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## Value chain analysis of *Jatropha* in tribal belt of Rajasthan

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#### Abstract

The value chain is a sequence of activities in which products pass through all in order and through each activity, the product gains some value. The major problem of Rajasthan's forest management is a challenging endeavour due to the harsh climatic and edaphic conditions, as well as the severe biotic pressure and growing demand and supply gaps for forest products. Migration has become the predominant source of income for the region as a whole and for the tribal communities. The majority of tribes are not aware of the opportunities within the radius. Due to pandemic, the majority of them had headed back to their regions. They started small-scale operations like daily wage contracts, goat rearing, collecting the forest produce, and setting up local shops and repair/ garage shops. Apart from all the odds, value chain interventions provide sustainable livelihood to the community in a far more appropriate manner. To Overcome this, minor forest products have untapped potential in the value chain, which should be exploited. Therefore, to provide the best out of available solutions, the majority of the foundations, NGO's and Government bodies focused on value chain intervention of the forest produce, which provides economic opportunities to tribal communities in an indefinite manner. The study aimed to map the value chain elements involved in Wild *Jatropha*. With this aim, three objectives are articulated in the study i.e. to map the elements/activities within the realm of the value chain and operational dynamics of Wild *Jatropha*, to analyze the identified key elements in the value chain and to identify the areas where interventions are required and suggest appropriate measures for the value chain of wild *Jatropha*. The study is limited to the Kotra block of Udaipur District (Rajasthan). Based on the study it is evident that the collection of wild *Jatropha* is one of the secondary occupations of the tribal. These untapped resources enhance the income of the tribal community, if it is use properly. There are many interventions or value-added aspects within the value chain of Wild *Jatropha*. However, limiting too few of them is entirely dependent on the community, financial status, awareness level, acceptance rate and technological interventions. *Jatropha* Shell is the value intervention, which suits more often to the tribal community. This sort of intervention draws a large section of the market and achieves sustainability within the community. Capacity building and awareness are the drivers that nudge economic stability and foster the livelihood of the tribal.

**Keywords:** Minor forest produce, value chain analysis, *Jatropha*, tribal belt

#### Introduction

Minor forest products play an important role in developing country economies, contributing to national gross production and providing a stable source of income for tribal communities. Rajasthan with its huge geographical area of 342 lakhs ha. has reached the status of being the largest state in India. Desert covers 57 per cent of the state, accounting for 61 per cent of India's desert. The rainfall is insufficient (average annual rainfall is 575 mm) and erratic in both time (3 out of 5 years are dry years) and quantity (23.55 cm to 99.9 cm). The tribal population in the Udaipur district is large. There are 1, 58,257 scheduled castes and 12, 60,432 scheduled tribes in the overall population, accounting for 6% and 47.86% respectively (Census, 2011). The district's southern half is mostly tribal. More than 70% of the people in the Jhadol and Kotra areas are tribal. Scheduled Tribes, primarily Bhils and Meenas, live in this area. The main horticultural fruits include mango, anola, pomegranate, guava, orange, ber, and Malta. Tribals used these fruits, along with Jamun, Anola, Bael, Karonda, Ker, Khirni, and others, as a source of nourishment and natural medicine, primarily in the form of fresh fruits, powder, fruit juice, and medications (Kaushik, 2013) [7]. *Jatropha* (*Jatropha curcas*) is an underutilized oil-bearing crop that is also widely used as a biodiesel fuel (Jocelyn et. al., 2020) [6]. It produces a seed that may be turned into non-polluting biodiesel, which can bring good returns for rural development if properly utilized. In addition to growing on degraded and

marginal lands with minimal inputs and management, this crop has a unique appeal in that it grows in drought conditions and is not grazed by animals, is susceptible to only a few pests and diseases, and is resistant to environmental stresses such as droughts and soil hardness (Achten *et al.*, 2008; Francis *et al.*, 2005) <sup>[1, 4]</sup>. However, several efforts and production projects in countries were truncated due to factors affecting levels of productivity like soil needs, agronomic practices, agro-climatic conditions, and supply chain network challenges (Antwi *et al.*, 2019; Ianda *et al.*, 2020) <sup>[2, 5]</sup>. Despite difficulties and inherent hazards, efforts are continuing to focus on utilizing the multi-dimensional capacity to manufacture biodiesel and other goods (Lang *et al.*, 2013; Prochazka *et al.*, 2019; Moniruzzaman *et al.*, 2017) <sup>[8, 10, 9]</sup>. With over 0.4 million acres under cultivation, India is the world's leading *Jatropha* cultivator. The Planning Commission of India has formally acknowledged *Jatropha* as a feedstock for biodiesel manufacturing. Even though a variety of different oilseeds qualifies as biodiesel feed stocks, *Jatropha* was chosen because it is a non-edible oilseed crop that does not jeopardize the nation's food security if commercially promoted (Shinoj *et al.*, 2010) <sup>[11]</sup>. The ability to obtain "carbon credits" from *Jatropha*-cultivated land is seen as an added benefit. *Jatropha* production in marginal or less productive soils has been supported by several international studies. (Tilman *et al.*, 2009; Fargione *et al.*, 2008) <sup>[12, 3]</sup>.

*Jatropha curcas* oil contains about 14% free fatty acid (FFA), which is higher than the 1% threshold for efficient biodiesel conversion by trans-esterification with an alkaline catalyst (Tiwari *et al.*, 2007) <sup>[13]</sup>. Some of the value-added products are- Biopolymer, Fuel, Insecticide, and Organic manure. There is no significant availability of the latest data on *Jatropha* as a forest produce. The majority of farmers in India cultivate *Jatropha* and process it into oil from the harvested seed. The quantity of forest produce collected vary according to the block. Kotra block in Rajasthan accounts for 60% of the entire forest area under *Jatropha*. Rajasthan itself contributes to 227 ha of *Jatropha* area under forestry during 2009-2010. There is much underutilization of this particular production. The major objectives of the study are; to map the elements/activities within the realm of the value chain and operational dynamics of Wild *Jatropha*, to analyze the identified key elements in the value chain and to identify the areas where interventions are required and suggest appropriate measures for the value chain of Wild *Jatropha*.

### Materials and Methods

The study used both primary and secondary data; however, it relied mostly on survey data acquired from Rajasthan using a pre-tested questionnaire. The Sampling procedure followed is Purposive & Random Sampling. In the primary survey, a well-articulated questionnaire is prepared in which questions includes the activities involved in the entire chain of commodity and mapping the same for the enriched interventions. For this study, selecting a suitable sampling technique and the sample size was a big challenge and the present study is supposed to be limited to the tribal community in an online mode only. The Sample Size of the study was Seventy-five. The primary data related to *Jatropha*

are- cultivation costs, yields, input sources, marketing strategies, and other economic and livelihoods indicators. Furthermore, data gathered through personal meetings and talks with state department officials, tribal community members, panchayat committee members, agricultural university faculty, market intermediaries, and corporate executives were utilized. In addition, secondary sources such as published reports, compendiums, and websites were use in this study.

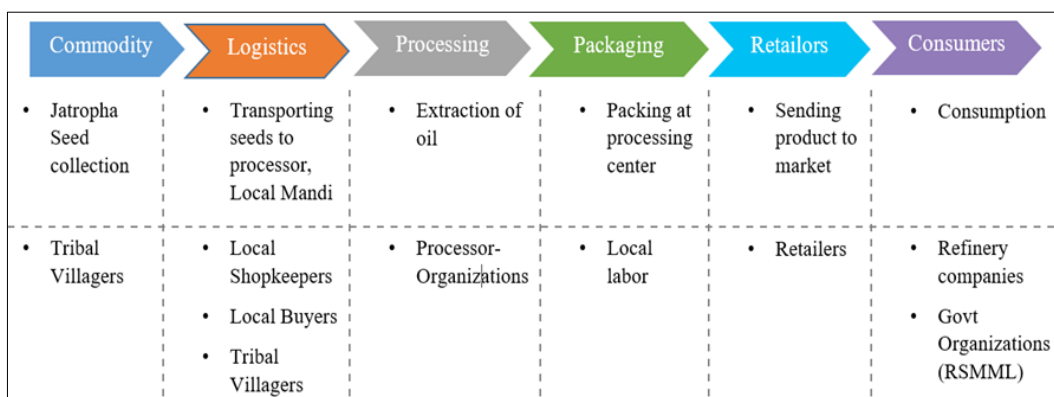
## Results and Discussion

### Agronomic Practices of *Jatropha*

In the study area, the majority of *Jatropha* producers were classified as marginal or small farmers. Some medium-sized farmers also grew *Jatropha*, but large-scale growers were not part of the cultivation. Early establishment operations of *Jatropha* cultivation were found to employ 85-110 human days throughout the first three years under moderate management settings. From the third year onwards, extra-human day labour per 50 kg of pods gathered was required. As a result, as the plants begin to yield, 40-50 people days of work are created per hectare each year on an average, and this number increases as the plants mature. More than 80% of the labour used in the production of *Jatropha* comes from inside the family. During the initial years, the farmers applied both manures and fertilizers and provides irrigation two or more times. The analysis reveals that the price policy of *Jatropha* seedlings, seeds, and oil will determine the break-even period and profitability of *Jatropha* farming. Most of the Farmers grew *Jatropha* on waste or fallow lands that had previously been uncultivated. Some farmers used *Jatropha* to create fences around their crop fields. *Jatropha* production, which is an animal deterrent crop, has caused some farmers in Rajasthan to express concern over the loss of grazing land for cattle. The loss of common grazing areas could lead to a lack of fodder, affecting the cattle sector in the *Jatropha* farming region. The majority of farmers believe that the current germplasm is low yielding and has a long gestation period and that the government should take steps to develop high-yielding varieties. They also feel that *Jatropha* cultivation's full output potential will only be reached once appropriate irrigation and nutrients are available.

### Wild *Jatropha* Value Chain

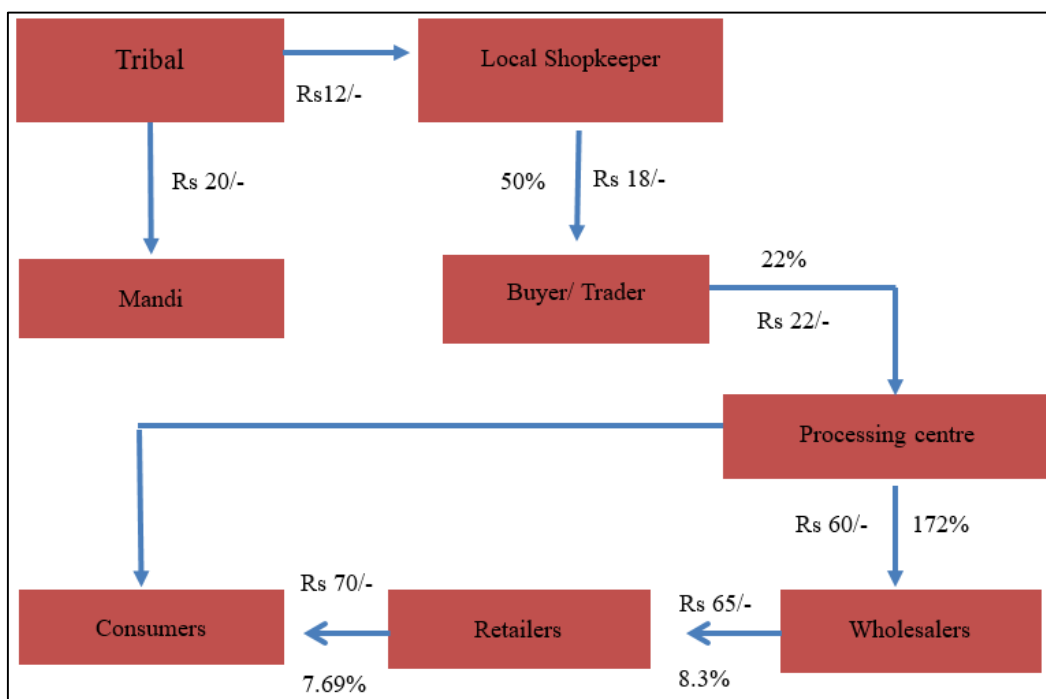
Value Chain Analysis deals with the examination of the value chain of an enterprise to find how much and at what stage, value is added. The *Jatropha* value chain encompasses a wide range of activities, from nursery development to distribution of biodiesel to end-users. The activities can be divided into six groups in general *viz.* Commodity, Logistics, Processing, Packaging, Retailers, and Consumers. At first, tribal villagers collect the wild *Jatropha* seeds. The seeds were sold through two channels. In one case, the collected seeds are given to the local buyer or shopkeeper, while in the other case, the collected produce is passed on to the local tribal *Mandi*. A trader or buyer buys the consignment from a local *Mandi* and then delivers it to the processing units in Gujarat. Oil is extracted and sold to several customers via retailers and wholesalers.



**Key elements in the value chain**

Around 10,000 MT of Jatropha seeds is collected from the forest during the season. Women, most of whom are untrained, mostly manage the collection. Around 80% of women are engaged in the collection of Jatropha in groups of 5-6 each for 30 days. The post-rainy season is the most crucial time for Jatropha. The Forest Department has village-level collection centres. Most of the community's produce is sold to local buyers or shop vendors. Jatropha is sometimes taken to the Mandi by tribal people to fetch a higher price. Tribal people can access the Mandi free. Jatropha seeds are

transported to the processing centre by van by the buyer. About 85% of respondents are willing to collectivization in which they believe that they can have good bargaining power. The tribal mostly follows selective picking in Jatropha. In wild Jatropha, nearly 81% of women are engaged in the collection of it. The majority (77%) of them are interested in value chain intervention. Jute is primarily used as packaging material in the case of Jatropha. Most respondents listed lack of market linkage as the biggest problem in the collection of wild Jatropha, followed by lack of awareness, and no price discovery, as their respective concerns.



**Interventions and suggesting measures for the value chain of Wild Jatropha**

**Tool & equipment:** The ideal technique to harvest Jatropha fruits is with a modified "apple picker," which is a long wooden pole with a circular comb at one end and a cotton bag at the other. Dry fruits can be collected from trees with this equipment, and the fruits fall into the bag and do not have to be found in the grass. Importance of seed husks as manure as well as briquetting/combusting material and its practicality. Market price realization for the commodity is in the nearby tribal mandis.

**Processing:** As of now, there are eleven Biomass power plants in Rajasthan's various districts i.e. Ganganagar, Hanumangarh, Kota, Baran, Tonk, Jaipur, Nagaur, Sirohi, and

Jalore districts. The majority of these plants are dependent on Agricultural wastes such as mustard stalks, cotton stalks, and wood (Prosopis) with a farm gate price ranging around Rs. 2000-2500/- per MT. There is a huge scope for forest waste too. The section of the Jatropha shell that can be dried, pounded into a powder, and made into fuel briquettes is seen here.

**Training and capacity building:** It may be provided to tribals for making briquettes or powdering the shell.

**Packaging:** Interventions should be made to increase the usage of jute bags rather than plastic by nudging the importance of sustainability through awareness campaigns.

**Networking:** By connecting tribal, public sectors, NGOs and the Forest department help to create innovation and development towards nudging tribal community for enabling livelihood and forest ecosystem. MSME can lead to a great advantage for the locals and help to curb the migration faced by the families. The creation of Self-help Groups will prioritize alternative livelihood possibilities for forest-dependent populations. These groups' skills must be developed through ongoing capacity-building activities, as well as seed money to enable them to create micro-firms for revenue generation.

### Conclusion

The majority of women (81%) collect the wild *Jatropha* seeds. They usually remove the seed shell and throw it away. This removed shell needs to be further processed which ultimately enhances the income of the tribal community. This creates a greater ecosystem for *Jatropha* and its value-added products. The majority of biomass plants are dependent on wood as the combustion material, now a day this does not seem that much lucrative due to its declining stage. Providing either *Jatropha*, shell powder or briquette material will act as a substitute for all. In the case of *Jatropha*, each part of it has its value and importance and it may be intimated to the community. Each value-added intervention in *Jatropha* is cash tracking and lucrative if different advanced tools are used like fabricating an apple picker. When compared with local buyers, the tribal get Rs.20/- in the Local *Mandi* Marketing channel as compared to only Rs.12/- from local buyers. For tribal to fetch high prices, awareness and accessibility should be provided. Farmers and several public sector enterprises have recently joined into contract agricultural agreements. In a nutshell, the farmers saw *Jatropha* as a supplementary crop that provided them with additional employment and income, and they did so with government assistance during the initial years of its establishment.

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