

Unlocking Value Addition in the Mango Value Chain: A Production–Processing Gap Analysis of the Kollapur–Pebbair–Wanaparthi Mango Cluster in Telangana, India

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Abstract :

We have studied production, utilization, market structure, and processing in the mango value chain cluster of Kollapur-Pebbair-Wanaparthi in Telangana, India. The study focuses on production–processing mismatch and the existence of significant potential but inadequate local processing. It is a finished analytical study using secondary materials, horticulture and food-processing government sources, research literature and consolidated regional estimates from earlier study. Analysis is done through descriptive statistics, percentage share of various product forms, cost breakdown in cultivation, value chain mapping and comparison with an example processing cluster. The estimated production is between 1.3–1.6 lakh tones from 33,000–35,000 acres, at an estimated average productivity of 4.5–5.5 tones/acre. 68 per cent of output comes to fresh market while 27% is dispatched outside to various external processing units, and 3% finds place in local processing and 2% is consumed at the farm/local level. At the mid-level production of 1.45 lakh tons it translates to 0.986 lakh tonnes of fresh market value; external processing adds another 0.3915 lakh tonnes, but only 0.0435 lakh tonnes local processing value addition. Highest estimated component of cultivation cost remains labour at 25 per cent, which is followed by plant protection and harvesting both at 14% per cent share, Fertilizers 12% transport 11% and Irrigation 10%. The paper establishes that lack of raw-material is not a problem, it is the deficient connectivity of upstream-downstream segments along the value chain. An FPO-aggregated and cluster-approach based on market intelligence, collection center, cold chain infrastructure, mango pulp and puree production; quality assurance certification, finance and market development strategy is put forth.

Key Words: Mango Value chain; Mango processing; Value-Addition; Production-Processing gap; Telangana; Kollapur; Pebbair; Wanaparthi; FPOs; Agribusiness;

1. INTRODUCTION:

Mango (*Mangifera indica* L.) remains a vital horticulture commodity which links up all levels of society ranging from producers, labours, traders, transport operators, processors, distributors, consumers, exporters in the economy. Horticulture production in the country increased to around 355.48 million tonnes (MT) in 2022-23 with fruits contributing nearly 110.21 million tonnes (MTs) [1]. This scale, and significant value retention with adequate back end processing and utilization activities make post harvesting issues as also the value addition paramount important. Fruit cultivation picked up momentum in Telangana as well. The state contributed about 24.33 lakh tonnes fruits in the horticulture output during 2022-23 with mango having significant contribution [2]. However, the Kollapur – Pebbair- Wanaparthi (KPW) belt in the southern parts of the state has been acknowledged as a prominent mango-growing region

with an estimated average area to the tune of 33,000–35,000 acres, an average annual output ranging between 1.3 and 1.6 lakh tonnes, and yielding 4.5–5.5 MT per acre (Regional estimate taken as the same as in [3].) We find disconnect between the available abundant resource-base of a wide area of production with poor local processing capacity. It appears the area's primary role in value chains is to function as a supplier to external processing. Nearly all gains, in terms of value addition (through processing, packing), and employment etc are therefore captured elsewhere, i.e. External to the local context. Since mango is a highly perishable product and its harvesting spans limited seasons, processing can be an alternative avenue to process the fruit class suitable for processing at reasonable pricing to supplement and diversify the existing avenues. The Ministry of Food Processing Industries (MOFPI), India recognizes various options for mango products – such as fruit pulp, juices, nectar, and other beverages, pickles and chuttny, mango powder, dry fruit slices and various innovative products [4]. It is with this perspective, the study critically looks at the production–processing gap prevalent in the region and suggests an appropriate cluster approach to make effective gains of mango crop available locally in terms of production value-Addition.

2. OBJECTIVES :

The study aims to, i) assess size, scale, nature of mango cultivation; ii) study production economics and cost components in a cultivation; iii) trace the linkages in market and value chain flow for mango in KPW area and iv) quantify and understand the genesis of production processing gap prevalent locally, and also formulate an efficient strategy for local value enhancement through food processing. The key analytical issues that the paper aims to address are (i) Why does local processing lag despite significant availability of raw material and its potential (ii) What infrastructure and institutional factors contribute to this production-processing lag (iii) What kind of farmer organizations, financial support, technological intervention, market development can enhance local value retention.

3. METHODOLOGY:

The study is conducted using a finished descriptive and analytical approach leveraging secondary information and consolidated estimates reported in a prior work on the same regional context. Although an initial design conceptualizing Questionnaire, proposed sampling technique, Likert scale measurement etc was envisaged, the present write up for analysis did not draw on Field survey or any statistical testing on hypothesis through a questionnaire since no statistically tested sampling or field based measurement was concluded for this write up.. Various Government institutions on Horticulture and food processing industries including: Ministry of Agriculture and Farmers' Welfare, Government of India, State government of Telangana (Department of horticulture, Telangana State Horticulture Development Society), Ministry of Food Processing Industries (MoFPI) Government of India, Ministry of Commerce & Industry (APEDA). Other agencies such as NABARD, NITI Aayog; etc have provided secondary materials used here[1-7]. Where ranges are provided in regional study, mid point figures are taken only for illustration of certain trends and analysis. Therefore any Derived figures here would be estimations under defined scenarios and not administrative figures on which any statistic would have been carried out.

4. STATISTICAL PROFILE OF THE REGION:

The regional production estimates provide a quantitative foundation for evaluating processing potential [3].

Table: 01

Indicator	Estimated value
Mango area	33,000–35,000 acres
Annual production	1.3–1.6 lakh tonnes
Average productivity	4.5–5.5 tonnes/acre
Mango-growing households	8,000–10,000
Average orchard size	3.5–5.0 acres

Source: Regional estimates reported in [3].

The statistical figures, in respect of an estimated productive domain have served as a base for analysis of processing possibilities. These estimations have already been given for KPW cluster as presented at TABLE-4. (Table 4 not reproduced here). It is to emphasize that using Mid-point for calculation in some of estimates researcher derived a data that it is roughly estimated to have 34000 acres under the crop. Similarly 1.45 lakh tonnes production. At present State level statistics indicates an area of 306,396 acres yielding 939,230MT during 2023-24 CEIC/District Horticulture data [8]. This is only for the purpose of understanding the scale of operation in the state. There are no data for mango-centric acres and production figures are generally a mix across fruit crops for other sources such as district horticulture reports that may report 40,575.38 acres under all fruit crops, in Nagarkurnool district among them most crops are identified but mango is not isolated with clear figures [9].

5. Mango Utilization and Production-Processing Gap:

The utilization pattern is the main statistical finding from the study, which estimated that 68 per cent of production would be used in fresh markets, 27 per cent for off-site processing, 3 per cent for local processing and 2 per cent for on-site or local consumption [3].

Assuming the midpoint production figure of 145,000 tonnes, then roughly 98,600 tonnes would go to the fresh market, 39,150 tonnes would be transported for external processing, 4,350 tonnes for local processing and 2,900 tonnes of raw material would be consumed on farm or in the locality. The volume sent for off-site processing is around 9 times greater than the volume being processed in the region, providing a large scale opportunity. This gap has been attributed not just to the lack of processing but also in efficient sorting, packaging, transporting and distribution. The biggest shortcoming is the absence of processing facilities within the region resulting in high logistic costs, low employment in processing and low regional value-addition.

Table: 02

Channel	Share	Midpoint quantity
Fresh market	68%	98,600 tonnes
Processing outside region	27%	39,150 tonnes
Local processing	3%	4,350 tonnes
Farm/local consumption	2%	2,900 tonnes
Total	100%	145,000 tonnes

Source: Calculated from utilization shares reported in [3].

6. Production Economics:

Mango cultivation is labor-intensive with labor costs accounted for 25 per cent, followed by plant protection 14 per cent, harvesting 14 per cent, fertilizers 12 per cent, transport costs 11 per cent, irrigation 10 per cent, orchard maintenance 9 per cent and others 5 per cent [3]. Labor and harvesting together share 39 per cent of total costs. Transportation cost at 11 per cent, will increase significantly in an all-local or external processing model, as this includes the costs involved to shift fruit to distant locations.

Factors such as the age of orchard, variety and proper pest-management and pruning significantly influence productivity [3].

Hence this leads to the thought that if processing is to be developed in the region, it will need to be accompanied by effective orchard practices. Premium varieties can cater to the fresh fruit markets, whereas processing varieties like Totapuri can be processed into puree.

Table: 03

Cost component	Share
Labour	25%
Plant protection	14%
Harvesting	14%
Fertilizers	12%
Transportation	11%
Irrigation	10%
Orchard maintenance	9%
Miscellaneous	5%

Source: Regional cost estimates reported in [3].

7. Mango Value Chain and Marketing:

The regional value chain that exists comprises of a number of players from input vendors, nurseries, farmers, mandis/local traders, commission agents, wholesalers, retailers to processors and consumers. The source study found that nearly 50 per cent of mango growers sell through commission agents and the remainder used direct wholesale and retail channels [3]. While commission agents facilitate markets and assist with aggregation and sales, the bargainability for individual farmers is weak, especially for industrial processing where large and consistent volumes are needed within a short window.

Farmer Producers Organizations (FPOs) can assist by aggregating yield, harmonizing schedules, standardizing quality and developing direct engagement with processors. MoFPI has pointed towards Chittoor and Krishnagiri as prominent processing clusters with effective linkages between industry and farmers [10]. These examples suggest the need for cohesive development between processors, FPOs, logistics and market linkage.

8. Comparison with Chittoor

While the source study indicated that the Kollapur-Pebbair-Wanaparthi area was an under-processing region with inadequate cold-chain and FPOs with low level of investments in industry, compared to Chittoor where the industrial base, infrastructure, backward and forward linkages and procurement systems were all well-developed and there was greater emphasis on

export led processing. This comparison clearly illustrates the need for more than just availability of raw material to build an industrial processing cluster. This would include, among others, adequate investment in processing facilities, predictable offtake of produce for processing, technology, energy, water supply, food-safety systems, skilled manpower, logistics and finance. Because a significant volume of mango is already being sent for processing outside the region, a locally focused industrial processor would initially target part of this market, thus circumventing the need to drive entirely new demand.

9. Infrastructure, Institutional and Financial Constraints

The absence of any food processing industry facility in the region and, lack of cold chain facilities, Warehousing spaces, and strong aggregators represent major infrastructure hurdles. At the institutional level, there is lack of participation of FPOs, entrepreneurship and co-ordination while on financial fronts high capital investments for industry setting up, loan accessibility for the long term and financing of short term working capital form substantial restraints. Several government policy frameworks such as PMFME [5] and PMKSY [6], providing credit-linked capital subsidies to eligible projects and support for common infrastructure and FPO development; are in place.

The Nagarkurnool district being named as the lead district for mango development under the PMFME ODOP (One District One Product) scheme, is a direct pointer for integrating production with the food processing ecosystem. However these facilities require actual uptake, which implies there needs to be focus on raw material supply aggregation and market linkages.

10. Statistical Interpretation and Opportunity:

The regional utilization data permits simple but meaningful calculations. The collection and processing of just 10 per cent more of the output for the local region from a baseline of 145,000 tonnes would contribute roughly 14,500 tonnes in total to local processing output. An additional 15 per cent would contribute roughly 21,750 tonnes, and an increase of 20 per cent would amount to nearly 29,000 tonnes.

These estimates serve not to provide firm targets but simply to illustrate the volume of material that is available for processing should local production and processing initiatives prove to be successful in aggregating supply and ensuring commercial viability. Transportation as a share of production costs is around 11% [3]. Direct picking, collection and processing within the region can offset a proportion of this logistics expenditure, though the precise extent of any savings would be determined on an individual project basis. Direct local processing would create jobs in collecting, sorting, processing, packaging and transporting.

11. Strategic Framework:

A strategy comprised of six components is recommended. Firstly, FPO aggregation should be strengthened to consolidate volumes, enhance grade standards and improve bargaining power. Secondly, village collection centres should be established to carry out weighing, sorting, grading and temporary holding functions. Thirdly, cold chain and post-harvest infrastructure should be linked with processing facilities.

Fourthly, initial processing capacity could be concentrated on pulp and purees, with diversification into juices, concentrates, frozen foods, powders and other products in

subsequent phases [4,10]. Fifthly, finance and policy convergence should be realized by the bringing together relevant food-processing, horticulture and infrastructure programs, subject to eligibility criteria [5-7]. Sixth, quality management, branding and market linkages should be identified as key activities and central components of strategy. Compliance with food-safety regulations, traceability standards, quality assurance and efficient packaging are crucial for market competitiveness and targeting institutional and export markets.

The proposed model of a processing operation should be a network facility not a stand-alone factory. FPO's and collection centers feeding central processing operations is a better approach. Such an ecosystem should be supported by cold-chain entrepreneurs, financial institutions, laboratories, transport operators, marketing agents and retailers.

12. Discussion:

The key outcome of the study is that the production–processing gap is a coordination gap rather than a problem relating to a shortage of raw material. The calculated figure of 27% utilization through external processing confirms that there is external processing demand but the actual processing activity is taking place elsewhere. The essential strategic concern is therefore to capture some of this value in the locale. This is consistent with Porter's value chain framework which emphasizes the importance of coordinated value-adding activities to competitive advantage, beyond mere production [11].

Processing, packing, quality standards, Branding, logistics and other supply-chain activities create value in a mango-processing cluster. The comparison with Chittoor also corroborates the cluster approach since processing facilities along with the farmers, input suppliers, local service providers and government institutions synergise if there is connectivity between these actors, which has proven to enhance the agro-industry base of a region [10]. The Kollapur-Pebbair-Wanaparthi region has potential production base which is supported by weak forwards links towards processing. This would mean that careful consideration must be applied before initiating large capacity plants.

An initial feasibility assessment covering the estimated size of mango cultivated, actual and potential pulp recovery rates, suitable product mix and process, seasonality of the crop, working capital requirement, demand forecasts and plant economics is recommended prior to undertaking mass investments in processing.

13. Conclusion:

The Kollapur-Pebbair-Wanaparthi region holds considerable potential as a mango growing area but exhibits a weak downstream link to value addition, processing and agro-processing Industries. The study estimated between 33,000–35,000 acres are under mango cultivation, producing approximately 1.3 to 1.6 lakh tonnes of fruit annually [3]. Out of the mid-point of 1.45 lakh tones, according to current utilization pattern, approximately 98,600 tonnes are allocated for the fresh fruit market, 39,150 tonnes for external processing, 4,350 for local processing and 2,900 tonnes for local consumption. The approximately 9:1 ratio of local to external processing confirms the severe production-processing mismatch.

Working cost estimate also revealed labour costs account for some 25% of total cultivation cost and 11% transport costs [3]. The evidence from Chittoor's agro processing cluster indicates that creating processing facilities, providing platforms for the farmer to collect their product

under a centralized hub to carry out pre-processing like grading, sorting and temporarily storage, developing a cold storage and transporting facilities, extending support to farmers for their finance, credit and risk management coupled with their engagement with processing entrepreneurs and local buyers to help secure a place in wider and expanding market, which have helped transform their production into an agro –industrial cluster [10]. The implementation of PMFME and PMKSY provides the necessary policy space and financial backing to support the formation of FPOs for strengthening farmer organisation and capacity building of farmers in aspects of production, storage, processing etc., support to Common facility centres for procurement, collection, pre-processing, storage and value addition and support to processing units [5,6]. The study thus concludes by recommending a cluster approach to be adopted in the Kollapur-Pebbair-Wanaparthy regions emphasizing on FPO aggregation for consolidation of quality raw material, decentralized processing facilities, establishment of a cold chain, a primary processing capacity focus on pulps and puree, quality certification, working capital provision and facilitating market access for farmers and agro-preneurs rather than establishing a standalone plant.

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Web Links:

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