifies the value being added to the product in form of services or processes at each stage of movement in the chain from production to consumption. It analyses relationships among the actors and coordination mechanism within the value chain along with the strengths and weaknesses each link in the entire chain to develop possible interventions that can improve the performance of value chain. Value chain framework helps to enhance the efficiency, productivity and profitability of agriculture. Studies on value chain of pulses are of immense importance as pulses are low cost dietary protein in the daily Indian diets and they have huge market demand for domestic consumption in the country. This paper has synthesized the research studies conducted on pulse value chains in India with focus on different componenets of value chains.

Conflict of interest

All authors declared that there is no conflict of interest.

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