

Impact & Needs Assessment and Market Study & Value Chains Development in Jawadhu Hills, Tamil Nadu

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EXECUTIVE SUMMARY



Jawadhu Hills Women Entrepreneurs at a produce showcase, displaying BAYA-branded honey and millet products.

The RGR Cell of Tamil Nadu Agricultural University, an associate initiative of Tata Trusts supported by Titan Company, has spent three years working with tribal Malayali farming households of Jawadhu Hills in Tiruvannamalai and Vellore districts, Tamil Nadu. Phase 1 of the programme reached 200 direct beneficiaries across 10 villages through goat-rearing, vegetable trellis cultivation, and the aggregation of non-timber forest produce (NTFP) such as wild honey, tamarind and custard apple. Of these, 106 women households have crossed the Latchathapati Vivasayi (LV) threshold of Rs. 1 lakh in annual household income, and a tribal women-led federation, the Jawadhu Hills Women Entrepreneurs Federation (JHWEF), has been established for the marketing of agricultural and forest produce.

This report consolidates three linked exercises undertaken between January and March 2025: (i) a rapid impact assessment and needs assessment of Phase 1, based on field interviews with a sample of over 20% of LV beneficiaries; (ii) a market survey and value-chain analysis for the six commodities most relevant to the region – honey, custard apple, little millet, horse gram, tamarind and milk; and (iii) a Phase 2 business plan and go-to-market strategy for scaling the programme to 50 villages and roughly 4,000 households.

The impact assessment finds goat-rearing to be the single most effective lever for income growth, with over half of surveyed beneficiaries earning more than Rs. 1 lakh from this activity alone, and income accelerating from the second year onward as herds proliferate. Vegetable cultivation on trellises and NTFP aggregation are meaningful secondary contributors, each averaging roughly Rs. 10,000 and Rs. 4,000 per beneficiary respectively. Community institutions – the Producer Groups and Self-Help Groups – remain active and continue to follow the Panchsutra principles of regular meetings, savings, internal lending and repayment, even as the erstwhile Federation faces an unresolved legal dispute that needs to be worked through before Phase 2 scale-up.



The value-chain analysis identifies honey as the highest-potential commodity for Phase 2, given the distinct identity of wild Jawadhu honey, an addressable market of health-conscious “Caterpillar” consumers willing to pay a modest premium, and India's fast-growing organised honey market. The financial model projects the honey business line reaching profitability (before grant support) by the third year of Phase 2, on a cumulative three-year grant requirement of roughly Rs. 1.13 crore for the honey line. Custard apple and tamarind offer near-term income through better collectivisation and reduced distress sales, but both require investment in cold-chain and processing infrastructure to move beyond raw-produce sales. Little millet and horse gram align well with the state's renewed policy push on millets and underutilised pulses respectively, and can be scaled through seed multiplication and agricultural extension. Dairy emerges as the largest untapped opportunity by household coverage: strong farmer interest in cattle exists across the hills, and a structured partnership with an established milk producer company offers a credible institutional pathway, provided milk pouring points can be made commercially viable.

For Phase 2, the report recommends a village-saturation approach across 50 villages, anchored by: (i) reconstitution of a unified Federation covering all project villages once the legal matters of the existing entity are resolved; (ii) a dedicated honey value chain investment, including an in-house processing facility, revived “Baya” branding, and a two-member marketing team; (iii) a strengthened agricultural extension system – roughly one service provider per 4–5 villages – to lift vegetable, millet and horse gram incomes through Integrated Pest Management, improved seed and sapling access, and better market linkages; (iv) a phased dairy partnership with a milk producer company; and (v) the human resource structure, budget and monitoring framework required to execute the above over a three-year horizon, at a total estimated Phase 2 outlay of approximately Rs. 6.5 crore.



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Chapter 1

BACKGROUND



The RGR Cell based at Tamil Nadu Agricultural University, Coimbatore is currently working in Jawadhu Hills, Tamil Nadu and presently reaching out to 150 HHs across 10 villages under a 3-year program funded by TITAN. It intends to expand the scope and scale to potential 50 villages with a fine-tuned GTM strategy, as it scales up interventions in the Jawadhu Hills.

Jawadhu Hills is known for being a tourist destination that is five hours from Chennai, four hours from Bangalore, and two hours each from Tiruvannamalai and Vellore. It is known for its forests, trees, lakes and waterfalls. The hills are known for producing various forms of millets – Foxtail (Thinai), Kodo (Varaghu), Little (Samai), Pearl (Kambu) and Finger (Ragi), besides horse gram, vegetables, NTFPs like Tamarind and Wild Honey, and fruits that include Custard Apple, guava, among others.¹



The Jawadhu Hills landscape – forests, lakes and waterfalls define the terrain in which the programme operates.

¹ The Malayali tribal community constitutes roughly 92–98% of the population of the Jawadhu Hills block; their livelihoods have traditionally centred on non-timber forest produce and tree crops grown on patta land, including tamarind, jackfruit, custard apple (seetha), gooseberry and honey. (Sources: Press Information Bureau, Government of India, “Van Dhan Vikas Yojana – Empowering the tribals of Jawadhu Hills”; Wikipedia, “Javadi Hills”.)



In the Jawadhu Hills, the initiative focused on transforming the lives of tribal women farmers irreversibly. It embarked on a journey through the Latchathipathi Vivasayi (LV) Project, a groundbreaking endeavor by the Reviving Green Revolution (RGR) Cell, an associate organization of Tata Trusts with the invaluable support of Titan Company.

The LV Project operated on a mission to lift marginalized tribal communities out of poverty by focusing on community-led income enhancement interventions. Its approach spanned agriculture, livestock, and Non-Timber Forest Produce (NTFP), aiming to address various needs while improving incomes and livelihoods.



YEAR-WISE PROJECT PLAN

Sl. No.	Indicator	Unit	Year 1 (2021-22)	Year 2 (2022-23)	Year 3 (2023-24)
Activity					
1.	Agri-demonstration plots setup (Millet and Second Crop) (0.5 Acre)	No.	100	100	100
2.	No. of training (capacity building, technical training, financial training and refresher trainings) @ 4 trainings/month	No.	48	48	48
3.	Women involved in Goatery/Animal Husbandry	No.	50	12	-
4.	Women involved in trellis-based vegetable cultivation	No.	10	20	20
5.	Women involved in Tamarind and Honey Sale	No.	10	20	20
6.	Supplementary Irrigation Systems	No.	5	10	10
Output					
1	HHs under Agriculture (Beneficiaries + Federation Membership)	HH	500	800	1100
2.	Cumulative Federation Turnover	INR	60 lakhs	100 lakhs	150 lakhs
3.	HHs under Agriculture (and Second Crop) + Livestock	HH	200 (60 layered)	200 (32)	200 (20)
4	HHs under Agriculture (Trellis/Vegetable) + Non-Timber Farm Produce (NTFP)	HH	200 (25 layered)	200 (50)	200 (50)
5	Cumulative Net Profit Generated	INR	3 lakhs	5 lakhs	8 lakhs
Outcome/Impact					
1	Women qualifying as Latchathapathi Vivasayi (atleast 75%) of 200 beneficiaries	No.	10	70	70
2	Beneficiaries below 1 lakh	No.	190	120	50



Community mobilization and institution building have been central to the LV program. RGR Cell has engaged with the tribal communities of Jawadhu Hills through various thematic interventions. Key components have been:

- Agriculture has been the major prototype through which tribal women farmers are enabled in recommended agricultural technologies.
- The federation evolved as the focal point in co-ordination of all Women Producer Groups (WPGs) across the project villages and becomes the convergence point between RGR Cell and community.
- Livestock promotion for risk diversification and addressing market demand.
- NTFP aggregation and sale of produce such as honey, tamarind, and custard apple.²

The work over the three-year project period has been spread across 10 villages supporting 200 direct beneficiaries of which 106 women households have achieved the project target of increasing household income above Rs.1 lakh/annum (Latchathapati Vivsai). Through the project, an all tribal women Federation – namely, the Jawadhu Hills Women Entrepreneurs Federation (JHWEF) has been established for marketing of agricultural and forest produce such as little millet, honey, tamarind, custard apple and vegetables. The goatery intervention has shown promising outcomes for families as a means of livelihood risk mitigation. In the next phase of the intervention, it is intended that the project is expanded to 50 villages with existing and new product interventions.

Challenges and limitations faced in the project:

1. Vegetables produced are sold in the nearby market but has a limitation of lower volumes and post-harvest losses.
2. NTFP product, wild honey is produced and packaged well to retain its original minimally processed nature. Contamination/adulteration by unidentified farmer(s) has affected the quality and credibility.
3. Custard apple produced has a shorter shelf life and is being graded and sold to bulk buyers. Potential for further value addition exists in custard apple, which could be more remunerative than selling raw custard apple and needs to be identified.
4. Need for developing a stable revenue source/additional revenue source for the Federation. Horse gram, a seasonal produce, is identified as a potential addition, and the need exists to establish the Go-To-Market (GTM) strategy for a ready to eat packaged roasted snack.

The current exercise focused on validating the outputs & outcomes from Phase 1 along with a need

² (Source: Excerpts from the RGR Cell Annual Report 2023-24 for TITAN)



assessment and explored the value chains for various commodities grown in the region, which feeds into the proposed plan for Phase 2 with increased scope and scale with GTM strategy.

The scope of services included the following:

Validated and assessed Phase 1, drawing out aspirations for Phase 2, and developing a roadmap on the way forward:

- Rapid assessment of the Phase 1 of the intervention, and needs assessment with focus on crop changes, livestock rearing, among others, for Phase 2.
 - Formulation of questionnaire.
 - Data validation from the field offices.
 - Field testing and data collection through FGDs and beneficiary interviews for an ~25% sample set, i.e. 25 randomly selected beneficiaries.
- Understood the current status of engagement to facilitate and handhold the beneficiary groups in attaining high yield production, quality, and in establishing & sustaining partnerships with buyers;
- Reviewed the current program from sustainability lens and establish the requirements for attaining sustainability & profitability in Phase 2, including the HR structure, and budget requirements;
- Assessed the ongoing and proposed program interventions for introducing potential new approaches and technologies;
- Understood the issues faced in the product quality of honey, establish approach to address those, improvements in packaging, and develop a 3-year GTM strategy.
- Recommended the GTM strategy in place for the proposed ready to eat packaged roasted snack in Horse Gram;
- Assessed the status of production quality and volume of vegetables, Tamarind, and Custard apple, the scope of expansion in scale, and evaluate for any upside potential in attaining better remuneration;
- Suggested alterations to the capacity building needs of beneficiaries and the program team;
- Engaged with institutions that may include CFTRI Mysore, Swami Vivekanand Centre, Hosur; TNAU Coimbatore, KVK, Divine Pure etc., to gather technical inputs and identify potential synergies for future involvement.
- Engaged with companies such as Jawadhu Fresh, to identify alternate supply lines for the produce.
- Assessed the requirements of working capital and required CAPEX, and the government or banking schemes to tap;
- Analysed the key challenges faced by the program team and ways / solutions for the same;
- Prepared the program/business plan (3 years) for roll-out, which would feed into the TITAN proposal for Phase II.



S. No.	Activity	Timeline
1	Preliminary discussion with program team, desk review of data and reports, development of questionnaire, and finalisation of a detailed field plan.	Complete by 20 th January 2025
2	Field visit to Jawadhu Hills and to the institutions/companies.	20 th to 31 st January 2025
2a	Meeting with the program team at the field office	20 th January 2025
2b	Individual and group meetings with beneficiaries for data validation, and needs assessment, along with members of the program team. Visit to a few potential expansion villages.	Between 20 th to 31 st January 2025
2c	Visit to Divine Pure, local markets, tourist hotspots	21 st January 2025
2d	Meetings with institutions with focus on packaging technology, fruit & vegetable technology.	23 rd to 28 th January 2025
2e	Follow-up meeting with beneficiaries, if required and with program team.	28 th to 31 st January 2025
3	Submission of the first Draft of findings and recommendations.	February 2025
4	Final draft with proposed plan, HR structure, and budget.	15 th March 2025





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Chapter 2

IMPACT & NEED ASSESSMENT





METHODOLOGY



Field interviews with beneficiaries and community elders formed the basis of the impact and needs assessment.

The impact assessment study involved analyzing and understanding the project data received from the implementation team on various interventions.

List of data collaterals used for the purpose of the exercise are listed below:

1. List of beneficiaries for goats, receipt of ATL 1 variety of millet seeds, and Trellis. Proof of receipts from beneficiaries.
2. Project KPIs and achievements (Project target and achievement)
3. LV data by intervention and consolidated for all beneficiaries (as the most important reference point).

Prior to the assessment, a survey tool was developed and aligned with the program team. The criterion for the selection of beneficiaries was laid out and aligned with the program team.

SELECTION OF VILLAGES:

The villages chosen for the purpose of the survey were selected after following the undermentioned criterion:

1. The geographical spread of chosen villages within Jawadhu Hills.
2. The proximity of villages to forest areas and thereby, the nature of interventions in those villages.
3. The unique aspect of an intervention in any given geography.



The following villages were selection by applying one or more of the criterions specified above.

S. No.	Village Name	Criterion Applied
1.	Amaranthus	Goatery, Trellis
2.	Kuriyanoor	Forest Area
3.	Periyakollai	Goatery, Trellis
4.	Arsavalli	Forest Area, Irrigation Infrastructure
5.	Komutteri	Oldest Intervention Village

SELECTION OF BENEFICIARIES:

From the LV data made available, the list of 100+ LVs and other non-LV beneficiaries were broken down across three categories. The criterion considered are the following:

1. LV by current income,
2. LV by change in income, since this represents a very strong execution by the beneficiary,
3. LV by number of interventions,
4. LV by nature of interventions.

The following table represents the criterion applied to the beneficiaries selected.

S. No.	Beneficiary Name	Village Name	LV Status by Project Data	LV with Change in Income >1	Number of interventions	Interventions Involved
1.	Geetha Selvam	Palamarathur	Yes		01	Goatery
2.	Rajeshwari Rajkumar	Palamarathur	Yes		02	Goatery, Trellis
3.	Vanitha Ramalingam	Palamarathur	Yes	No	01	Goatery
4.	Mangailaxmi Arunchalam	Palamarathur	Yes		01	Goatery
5.	Rajeshwari Kuppusamy	Kuriyanoor	Yes		01	Goatery





6.	Mangai Krishnan	Kuriyanoor	Yes		03	Goatery, Trellis, NTFP
7.	Ramya Kumaresan	Kuriyanoor	No	No	01	Goatery
8.	Kamsala Sakrapani	Kuriyanoor	Yes		01	Goatery
9.	Kamatchi Sekar	Kuriyanoor	Yes		01	Goatery
10.	Jayakodi Kasi	Periyakollai	Yes	No	02	Goatery, Trellis
11.	Menaga Kuppusamy	Periyakollai	Yes	No	02	Goatery, Trellis
12.	Valli Kuppusamy	Periyakollai	Yes	No		
13.	Suguna Rajendran	Periyakollai	Yes	No	02	Goatery, NTFP
14.	Jayamalini Govinthesamy	Periyakollai	Yes	No	02	Goatery, NTFP
15.	Sivalaxmi Annamalai	Periyakollai	Yes		02	Goatery, Trellis
16.	Kamala Ramakrishnan	Arsavalli	No	No	02	Goatery, NTFP
17.	Valli Sanmugam	Arsavalli	No	No	02	Goatery, NTFP
18.	Pushpa Kulanthai	Arsavalli	Yes	No	02	Goatery
19.	Sangeetha Elumalai	Arsavalli	No	No	01	Trellis
20.	Venilla Sudhakar	Arsavalli	Yes	No	02	Goatery, Trellis
21.	Thamila Govintharaj	Arsavalli	Yes		02	Goatery, Trellis
22.	Jansirani Saminathan	Arsavalli	Yes	No	02	Goatery, Trellis
23.	Santhi Selvam	Komutteri	Yes		01	Goatery
24.	Deepa Venkatesan	Komutteri	Yes		01	Goatery
25.	Bommi Sankar	Komutteri	Yes		01	Goatery
26.	Santhi Sankar	Komutteri	Yes		02	Goatery, Trellis



27.	Mani Ramachandran	Komutteri	Yes		01	Goatery
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INCOME CALCULATION

In order to establish the appropriate income, a visit to all the key vendors for various produce was undertaken. The price at which the products were sold in the previous year and in the current year was established. The actual production by the farmer was then multiplied by the prices established to attain the production value. This has been considered as part of overall income, irrespective of whether a part or 100 % of the produce was actually sold.

For goatery, the income data was captured at two levels. One, the income from goats sold in the past, and second, from the number of live goats available with the beneficiary. The potential value of the unsold goats has been arrived at Rs. 6,500/- basis the typical price of an average healthy goat as on date. For calculating the annualized income, the potential value is taken as is along with the annualized amount applied for goats sold. For calculating annualized amount from sale, please see this example. Rajeshwari Rajkumar (case # 2) sold 5 goats for Rs. 38,000/-. Since the goats were received in 2022, the period considered for annualizing the income from sale of goats required dividing Rs. 38,000/- by 2, i.e., Rs. 19,000/-.

The income has been classified as that from direct intervention, and the income from non-interventions. The direct interventions have considered the income from goatery, ATL1 millet variety, Trellis, and NTFP (Honey, Tamarind, Custard Apple). Non-intervention income included others like Cotton farming, Gherkins plantations, Horse gram, Paddy, and Millets. However, exception for intervention crops was granted for a village like Arsavalli where pond regeneration work was undertaken, which had a fundamental bearing on increased income from sale of produce like Sugarcane that are water intensive.

Note that some of the beneficiaries also have income from other occupations like migrant labor or MGNREGS (local labor). Those income have been added only for those beneficiaries where the income from interventions and non-interventions collectively was not found to cross Rs. 1 lakh mark. This was done to ascertain their true status.



FINDINGS FROM IMPACT ASSESSMENT

SUMMARY OF THE IMPACT ASSESSMENT STUDY

1. Out of 100+ LC farmers, a sample of >20 % were surveyed. A total survey size of LC farmers was 22 and non-LC farmers was 4.
2. Out of a total of 22 LC farmers, 21 of them are indeed found to be LCs. 10 of these farmers have generated over and above of Rs. 1 lakh additional income from the project interventions itself, while remaining others have collectively been able to cross their incomes between the range of ₹ 1 Lakh to ₹ 2.5+ Lakhs.
The beneficiary-by-beneficiary record of income arrived, from direct intervention and non-intervention is provided in the [Annexure 2](#).
3. 11 of 22 farmers have become LC based on one intervention, i.e., Goatery. 10 others have become LC from a combination of two interventions. 60% of these are combined with Trellis and 40 % are with NTFP.
4. Strength of Institutions: Despite the issues faced by the FPO that was set-up during the course of the intervention and that continues to be sub-judice, all the Producer Groups have been found to be active and adhering to the Panchsutra principles of the community institutions. These include regular meetings, regular savings, internal lending, regular repayment and bookkeeping.
5. The intervention on Goatery has been the single most impactful intervention among the three, Goatery, Trellis for vegetable cultivation, and the non-timber forest produce (that include Tamarind and Honey).
6. The Goatery intervention: It has been the most successful contributor to income enhancement with over 50% surveyed beneficiaries having greater than ₹ 1,00,000/-. The rate of proliferation of goats is greatly able to wedge up the income from Goatery itself. The Jawadhu Hills were earlier not really know for Goatery.
 - a. Mortality of goats have reduced vis-à-vis the start of the intervention. Maximum mortality was reported in the years 2021 and 2022. The engagement of a dedicated veterinarian and the regular deworming and vaccination services is seen to be beneficial.





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- b. Goatery intervention starts paying dividends from year 2 onwards with the proliferation of buck and doe. It is seen that those who received goats in 2021 and 2022, in most cases hold between 3 to 5 live goats as three-to-four years average. In comparison, the number of new goats held by beneficiaries who received those in last one year has between 0 and 1 goats. It can be said that by third year, the income differential of at least ₹ 20 to 30 thousand gets generated, the rate of which only increases from subsequent years.
7. Trellis for vegetable cultivation: is the second most significant contributor of income through vegetable cultivation, while NTFP is the third most. The average income for Trellis farmers is around Rs. 10,000/-, while that through NTFP is around Rs. 4,000/-.
 - a. Previously, the region was not into vegetable cultivation and all their local requirements were met through purchase from local market. Things are changing for the better and the introduction of Trellis, which has had a role to play in it. Through the 10 to 20 cents (100 cents = 1 acre) deployed for vegetable cultivation, few farmers have started producing either for their self-consumption or for sale. The local markets though are not as remunerative and thereby, farmers associated to RGR are seen to independently carry the produce to better remunerating nearby markets like Vanibadi. The introduction of contract farming by a number of companies for the production of Gherkins is also seen to significantly drive farmers into cultivation. These changes in recent years have diversified the crop production profile of the region and mitigated the income & nutritional risks. This is particularly seen considering farmers typically focusing upon crops susceptible to weather patterns like Horse gram, Black gram.
8. Non-Timber Forest Produce: The farmers have been supported by means of collectivization and profitable sale of custard apple. Previously, farmers would sell individually at low rates in the local market. The collectivization has enhanced their bargaining power with vendors and prevented distress sales.
9. The irrigation intervention in Arsavali village had a significant positive influence visible on the ground water level available in open wells, used for irrigation purposes. It's one of the very few villages where farmers are now involved in sugarcane cultivation and earning more than Rs. 50,000/- from one crop itself.
10. The honey procurement and sale of honey packaged under the brand name 'Baya' was being one and sold in packaging of 500 gms. The procurement undertaken and volume of sales is





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limited in quantity. Besides, adulteration related issues were reported, which were being tackled by the Federation.

11. The economic impact of the program can be understood from the fact that the asset profile of beneficiary households has got enhanced. Refer to the individual cases which represent the improving as well as changes in asset profile. For instance, a beneficiary purchased tractor with the income drawn from the sale of goats, and gave away cows to do away with their involvement in dairy owing to lesser time available for the same. Others have added assets like camera to set-up a studio or purchased jewellery.
 - a. The income generated has given the confidence to beneficiaries in their ability to repay debts. A significant number of beneficiaries are now known to take loans from a microfinance company, Belsatar, over and above the loan taken from the PG, that is being used for purchasing productive assets like tractors.

KEY RECOMMENDATIONS

1. **Community Institution:** The engagement needs to be maintained with the old Federation facing sub-judice matters until matters are resolved.

The SHGs, while have remained strong in their fundamentals despite the shutdown of operations of the Federation, need to be rewired to function like a Producer Groups for all key products, and thereby expand on the scope it plays to become self-reliant in providing high-tech inputs such as healthy saplings and other inputs necessary for IPM, collectivization and sales of agri, NTFP, or the livestock produce.

It is critical to have a larger unified entity that combines all the PGs for sustainable and economical scale of operations. The new Federation needs to cover all 50 villages proposed under Phase II. The legal issue around the existing entity is resolved, any relevant assets such as the transport vehicle, the Baya brand, and any other resources may be transferred to the new entity, contingent to the terms and conditions as laid out by the court of law. The old Federation would be merged into the new. All members will of the old Federation will automatically get membership of the new Federation.

2. **Vegetable Contract Farming and Agricultural Extension:** The widespread expansion of Gherkin production in contract farming mode was assessed. Diseases like Leaf Blight and Downy Mildew were widespread. Likewise, in cotton production the usage of pesticides is heavy. It is found that the companies have resorted farmers to a heavy usage of fungicide to address fungal diseases in Gherkins. The spraying is being done on every 4 days. This is bound





to make the production of Gherkin economically unsustainable and also ecologically damage the areas in the vicinity. These issues have a direct implication on the vegetable production as well. In the first phase of the intervention, the RGR Cell focus has been to provide financial support to assist farmers conceive and initiate the idea of venturing into vegetable cultivation. For enhancing the income contribution from vegetables beyond current average levels of Rs. 10,000/- to Rs. 40-50,000/-, there is a need for putting in place a strong agri extension system with one service provider in every 4-5 villages. The focus of the extension strategy will be to deploy Integrated Pest Management (IPM) to bring down pesticide load as well as to reduce the production costs, introduction of the Package of Practices (PoP) for improved productivity, and the access to high quality saplings produced by select few identified and nurtured nursery entrepreneurs (refer to annexure for more details on the recommended setting up of nurseries). Beyond the sustainable, economical as well as ecological vegetable farming, the farmers have to be supported in the aggregation and sales of the produce at better remunerative prices.



Trellis-based vegetable cultivation on beneficiary land in Jawadhu Hills – the second-largest contributor to LV income after goatery.





Gherkins harvested under contract-farming arrangements – a widely adopted but input-intensive cash crop in the region.

3. **Honey Value Chain:** In honey, there are various active players like Divine Pure, Hand in Hand, TVS, other than RGR, that are involved in either supporting farmers with boxes and its training, or procuring honey from them. The scoping assessment undertaken for the 50 villages for next phase by RGR indicates a minimum of 1.5 Tons of wild honey. It is also expected that 1 tonnes of box honey will also be purchased and sold.

Considering that the potential of expanding the scale of operations in honey procurement after considering the markets held by other player is reasonably good, it is recommended that direct procurement of wild honey can be expanded in a phased manner to about 2-2.5 Tons of wild bee honey and 1.5-2 Tons of box honey.

The BAYA brand previously held should be revived and needs to be promoted proactively under association with the new FPO, after taking necessary clearance from the court. The branding focus needs to be on the uniqueness of wild bee honey from Jawadhu Hills. The health benefits





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need to be highlighted and certified using the labs in TNAU and Kerala. Develop a strong brand identity for the honey product, emphasizing its unique qualities, such as being wild honey collected by tribal communities/artisanal honey. Invest in attractive and eco-friendly packaging that highlights the product's natural and health benefits.

BAYA honey was being sold in 500 ml bottles. However, a rapid assessment of the general honey market shows dominance of smaller bottles of honey, especially in the 200-250 ml size. This has many advantages, including making the product more “affordable” and giving an opportunity to connect better with new potential buyers.

The processing of honey has to be undertaken in-house, even though there are other entities like TVS, Divine Pure that hold their own processing facilities. This is because for the proposed scale of operations would exceed the capacities of the existing unit set-up by other entities. Therefore, CAPEX needs to be undertaken to set-up an independent processing facility.

4. The demand for cows for milk production at each farmer level is significant with almost all farmers intently inclined towards it. The scope of linking then to dairy collection centers exists. The RGR Cell should explore developing a dairy project with SREEJA Mahila Milk Producer Company (SHREEJA) in the Jawadhu Hills along with surrounding clusters near Alangayam and Athimoor. It will have to be a collaborative project, as a lot of effort will be required in the Jawadhu Hills itself to make some of the Milk Pouring Points (MPP) viable. This would involve cattle induction, increase the availability of feed and fodder, interventions in water, etc. The project villages will also benefit from SREEJA’s Productivity Enhancement Services (PES) services. It is advisable if the RGR Cell work on the backend and over a period of time ensure most of the MPPs become viable and add value to SREEJA operations. In parallel, it is hoped that SREEJA will work on the milk supply chain including procurement, MPPs, BMC, institutional building, finalizing the milk route, PES, etc. SREEJA and RGR need to collectively develop the DPR for creating a large dairy project in the region.





FINDINGS FROM SURVEYED BENEFICIARIES



A Trellis vegetable plot ready for harvest, supported under the LV programme.

Beneficiary #1: Ms. Geetha Selvam

Summary of findings:

- A member of the Producer Group, Palamarathur from the year 2022.
- Over the last six months, she has not missed a single monthly group meeting and has consistently contributed Rs. 50 every month to the group's savings fund. No loans have been taken from the group or a microfinance entity.
- Assets status:



Assets before intervention	Assets after intervention	Land holding
02 cows, 10 hens, and 1 bike	16 goats, 1 cow, no hens, and 1 bike, hydrogreens, and a studio with professional camera	3 acres with 2 acres of Lower Land

- Receipts, Guidance & Support from RGR - Hydroponics machine for production of green fodder, 04 goats, 0.5 Kg ATL-1 seeds along with training on ATL-1 variety for millets. Orientation on the dos and don'ts of Goatery, and a booklet received on SRI Paddy.





- **Impact measurement** – The beneficiary has become a Latchathipathi. Incremental annual income from direct intervention itself is ₹ 48,500, and from other sources it is ₹ 40,000. Apart from this, the sale of goats allowed the beneficiary to buy a professional camera for her spouse who has gone on to set-up a studio in Jawadhu. Annually, that is also able to add an income of over ₹ 100000.

Income from key activities/interventions:

1. Goatery

Year of receipt	Sold	Income so far from sales (₹)	Current Herd Size	Current Asset Value (₹)	Net Income (Annualized) (₹)
2022	12	45,000	04	26,000	48,500

Apart from 4 goats, the farmer was also supported with a Hydro greens unit. She was only one of the two farmers supported with it. She was able to produce animal green fodder that produced 500 Kgs of it and that could be sold for ₹ 5,000/- to the farmers in the nearby villages, besides the self-use. The beneficiary has set-up a goat shed.





2. ATL1 / Little Millet

Little Millet was being sown in 01-acre land area and achieved a production of 250 Kgs, 125 Kgs of which was retained for self-use. The total production value was of ₹ 11,250/-. Although she was also given ATL1 seeds, she could not be successful in undertaking its production.

3. Trellis / NTFP

This farmer was not supported by these interventions.

4. Non-intervention

Horse gram is produced at limited scale for self-consumption which is seen to be quite susceptible to weather patterns. Only 25 Kg could be produced in the year 2023 (of value ₹ 1,750/-) while it failed in 2024 to incessant rains.

SRI Paddy was undertaken. From RGR, the beneficiary had received a booklet on SRI. 100 Kgs of production was achieved of approx. value of ₹ 2,000/-.

Cotton was taken up by the farmer on the same piece of land where it would undertake paddy and it could earn ₹ 20,000/- from the same in the year 2023. However, the farmer has discontinued cropping for excessive effort required and labour shortages.

Beneficiary #2: Ms. Rajeshwari Rajkumar

Summary of findings:

- A member of the Producer Group, Palamarathur from the year 2022.
- Over the last six months, she could attend three of six monthly group meeting owing to her constant involvement w.r.t. health challenges faced by her sister. She has consistently contributed Rs. 50/- every month to the group's savings fund. No loans have been taken from the group or a microfinance entity.
- Assets status:

Assets before intervention	Assets after intervention
15 cows, 03 hens, and 1 bike	07 goats, 03 cows, 02 01 TV



- Receipts, Guidance & Support from RGR - 04 goats, and Trellis. Orientation provided on the dos and don'ts of Goatery.
- Sources of income – Farm labour, farmer, and an owner of the candy shop started in 2019.



- **Impact measurement** – The beneficiary has become a Latchathipathi. Incremental annual income from direct intervention itself is ₹ 90,000+/-, and from other sources it is ₹ 36,000/-. The net income is of ₹ 1.26+ Lacs/-.

Income from key activities/interventions:

1. Goatery

Year of receipt	Sold	Income so far from sales (₹)	Current Herd Size	Current Asset Value (₹)	Net Income (Annualised) (₹)
2022	5	38,000	07	45,500	56,500

2. ATL1 / Little Millet

Little Millet was being sown in 0.75-acre land area and achieved a production of 150 Kgs. They undertook sales for a value of ₹ 5000. The total production value was of ₹ 6,750. No ATL1 variety production was undertaken.

3. Trellis / NTFP

This farmer was supported with Trellis. The farmer ventured into production of three different crops – tomato, chili, and brinjal. The production was taken up in a total land area of 0.6-acres. She managed to produce 1,250 Kgs of tomato of value ₹ 33,750/- which was sold in market 60 Kms away from Jawadhu. There was some production for the other crops used in house.

The photo showcases the field being readied for vegetable cultivation and with Trellis to be subsequently installed.



4. Non-intervention

Horse gram was produced on 0.75 acres producing 40 Kg of value ₹ 2,800/-.

Cotton was taken up by the farmer on the same piece of land where it would undertake paddy and it could earn ₹ 27,000/-. However, the farmer has discontinued cropping for excessive effort required and labour shortages. A total of ₹ 36,660/- were earned in a year.

Beneficiary #3: Ms. Vanitha Ramalingam

Summary of findings:

- A member of the Producer Group, Palamarathur from the year 2022.
- Over the last six months, she attended all monthly group meeting and contributed Rs. 50/- every month to the group's savings fund. No loans were taken from the group or a microfinance entity.
- Assets status:



Assets before intervention	Assets after intervention	
05 cows, 05 hens	07 goats	4.5 acres with 1-acre of unused land

- Receipts, Guidance & Support from RGR - 04 goats, and ATL1 seeds. Orientation provided on the dos and don'ts of Goatery.
- Sources of income – Farm labour and farmer.
- **Impact measurement** – The beneficiary has become a Latchathipathi. Incremental annual income from direct intervention itself is ₹ 80,500/-, and from other sources it is ₹ 15,000/-. In addition to this, there is income from farm labour, taking the annual income over and above ₹ 1+ Lacs.

Income from key activities/interventions:

1. Goatery

Year of receipt	Sold	Income so far from sales (₹)	Current Herd Size	Current Asset Value (₹)	Net Income (Annualised) (₹)
2022	2	5,000	12	78,000	80,500

2. ATL1 / Little Millet



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Little Millet was being sown in 0.5-acre land area and achieved a production of 400 Kgs. They sold 100% of the produce for a value of ₹ 15,000/-. Likewise, 400 Kgs of production of ATL1 variety of millets. Total generated income was Rs. 30,000/-.

The picture depicts the storage of little millet and ATL1 produce in the grain bags.



3. Trellis / NTFP

This farmer did not venture into the trellis-based vegetable production or NTFP.

4. Non-intervention

No other produce undertaken by the farmer.

Beneficiary #4: Ms. Managailaxmi Arunchalam

Summary of findings:

- A member of the Producer Group, Palamarathur from the year 2022.
- Over the last six months, she could attend three of six monthly group meeting owing to her constant involvement w.r.t. health challenges faced by her sister. She has consistently contributed Rs. 50/- every month to the group's savings fund. She took a loan of ₹ 23,000/- for making a piece of rock laden land cultivable, and to attend to medical expenses.
- Assets status:

Assets before intervention	Assets after intervention
No assets	17 goats

- Receipts, Guidance & Support from RGR - 04 goats, and Trellis. Orientation provided on the dos and don'ts of Goatery.
- Sources of income – Farmer only.
- **Impact measurement** – The beneficiary has become a Latchathipathi. Incremental annual income from direct intervention itself is ₹ 1,17,500/-, and from other sources it is ₹ 18,000/-. The net income is of ₹ 1.35 Lacs.



Income from key activities/interventions:

1. Goatery

Year of receipt	Sold	Income so far from sales (₹)	Current Herd Size	Current Asset Value (₹)	Net Income (Annualised) (₹)
2022	2	14,000	17	1,10,500	1,17,500



The

picture shows a herd of goats belonging to Mangailaxmi.

2. ATL1 / Little Millet

No ATL1 support and production undertaken. Little Millet was sown in 3-acres land area and achieved a production of 400 Kgs. The total production value was of ₹ 18,000/- of which it was sold for ₹ 10,000/-.

3. Trellis / NTFP

NA

4. Non-intervention

horse gram was produced for 40 Kgs of value ₹ 2,800/-.

Beneficiary #5: Ms. Rajeshwari Kuppusamy

Summary of findings:

- A member of the Producer Group, Kuriyanoor from the year 2022.
- Over the last six months, she has regularly attended to all monthly group meetings. She has consistently contributed Rs. 50 every month to the group's savings fund. She has not taken any loan.
- Assets status:

Assets before intervention	Assets after intervention
03 cows, 05 hen, 1 bike and a TV.	04 goats, 02 cows, 05 h bike and a TV.



- Receipts, Guidance & Support from RGR - 04 goats, Trellis and ATL1 seeds. Orientation provided on the dos and don'ts of Goatery. Custard apple sales linkage achieved as a collectivized produce to identified vendor via the Producer Group formed by RGR.
- Sources of income – Farm labour, farmer, and a migrant worker in Bengaluru only.
- **Impact measurement** – The beneficiary has become a Latchathipathi. Incremental annual income from direct intervention itself is ₹ 83,500/-, Trellis is ₹ 8,000/- and from other sources it is ₹ 11,250/-. The net income is of ₹ 1.1 Lacs.

Income from key activities/interventions:

1. Goatery

Year of receipt	Sold	Income so far from sales (₹)	Current Herd Size	Current Asset Value (₹)	Net Income (Annualised) (₹)
2022	10	50,000	9	58,500	83,500

2. ATL1 / Little Millet

No ATL1 support and production undertaken. Little Millet was sown in 1-acres land area and achieved a production of 250 Kgs of which 200 Kgs was sold. Income from sale was ₹ 10,000/- and total production value of ₹ 11,250/-.





3. Trellis / NTFP

The net sown area was 20 cents and yielded a production of 400 Kg of tomatoes and sales income of ₹ 8,000/-.

She is also an owner of 25 custard apple trees and attained a production of 250 Kgs that yielded income of ₹ 8,000/-. The sales via the producer groups has increase the per Kg income from ₹ 250/- to ₹ 400/-.

4. Non-intervention

NA.

Beneficiary #6: Ms. Mangai Krishnan

Summary of findings:

- A member of the Producer Group, Kuriyanoor from the year 2022.
- Over the last six months, she has regularly attended to all monthly group meetings. She has consistently contributed Rs. 50/- every month to the group's savings fund. She has not taken any loan.

- Assets status:

Assets before intervention	Assets after intervention
02 goats, 02 cows, 04 hen, 1 bike and a TV.	04 goats, 02 cows, 04 hen, 1 bike and a TV.



- Receipts, Guidance & Support from RGR - 04 goats, Trellis and ATL1 seeds. Orientation provided on the dos and don'ts of Goatery. Custard apple sales linkage achieved as a collectivized produce to identified vendor via the Producer Group formed by RGR.
- Sources of income – Farm labor and farmer.
- **Impact measurement** – The beneficiary has become a Latchathipathi. Incremental annual income from direct intervention itself is ₹ 83,500/-, Trellis is ₹ 8,000/- and from other sources it is ₹ 11,250/-. The net income is of ₹ 1.1 Lacs.



Income from key activities/interventions:

1. Goatery

Year of receipt	Sold	Income so far from sales (₹)	Current Herd Size	Current Asset Value (₹)	Net Income (Annualised) (₹)
2022	10	50,000	9	58,500	83,500

2. ATL1 / Little Millet

No ATL1 support and production undertaken. Little Millet was sown in 1-acres land area and achieved a production of 250 Kgs of which 200 Kgs was sold. Income from sale was ₹ 10,000/- and total production value of ₹ 11,250/-.

3. Trellis / NTFP

The net sown area was 20 cents and yielded a production of 400 Kg of tomatoes and sales income of ₹ 8,000.

She is also an owner of 25 custard apple trees and attained a production of 250 Kgs that yielded income of ₹ 8,000/-. The sales via the producer groups have increased the per Kg income from ₹ 250/- to ₹ 400/-.

The picture depicts the cultivated land area for vegetable cultivation with Trellis to be installed in due course.



4. Non-intervention

NA.

ANNEXURE

ANNEXURE 1: KEY TAKEAWAYS FROM MEETINGS WITH WHOLESALE VENDORS

1. Goatery

Mr. Rangasami and Mr. Ravi caters to all villages of Jawadhu Hills and has been in this occupation for over a decade. They operate as independent vendors and make purchases directly from the villages and attain purchase of about 20 goats a week. The purchase price ranges between Rs. 5,000/- to Rs. 7,000/- depending upon the weight of the goat. In certain cases, where there is some deficiency in a goat, the purchase price can be lesser.

2. Paddy

Mr. Rafiq is the rice vendor for the region. He procures it from the villages and sells it in Erode or Salem. The typical procurement price ranges between Rs. 22/- to 25/- per kg, and can go up to Rs. 30/- per kg. In case of paddy with high moisture content, it is purchased as second grade quality and the price can be around Rs. 14/- per kg.

3. Millets and Horse gram

Mr. Ravi is a millet (both traditional and ATL1 varieties) vendor and horse gram vendor. He holds his storehouses in three places within Jawadhu. The farmers independently visit to the storehouses for the sale.

The total procurement and sales achieved in millets is around 1000 tons a year, even though it can be up to 2000 tons, if the availability from villages is higher. The purchase price is Rs. 35/- per Kg this year, while it was Rs. 45/- in the previous year. The price is the same for both the varieties.

In horse gram, the annual procurement quantity is around 50 ton a year. The procurement price is Rs. 55/- per Kg. Last year, it was Rs. 70/- per Kg.



ANNEXURE 2: INCOME STATES BASED ON IMPACT ASSESSMENT

S. No.	Beneficiary Name	LV Status Project Data	Goatery	Trellis	NTPF	Other - Agri	Other- Non Agri	Total Income	Income Category (<1, 1-1.25, 1.25-1.5, 1.5-1.75, >1.75)
Village Palamarathur									
1.	Geetha Selvam	Yes	48,500	0	0	40,000	TBA	85,500	
2.	Rajeshwari Rajkumar	Yes	64,500	33,750	0	36,550	-	1,41,500	1.25-1.5
3.	Vanitha Ramalingam	Yes	80,500	0	0	15,000	TBA	95,500	
4.	Mangailaxmi Arunchalam	Yes	1,17,500	0	0	20,800	-	1,38,300	1.25-1.5
Village Kuriyanoor									
5.	Rajeshwari Kuppusamy	Yes	83,500	8,000	0	11,250	-	1,14,000	1-1.25
6.	Mangai Krishnan	Yes	50,000	34,000	12,000	44,000	-	1,58,000	1.5-1.75
7.	Ramya Kumaresan	No	39,000	0	3,025	19,500	-	78,000	
8.	Kamsala Sakrapani	Yes	72,500	0	0	45,500	-	1,18,000	1-1.25
9.	Kamatchi Sekar	Yes	41,500	0	0	59,500	-	1,01,000	
Village Periyakollai									
10.	Jayakodi Kasi	Yes	32,500	25,000	0	31,400	TBA	88,900	
11.	Menaga Kuppusamy	Yes	26,000	35,000	2,000	96,100	-	1,90,000	>1.75



12.	Valli Kuppusamy	Yes	0	0	0	47,450	TBA		
13.	Suguna Rajendran	Yes	74,000	0	12,000	53,750	-	1,78,000	>1.75
14.	Jayamalini Govinthasamy	Yes	19,500	0	1,200	40,500	TBA	61,200	
15.	Sivalaxmi Annamalai	Yes	32,500	50,000	0	64,600	-	1,47,100	1.25-1.5
		Village Arsavalli							
16.	Kamala Ramakrishnan	No	39,000	0	8,000	18,250	-	65,250	
17.	Valli Sanmugam	No	39,000	0	30,000	34,000	-	1,03,000	1-1.25
18.	Pushpa Kulanthai	Yes	88,500	0	5,000	1,08,000	-	2,02,300	>1.75
19.	Venilla Sudhakar	Yes	63,500	7,000	0	1,20,550	-	1,91,000	>1.75
20.	Thamila Govintharaj	Yes	75,000	5,000	0	1,27,400	-	2,34,000	>1.75
21.	Jansirani Saminathan	Yes	1,04,000	30,000	0	69,000	-	2,12,000	>1.75
		Village Komutteri							
22.	Deepa Venkatesan	Yes	52,000	0	0	22,750	TBA	75,000	
23.	Bommi Sankar	Yes	17,000	0	0	20,500	TBA	37,500	
24.	Santhi Sankar	Yes	1,40,000	0	0	0	90,000	2,30,000	>1.75
25.	Mani Ramachandran	Yes	48,000	0	0	15,600	TBA	63,600	



Chapter 3

MARKET SURVEY & VALUE CHAINS DEVELOPMENT



Chapter 3.1

HONEY VALUE CHAIN³



Javadhu Box Honey, marketed as “Unveiling the Sweet Secrets of Tribal Tradition” – an existing branded product from the Jawadhu Hills value chain.

³ India’s organised honey market was valued at roughly Rs. 25–29 billion in 2025 and is projected to grow at a CAGR of approximately 7–10% through the early 2030s, driven by rising health consciousness and government support through the National Beekeeping and Honey Mission – a favourable tailwind for a differentiated wild-honey brand such as Baya. (Source: Research and Markets / IMARC Group, “Indian Honey Market Size, Share, Trends and Forecast to 2034”, 2025.)



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BAYA-branded little millet and NTFP products on display, marketed as “Product of Jawadhu Hills.”



Packaged wild and box honey ready for distribution under the Jawadhu Hills / BAYA brand.



Background

India is the fourth largest honey-producing country in the world, with an estimated annual production of about 70,000 tonnes. ⁴ The Indian honey market has experienced significant growth in recent years, driven by increasing health consciousness and a preference for natural sweeteners. In 2023, the market was valued at approximately Rs. 2520 Crores and is projected to reach Rs. 4860 Crores by 2032, exhibiting a compound annual growth rate (CAGR) of 7.3% during the forecast period. ⁵ The global organic honey market, which includes wild honey, was valued at approximately USD 800.75 million in 2024 and is expected to grow at a CAGR of about 7.2% from 2025 to 2034. ⁶

Key factors driving growth:

1. **Health Awareness:** The rising prevalence of chronic medical conditions such as diabetes, heart disease, and cancer has led consumers to seek healthier alternatives to refined sugars. Honey, with its natural composition and health benefits, has become a favoured choice.
2. **Product Innovation:** Manufacturers are introducing various honey variants, including flavoured, infused, and organic options, to cater to diverse consumer preferences.
3. **Government Initiatives:** The Government of India has implemented training programs and mentoring services to educate farmers on modern beekeeping practices, thereby boosting honey production.
4. **Market Segmentation:** Multiflora honey holds the largest market share, followed by eucalyptus, ajwain, and other varieties.
5. **Distribution Channels:** The business-to-consumer (B2C) segment dominates, with significant sales through general trade, modern trade facilities, and e-commerce platforms. Maharashtra leads in honey production, followed by Tamil Nadu, Karnataka, Punjab, and Rajasthan.

Despite the positive outlook, the industry faces challenges such as adulteration, environmental threats to bee populations, and the need for stringent quality control

⁴ (Excerpt from the study “A Value Chain on Wild Honey Bees, NAIP, ICAR, 2014”)

⁵ (https://www.imarcgroup.com/indian-honey-market?utm_source=chatgpt.com)

⁶ (https://www.expertmarketresearch.com/reports/india-organic-wild-honey-market?utm_source=chatgpt.com)



measures. In summary, the Indian honey market is poised for substantial growth, driven by health trends, product diversification, and supportive government policies.⁷

Honey Production: India Scenario

India is home to four species of wild honey bees i.e. Apis Dorsata (Giant Rock Bee), Apis Cerena Indica (Asiatic Honey Bee) Apis Florea (Dwarf Honey Bee) and a Trigona species - the Dammer Bee. Nearly 50% (~35,000 tonnes) of honey marketed is from wild bee colonies, primarily the Apis Dorsata species, known for its high honey yield, aggressiveness and ability to pollinate crops in a 10 km radius of its comb. In India, wild honey collection is often done by tribal communities dwelling in forest areas. The wild honey market in India represents a unique segment within the broader honey industry, characterized by honey harvested directly from natural bee colonies in forests. This practice is deeply rooted in the traditions of various indigenous communities and contributes to their livelihoods. However, traditional harvesting practices are followed such as smoking out bees which often leave hives damaged and unfit for further colonisation.⁸

Table 1: Bee Type and Production:

Bee Type	Wild / Domesticated	Production (Tonnes)	Kg Yield
Apis Dorsata	Wild	30,000	Highly variable and dependent on available flora. Harvestable colony will have on an average about 2.5 to 3 kg per harvest. The second harvest may yield on an average about 3-4 kg per colony.
Apis Florea	Wild	3,000	Average honey yield of 6-8 kg per colony per year
Apis Cerena Indica	Wild & Domesticated	Not Available	20/25kg/hive in rubber plantations or controlled conditions. On an average 6 to 8 KGs per colony per annum.
Apis Mellifera (Italian bee)	Domesticated	40,000	15kg/colony to 40 KGs/ colony

⁷ (https://www.imarcgroup.com/indian-honey-market?utm_source=chatgpt.com)

⁸ (Excerpt from the study "A Value Chain on Wild Honey Bees, NAIP, ICAR, 2014)



KEY ASPECTS OF THE WILD HONEY MARKET INCLUDE:

1. **Traditional Collection Practices:** Tribal communities have long been engaged in wild honey collection, often using methods that lead to the destruction of bee colonies.⁹
2. **Sustainable Harvesting Initiatives:** Organizations like WWF-India have introduced training programs for forest-dwelling communities to promote non-destructive collection techniques.
3. **Market Potential:** In terms of market price realisation, there is up to 100% price difference between per kg returns to the tribal honey collector and the seller either B2B or B2C. Making a unique value proposition to focus on wild honey. Organized efforts and direct marketing have enabled communities to sell honey at higher prices, enhancing their income. For example, WWF-India promoted Maikal Sahad Sangraha Kalyan Samiti (MSSKS) through organised efforts and direct marketing sold honey at Rs.400/kg to a company in Bangalore. Prior to intervention, wild honey was being sold in local markets or to intermediaries at rates fluctuating between Rs.100-150/kg.¹⁰
4. **Adulteration and Processing:** Wild honey needs to be tested for purity (and enzymes), as it is often adulterated with sugar syrup or corn syrup. Further, processing is essential due to the large amount of residue in wild honey from traditional harvesting practices. Modern processing plants include facilities for loading, preheating, clarifying, ultra-filtering, pasteurization,
5. moisture reduction, and honey settling. Newer processing plants are available with scraping film technology for moisture reduction, fine filters and clarifiers for residue-free wild honey.¹¹
6. **Geographical Indication (GI) Recognition:** Certain varieties of wild honey, such as Sunderban Honey, have received GI tags, acknowledging their unique origin and quality. Notably, Sunderban Honey, collected from the mangrove forests of the Sunderbans in West Bengal, obtaining GI registration in 2024. This recognition helps in preserving traditional knowledge and promotes the product in niche markets.¹²

MARKET PLAYERS

⁹ (Excerpt from the study "A Value Chain on Wild Honey Bees, NAIP, ICAR, 2014)

¹⁰

https://www.wwfindia.org/news_facts/feature_stories/wild_honey_adding_sweetness_to_lives?utm_source=chatgpt.com

¹¹ (Excerpt from the study "A Value Chain on Wild Honey Bees, NAIP, ICAR, 2014)

¹² https://en.wikipedia.org/wiki/Sunderban_Honey?utm_source=chatgpt.com



The Indian honey market features several prominent players, each contributing significantly to the industry's growth. Key companies include:

- **Dabur India Ltd.:** A leading FMCG company renowned for its natural and Ayurvedic products, including Dabur Honey. In the first quarter ending June 30, 2024, the company reported an 8% increase in consolidated net profit, reaching Rs. 500 Crores.
- **Patanjali Ayurved:** A significant player in the honey market with its emphasis on natural and Ayurvedic products.
- **Apis India:** Initially a supplier to major brands, Apis India transitioned to the B2C market in 2016 with its brand, Apis Himalaya Honey.
- **Marico Ltd.:** Entered the honey segment with its Saffola Honey brand, targeting Rs. 100 Crore in revenue by the fiscal year 2021-22.
- **Emami Limited:** Ventured into the honey market with its Zandu Pure Honey.

These companies play a pivotal role in shaping the Indian honey market through their diverse product offerings and strategic initiatives.

Some of the key challenges and opportunities in the wild honey sector are as follows: (i) quality and standardization - ensuring consistent quality and adhering to food safety standards are crucial for accessing premium markets; (ii) sustainable practices - promoting non-destructive harvesting methods is essential for the conservation of bee populations and the environment; and (iii) market access - building direct links between collector communities and consumers can help in obtaining better prices and preserving traditional practices.

Tamil Nadu and Honey

In India, Tamil Nadu is the second largest producer of honey and has a rich tradition of beekeeping and honey production. The State's diverse flora and favourable climatic conditions contribute to the honey market. Tamil Nadu's honey market is characterised by a blend of traditional practices and modern marketing strategies, catering to a diverse consumer base with varying preferences. In terms of market segmentation, the honey market in Tamil Nadu comprises both organized and unorganized sectors. The organized sector includes well-established brands with large-scale production and marketing, while the unorganized sector consists of honey produced by local beekeepers or vendors in small quantities, often sold locally under their own labels.



Key brands in Tamil are a] **Lion Honey** - produced in Tamil Nadu, Lion Honey is a prominent brand with widespread market presence across India. Bulk of its sales are in the Middle East, b] **Dabur Honey** - a leading brand in the Indian market for over 30 years, Dabur Honey is widely available in Tamil Nadu, c] **Patanjali Honey** - a relatively recent entrant, Patanjali Honey has rapidly gained market share in the state, and d] **Apis Himalaya Honey** - available in supermarkets, hypermarkets, and online platforms in Tamil Nadu. Kanyakumari district is a pioneer in honey production and marketing within Tamil Nadu. The Tamil Nadu Khadi and Village Industries Board operates a honey processing unit in Amsi, Kanyakumari, producing "A" grade honey. Quality Certifications, to ensure product quality are in place, such as FSSAI, AGMARK, AGMARK Grade A, and USDA organic certification. These certifications help maintain standards and build consumer trust and are essential for reaching out to a wider market.¹³

Consumer Preference: A study involving 301 respondents from Tamil Nadu revealed that 35% preferred light-colored branded honey, while another 35% favored wild or tribal honey. The majority of consumers purchased honey directly from beekeepers or direct outlets (31%), followed by supermarkets (20%) and tribal stores (14%)¹⁴. **Raw wild honey (from Apis Dorsata) collected by tribal communities contributes to the unorganized sector and is primarily sourced from Jamunamarathur (Jawadhu Hills) in Thiruvannamalai District and Marthandam in Kanyakumari District¹⁵. Thus, there is potential to capitalize on the uniqueness of the wild honey sourced from Jawadhu Hills and target the 35% consumers who have shown preference to wild honey.**

There are successful case studies on value chain development in the honey business in Tamil Nadu. For example, Keystone, a non-profit organization in the Nigiris, encouraged traditional honey harvesting practices and set up value addition units (*see Case Study 1 below*). Their

¹³ http://en.wikipedia.org/wiki/Sundarban_Honey?utm_source=chatgpt.com;

https://www.expertmarketresearch.com/reports/india-organic-wild-honey-market?utm_source=chatgpt.com

[https://www.entomoljournal.com/archives/2020/vol8issue5/PartR/8-4-518-](https://www.entomoljournal.com/archives/2020/vol8issue5/PartR/8-4-518-823.pdf?utm_source=chatgpt.com)

[823.pdf?utm_source=chatgpt.com](https://www.entomoljournal.com/archives/2020/vol8issue5/PartR/8-4-518-823.pdf?utm_source=chatgpt.com);

https://agritech.tnau.ac.in/farm_enterprises/fe_api_beekeepingindustry.html?utm_source=chatgpt.com)

¹⁴ Source: <https://www.entomoljournal.com/archives/2020/vol8issue5/PartR/8-4-518-823.pdf>

¹⁵ Source: https://agritech.tnau.ac.in/farm_enterprises/fe_api_beekeepingindustry.html



products, branded as '**Last Forest**,' are sold through Green Shops in various locations and maintain traceability back to the primary collectors.

Case Study 1

There are some good case studies on value chain development undertaken in the honey business. One such case study is from the Nigiris. A non-profit organization, Keystone encouraged honey collection through traditional harvesting practices. Keystone set up value addition units. A paper published in the book "Innovative Approaches to Hi Value Agriculture: Success Stories" indicates that primary collectors were given necessary technical and marketing help. Keystone provided items such as filters to filter honey or wax melters. The products obtained through these units are given the brand name of 'Last Forest' (which has been recognized as a mark of quality now) and sold through Green Shops at Ooty, Kotagiri, Mysore and Coonoor. Keystone maintains traceability of its products. Any product that has been sold to a consumer can be traced back to the person who has sold it to Keystone.¹⁶

The Last Forest products in the Nilgiri Hills, took advantage of the major price differential between honey collector and consumer and increased the value for forest rock honey by 40% as the product reached consumers through internet stores and local markets. Last Forest honey provides traceability of its products from the honey seller to Keystone. For Last Forest, preservation and exchange of traditional ecological knowledge are criteria in several schemes, with traditional rock honey collection in the Nilgiri Hills being one of it. Building collaborations between different actors, including consumers and retailers and leadership/ownership of indigenous communities has proved a key factor in their success as well as mitigating risks. Last Forest products further extend into value-added beeswax lip balms, therapeutic balms and soaps. Last Forest was appreciated by FAO as one of the several case studies that brought to life innovative solutions with a 'territorial' approach – by way of linking products and their intrinsic value to the people, culture and places that made them unique.

Source: www.keystonefoundation.org

¹⁶ (Source: *Intervention in Honey Value Chain Making Difference for Indigenous Communities, Athoor, 2008, Sony Pellisery & Snehlata Nath*).



In summary, the wild honey market in India offers significant opportunities for economic development among forest-dependent communities. With appropriate support in sustainable practices, quality assurance, and market access, this sector can contribute to both conservation and livelihoods. There is tremendous scope in the honey value chain, especially in wild honey. Branding and market development are key to success. Highlighting the uniqueness and health benefits of wild bee honey can significantly enhance consumer awareness and demand.

HONEY VALUE CHAIN & BUSINESS PLAN

Honey Production in Jawadhu Hills

An estimate was undertaken on the volume of wild honey available in the Jawadhu Hills through in-person interviews with honey collectors, NGOs and buyers. There are approximately, 300 villages in the region with **3 to 4 serious honey collectors per village, each collecting 50 to 100 kgs a year, totalling around 15 tonnes of wild honey annually**. Major institutional players include Srinivasan Services Trust (SST-TVS), Divine Pure (SRLM-Government of Tamil Nadu), and Hand-in-Hand (NGO) collectively process 60% of the honey collected in the region.

Divine Pure is one of the key market players in the honey business in the Jawadhu Hills, with a manufacturing unit in Jamanumarathur. In FY 2023-24, they processed and sold 4 tonnes of honey, purchased at Rs. 420/kg and sold at Rs. 700/kg to wholesalers and Rs. 850/kg to retailers. **Hand-in-Hand**, which operates through the Jawadu Hills Organic Farmers Producer Company, handling commodities like honey, millets, tamarind, and health mixes. In the previous FY, the company sold 4 tonnes of honey and 300 kgs of box honey. The company purchasing wild bee honey at Rs. 450/kg to Rs. 500/kg and retailing it at Rs. 800-900/kg. Smaller bottles of 100, 200 and 300 grams were retailed at Rs. 1/- per gram. In keeping with the philosophy of a farmer producer company, honey is only purchased from its 1000 members, of whom 500 are involved in some honey related activity. **SST-TVS**, also operates a honey processing plant near Jamanumarathur, collecting and processing 1 tonne of wild honey and 700 litres of box honey in FY 2023-24. The **RGR Cell** has also worked in the honey business with sales of around 1 tonne in FY 2023-24. At current scale, there is still a **potential of an additional five tonnes of honey, which is not being marketed through these four players** and remains sold through informal channels.





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(Divine Pure Processing Unit)



(Divine Pure Product)





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(Divine Pure Honey Product Line)



(SST-TVS Honey Processing Unit)





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(SST-TVS Product)



(Hand-in- Hand Honey Processing Unit)





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(Hand-in- Hand Honey Products)





(Hand-in- Hand Honey Product)

Table 4: Market Players Comparative Jawadhu Hills





Organisation	Brand Name	Processing Method	CAPEX (INR)	Sales Channel and Pricing	Remarks
Companies					
None					
Non-Profits					
Divine Pure	Jawathu Hills	Manufacturing Unit (1 quintal/ hour capacity) – 100 days functioning during season	Rs. 15 Lakhs	Mainly, TRIFED and Govt. Departments @ Rs.700/ kg to wholesalers and Rs.850/ kg to retailers. Margin: Rs. 200/kg – Rs. 350/kg. Probably loss making.	OPEX through government. Schemes/ subsidies. Operations and sales are mainly managed through the government system. Therefore, viability will also be questionable.
Hand in Hand	Jawa Delite	Manufacturing Unit (1 quintal/ hour capacity) – 100 days functioning during season	Rs. 12 Lakhs	Sales through FPOs, few supermarkets and its own outlet in Kanchipuram @Rs. 100 (100 mg); Rs. 290 (300 mg) Margin: Rs. 300/mg for wild honey and Rs.400/ mg for box honey. Probably just about breaking even.	Selling wild honey in 100 gm and 300 gm bottles. Though both 500mg and 1 kg bottles are available. Purchase price ranges from Rs.450 – Rs.500 per kg based on purity.
SST-TVS	Javadhu	Basic Unit	Rs. 10 Lakhs	“Truly Cottage” e-	Working with 350 farmers with both





				commerce platform @ Rs.700/kg. Margin: Rs. 200/ kg. Loss making	box and wild honey. Now bottling honey only basis demand received. Processed only 1 Tonnes during the season. Relies for sales through its e-commerce platform and through TVS outlets. Supply driven approach. Mainly providing honey boxes, but very limited procurement.
RGR	Baya Honey	Basic Unit**		Offline. Local supermarkets, individuals and Hosur sales Profitable, if rate is near Rs. 1000 per kg.	500 mg bottle @ Rs.700 – 850
*Basic Unit (SST): A basic filtering and boiling plant. A bottling unit is also available. *Basic Unit (RGR): Jerry can storage with double-filtration and pouring undertaken through machine in 500 mg bottles					



KEY TAKEAWAYS FROM JAWADHU HILLS MARKET SCENARIO:

A detailed analysis has been undertaken of the current honey value chain in the Jawadhu Hills. Based on the SWOT analysis, the strategy for taking forward honey has been developed under the BAYA brand.

SWOT Analysis of Honey Scenario in Jawadhu Hills

Strengthens

- Uniqueness of Jawadhu Honey, especially wild bee honey along with consumer awareness of its distinctiveness.
- Sufficient volumes wild honey available. Introduction of better harvesting practices can ensure long term sustainability.
- Box honey also benefits from the multi flora of the Jawadhu Hills, giving it distinctive taste and color.
- Local population is quite familiar with beekeeping.

Opportunities

- Huge demand for Jawadhu honey with consumers wanting this kind of unique honey, which has such positive health impacts. More consumers prefer organic, raw, and unprocessed honey for health benefits.
- Promoting wild bee honey as a sustainable product can boost sales through ethical and eco-conscious marketing.
- Processing into premium honey products (infused honey, skincare, supplements) can increase profitability.
- Potential funding, training, and certification programs can improve production and market access.

Weaknesses

- Currently, the honey value chain is dominated by non-profit players, who are all sitting on unsold stock due poor marketing, branding and distribution problems. Poor quality packages and labelling
- Very basic processing facilities.
- Wild bee honey production is not consistent year-round, leading to supply shortages.
- Traditional honey collection is often manual, dangerous, and requires skilled labor. Processing facilities are very basic.
- Variability in quality, taste, and purity can make it hard to compete in structured markets.

Threats

- Unscientific harvesting techniques for wild honey can cause damage to the long term sustainability of wild honey supply chain.
- Use of unrecommended or excessive pesticides, fungicides, etc. can wipe out bee colonies.
- Environmental degradation threatens wild bee populations and honey production. Changing weather patterns can impact bee behavior and honey yield.
- The market is flooded with counterfeit honey, making consumer trust a challenge.
- Strict food safety and export regulations can make it difficult for small producers to expand.

Proposed Baya Honey Business Plan: Critical Points While Developing the Honey Value Chain the Jawadhu Hills:

1. **Marketing Plan:** The biggest challenge in the honey value chain in Jawadhu is marketing and sales. Efforts are needed in branding and reaching premium markets. Overall, the honey consumer base can be classified into three categories i.e. rockers, caterpillars and butterflies.

	 ROCKERS	 CATERPILLARS	 BUTTERFLIES
Lifestyle	Leading a convenient lifestyle is important	Have intent to but don't have enough motivation to live a healthy life	Have embraced healthy living as a way of life
Inclination for organic foods	Low	Medium	High
Belief and values	Don't believe in making changes in diet	Believe that sometimes making healthy dietary choices is good	Believe in following a strict diet and making healthy choices everyday
Price consciousness	Price-conscious	Are conscious about price but willing to pay small premium for healthier product	Willing to pay a premium for unprocessed, organic products
Typical demography	Range across age groups	Comprise mainly of middle and upper middle-class people in urban areas	Comprise mainly of working professionals in urban areas



From the above classification, it would be advisable for RGR to target the caterpillars for marketing of its honey product. The current branding of “BAYA Honey” can be continued as it remains unique in the market and communicates the natural nature of honey sold.

The reasons for **targeting the “caterpillars”** rather than the rockers or butterflies are:

1. Largest percentage of people consuming online content on social media and therefore, easy to reach through collaborations with food influencers etc.
2. Have basic knowledge of organic and healthy produce and therefore, more likely to purchase.
3. Not as price conscious as buyers of Patanjali and Dabur honey, therefore likely to be willing to pay a small premium for an assured quality product.

The biggest problem in the whole honey value chain in Jawadhu is the marketing and sale of both wild and box honey. Consequently, most manufacturing facilities are under-utilized and have working capital stuck in unsold stocks. Organizations are struggling to market honey under the Jawadhu wild honey label, which is surprising. All the large producers are non-profit and by DNA has limitation with marketing and sales. Major efforts are needed in this direction, especially with branding and reaching out to premium markets.

- Marketing Cell: On the marketing front, the RGR Cell need to put in place a separate two-member marketing unit under the new Federation based at the Agri-Business Incubation Centre at TNAU, which will reach out to consumers through different marketing strategies and ensure sales. This will be a specialized unit, which will focus on developing markets for the honey. Expertise of TITAN Ltd would also be tapped to strengthening the marketing efforts of this two-member team.
- Export Market: Furthermore, the new Federation should explore developing an export market for the honey. This requires certain changes in the extension strategy at field level with honey farmers, as there are specific requirements to meet export standards including ensuring zero pesticide residue in the honey. Developing this export market can be another critical task for the Marketing Cell.
- Branding & Marketing: BAYA brand needs to be promoted proactively. The branding focus needs to be on the uniqueness of wild bee honey from Jawadhu Hills. The health benefits need to be highlighted and certified using the labs in TNAU and Kerala. This certification and quality assurance will make it easier in due course to export the Jawadhu honey. Develop a strong brand identity for the honey product, emphasizing its





unique qualities, such as being wild honey collected by tribal communities/artisanal honey. Invest in attractive and eco-friendly packaging that highlights the product's natural and health benefits. Ensure that the packaging is tamper-proof and maintains the honey's quality whilst communicating the health benefits, usage (on toast etc.) and sourcing. It is important that the Marketing Cell ensure far better bottling and packaging for wild honey. Most of the packaging used by other agencies do have shortcoming. Packaging and design of the product need to look exciting and attract the customer.

- Marketing and Promotion: Develop a comprehensive marketing strategy that includes digital marketing, social media campaigns, and influencer partnerships. Highlight the health benefits of wild honey and its unique taste. Use storytelling to connect with consumers, sharing the journey of the honey from the forests of Jawadhu Hills to their table. The RGR Cell through the Federation would have to invest in branding and then ensure sales through the dedicated Marketing Unit.
- Distribution Channels: Expand distribution channels to reach a wider audience from the current scenario. These would include institutional sales through FPOs, government entities and Tata companies, which are based in the region. Gradually, sales can be increased to elite and up-end markets through far better marketing. In the initial years, at least 50% sales should be through institutional sales and ensure that the manufacturing unit meets the necessary quality standards. Thereafter, rest of the honey needs to be sold in the open market, establishing partnerships with retailers and distributors to ensure the product is widely available. A budget of Rs. 20 lakhs are being kept for sales and marketing. This includes selling through e-commerce platforms, supermarkets, health food stores, and specialty stores.
- Product Diversification: Introduce different variants of honey, such as flavoured, infused, and organic options, to cater to diverse consumer preferences.
- Consumer Education: Educate consumers about the benefits of wild honey through informational content on the packaging and online via social media. Recipes/usage tips can be added to encourage consumers to incorporate honey in their daily routines. Emphasize the sustainable and ethical practices involved in honey production. Highlight the positive impact on the livelihoods of tribal communities and the conservation of bee populations. This can resonate with socially conscious consumers and enhance brand loyalty.
- Promotional Offers and Loyalty Programs: Offer promotional discounts, bundle deals, and loyalty programs to attract and retain customers. Provide incentives for repeat purchases.





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- **Collaborations and Partnerships:** Collaborate with health and wellness social media influencers to promote the honey product. Explore partnerships (in different packaging sizes) with institutional buyers, hotels and cafes.
- **Customer Feedback and Improvement:** Proactively gather feedback from customers and stakeholders to improve the product and address concerns. Feedback forms or WhatsApp Business can be utilised for quick feedback from customers.

2. STAKEHOLDER ENGAGEMENT

Engaging key stakeholders, such as farmers, processors, marketers, and consumers, is essential for the successful implementation of the honey value chain and marketing plan. The proposed new federation covering all 50 villages should work closely with these stakeholders to ensure their active participation and support. The Hand-in-Hand model of community engagement provides a lot of learn to all concerned.

3. QUALITY ASSURANCE, CERTIFICATION, BLOCKCHAIN AND TRACEABILITY:

Explore and obtain certifications from recognized bodies such as FSSAI, AGMARK, and organic certifications. TNAU lab certification, this will build consumer trust and ensure that the honey meets high-quality standards. Implement blockchain technology for traceability, allowing consumers to verify the authenticity and origin of the honey. Most people acknowledge that Jawadhu honey is unique vis-à-vis its health-related benefits and has sufficient demand amongst consumers. The RGR Cell should get each batch of processed honey certified by TNAU technical Lab at the Centre for Post-Harvest Technologies, which has the required lab technologies to certify the actual qualities of this wild honey for the Jawadhu Hills. As indicated by TNAU, there are laboratories in Kerala, which can also test enzymes in honey, which is a major value addition vis-à-vis branding. This would be essential if an export market is to be developed for the Jawadhu honey. Blockchain is another possibility, which would provide traceability to each batch and add premium value. Traceability and blockchain would add another 5% to the overall cost, which is necessary if the premium market has to be targeted.

4. REDUCING BOTTLE-SIZE

BAYA honey is sold in 500 ml bottles, however, a rapid assessment of the general honey market, shows dominance of smaller bottles of honey. Especially in the 200-250ml size.





This has many advantages, including making the product more “affordable” and increasing the likelihood of consumers willing to “try” a new product. A competitive pricing would need to be worked out. Hand-in-Hand has experimented with smaller bottles. The cost works out to approximately Rs. 100 per 100 grams, if smaller size bottles are sources. However, currently all bottles are being sourced from Gujarat, which adds an additional cost to the product.

5. PROCESSING FACILITY (INCLUDE CAPEX INVOLVED)

The plan includes setting up a manufacturing unit with an installed capacity of one quintal per hour, which should be sufficient to meet the projected demand. Only Divine Pure and Hand-in-Hand have production levels of 4 tonnes a year, which implies a maximum of 100 day working per year. As honey is seasonal, these facilities may not be available when needed. Mainly honey is processed twice a year. Consequently, it is better to have the manufacturing under the control of the new Federation.

Details of the machinery layout are shown below.



Approximate costing is **between Rs. 10 to Rs. 15 Lakhs**. Most vendors are Punjab based with few manufactures in Kerala. Both options need to be explored. After sales service, is



one of the most critical factors, should be the key deciding factor while finalizing the vendor, as the machinery does have occasional problems. The proposition being a moderate-sized operation, this would be suitable for medium-scale honey producers who need to process a significant volume of honey efficiently. This type of unit would usually include features like a honey extractor, strainer, heating tank for pasteurization (if necessary), and filling/packaging equipment. This unit would typically included honey extraction, filtration, heating (if needed), and bottling.

BUDGET

A budget of Rs. 1.51 Crores is proposed over three years for the honey value chain. This includes all management supervision costs for the project including developing the horse gram value chain. Consequently, the human resource costs for the horse gram RTE are not being budgeted separately.

The proposed budget is inclusive of all CAPEX and OPEX costs. An amount has been kept separately for the marketing efforts and for salaries of the Marketing Cell. Furthermore, an amount can be made available for working capital for the procurement of honey (Rs. 32.2 Lakhs).

An assessment undertaken of the 50 project villages by the RGR Cell indicates that an additional amount of 1.5 Tonnes of wild honey is available over and above the amount already being procured by other organizations. It is also expected that 1 tonnes of box honey will also be procured in Year 1.

Box honey will probably be sold in B to B format and institutional sales. While wild honey will be targeted at the premium market. To make the project viable, Rs. 30 Lakhs would be recovered from sales over Year 2 and Year 3. The project would break even at the end of Year 3, with all OPEX costs being recovered from sales.

A budget of Rs. 1.51 Crores is proposed over three years, inclusive of all CAPEX and OPEX costs. The project aims to break even at the end of Year 3, with all OPEX costs being covered from sales including salaries in Year 3.



FINANCIAL PROJECTIONS

The financial projections for the honey production business plan¹⁷ as per the RGR Cell original proposal were as follows:

- FY 2025-26: Total procurement of 1500 kg of wild honey and 1000 kg of box honey, with a total sales revenue of Rs. 22.7 Lakhs and revenue of Rs. 9.75 Lakhs before tax. OPEX and operations are subsidized.
- FY 2026-27: Total procurement of 1650 kg of wild honey and 1100 kg of box honey, with a total sales revenue of Rs. 25.8 Lakhs and a revenue of Rs. 11.5 Lakhs before tax.
- FY 2027-28: Total procurement of 1815 kg of wild honey¹⁸ and 1210 kg of box honey, with a total sales revenue of Rs. 29.3 Lakhs Crores and a revenue of Rs. 13.6 Lakhs before tax.

The table below captured the details of the proposed plan:

Table 1

	Total Wild Honey Procured (KGs)	Total Box Honey Procured (KGs)	CP per KG Wild Honey (Rs.)	CP per KG Box Honey	Total Procurement Cost (Rs.)	SP per KG of Wild Honey	SP per KG of Box Honey	Total Sales (Rs.)	Total Revenue from Sales (Rs.)
FY 2025-26	1500	1000	500	550	1300000	1000	1000	2275000	975000
FY 2026-27	1650	1100	500	550	1430000	1000	1000	2585000	1155000
FY 2027-28	1815	1210	500	550	1573000	1000	1000	2934250	1361250

However, an analysis of the above numbers indicates the following:

- Suggested volumes are too small. Larger volumes of honey need to be procured to bring down the OPEX and make the business viable.

¹⁷ Draft Plan, which has subsequently been reworked, as per the suggestions in this chapter.

¹⁸ Wild Honey: Mainly Apis Dorsata, Box Honey: Mainly Apis Cerana Indica. Both are wild bees; however, Apis Cerana is semi-domesticated



- There are no elements of cost recovery. A 100% subsidy is not advisable, if financial sustainability and break-even are the objectives.
- It is important to note that if marketing and block chain costs were recovered from the revenue, major losses are expected in Year 1 and marginal losses in Year 2.

As per the reworked numbers, the following table captured the key line-item wise allocation over the three-year period.

Table 2

	Hardware (Rs.)	Software (Rs.)	OPEX (Rs.)	Fund for Procurement (Rs.)	Salary Support (Rs.)	Marketing Support (Rs.)	Block Chain (Rs.)
FY 2025-26	2035400	270000	438000	1300000	1500000	2000000	125000
FY 2026-27	205200	450000	468660	1825000	1620000	0	137500
FY 2027-28	205200	180000	501466	0	1752000	0	137500
Total	2445800	900000	1408126	3125000	4872000	2000000	400000

Table 2 distributed the project budget over its main sub-heads

It is recommended that in Year 1 the operations be fully subsidized and some cost recovery be commenced from Year 2 onwards. The proportion can be decided, but it is essential that by the end of Year 3, total OPEX costs are recovered from honey sales. This would include salary for all personnel including the Marketing Cell. The following is recommended to make the business viable and recover OPEX cost from Years 2 and Year 3.

- An additional amount of 0.5 tonnes wild bee honey would be procured per annum from Year 2 and 3 onwards. Similarly, an additional minimum amount of 0.5 tonnes of box honey would be procured each year from Year 2, onwards. Any further procurement over and above these numbers would be undertaken through the Federation's own resources. This is possible, if yields from box honey are maximized. It is also important to increase the targets annually, as there is and will be sufficient honey available. However, in parallel, a major effort needs to be put into the branding and sale of the honey. Additional volumes can be absorbed, if markets are created for the 'Baya' brand.





- The numbers will look as follows:
 1. Year 1 – Wild Bee Honey – 1.5 tonnes, Box Honey 1 tonne (Total 2.5 tonnes)
 2. Year 2 – Wild Bee Honey – 2 tonnes, Box Honey 1.5 tonnes (Total 3.5 tonnes)
 3. Year 3 – Wild Bee Honey – 2.5 tonnes, Box Honey 2 tonnes (Total 4.5 tonnes)
- To reach the above volumes of box honey, 300 boxes would be ordered from TNAU. Each will come with the mother bee and its hive @ Rs. 2736/- approximately. On an average Apis Cerana will produce 10-20 kgs of honey per colony (box). However, we are taking a conservative estimate of 7 kgs of honey per colony. Conservative numbers are advisable, as box honey will have to be introduced and farmers trained. In addition, box honey production can be major impacted, if the bees forage of vegetable crops and cotton grown in the area, where farmers are spraying excessive pesticides or fungicides. Therefore, the proposed extension project focusing on IPM of vegetables crops is critical to reduce the pesticide load and ensure spraying is restricted and based on ETL damage to the crops.
 - Year 1 – Box Honey – 150 boxes = 1000 KGs (average of Apis Cerana – 6 to 8 Kgs per annum) of Honey = 1 tonne.
 - Year 2 – Box Honey – 75 boxes = 500 kgs = 0.5 tonnes
 - Year 3 – Box Honey – 75 Boxes = 500 kgs = 0.5 tonnes

(300 boxes @ Rs. 2736/- = Rs. 8.2 Lakhs.)

- Each box honey farmer is expected to make from 10 boxes approximately Rs. 38,500/- per annum (10 boxes x 7 kgs x Rs. 550/-). On an average there are 4 wild bee collectors in each village (50 villages). They would make approximately make Rs. 3500/ per hive (1 hive x 7 litres x Rs. 500/-). On an average one honey collector harvesting 10 hives a year, which also works out to Rs. 35,000/- per annum per farmer. To harvest 1.5 tonnes of honey in Year 1, 35 plus wild honey harvesters will have to work with the project. It is proposed that each family through their women members will have membership of the new Federation, which would make it easier to provide them services.
- A procurement budget is required. Honey is purchased on an average @ Rs. 500 per kg. This would work out in the following manner:
 - Year 1: 2.5 tonnes → Rs. 13 Lakhs
 - Year 2: 3.5 tonnes → Rs. 18.2 Lakhs
 - Year 3: 4.5 tonnes → Rs. 23.5 Lakhs

The total procurement budget requested would be for only Years 1 and 2 totalling Rs. 31.25 Lakhs. The same amount would be used as working capital to purchase honey in Year 3 and would be kept with the new Federation as a revolving fund for procurement of honey in the





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subsequent years. Any additional purchases of honey would be done through revenue generated by the honey sales.

- In addition, it is expected that the current 15% wastage of purchased wild honey would have been reduced to 10% and 5% in Year 2 and Year 3 respectively, as better harvesting techniques are adopted by farmers. Consequently, far better-quality of wild honey would be available, which would meet the required QA standards.
- Under the scenario given below, the team is required to recover Rs. 30 Lakhs from OPEX in Year 2 and Year 3.

Table 3

	Total Wild Honey Procured (KGs)	Total Box Honey Procured (KGs)	CP per KG Wild Honey (Rs.)	CP per KG Box Honey	Total Procurement Cost (Rs.)	SP per KG of Wild Honey	SP per KG of Box Honey	Total Sales (Rs.)	Income after Sales (Rs.)
FY 2025-26	1500	1000	500	550	1300000	1000	1000	2275000	975000
FY 2026-27	2000	1500	500	550	1825000	1000	1000	3300000	1475000
FY 2027-28	2500	2200	500	550	2460000	1000	1000	4575000	2115000
FY 2028-29	4000	3000	500	550	3650000	1000	1000	6800000	3150000
Total					5585000			10150000	4565000



Table 4

	Revenue (Rs.)	OPEX (Rs.)	Software, Capacity Building, etc. (Rs.)	Salaries, Marketing, Blockchain (Rs.)	Profit / Loss (Rs.)	Subsidy (Rs.)	Profit / Loss after Deduction of Subsidy (Rs.)
FY 2025-26	975000	438000	270000	3625000	-3358000	4333000	975000
FY 2026-27	1475000	468660	450000	1757500	-1201160	2207500	1006340
FY 2027-28	2115000	501466	180000	1889500	-455966	180000	24034
FY 2028-29	3150000	551613	0	2078450	519937	0	643586
Total	4565000	1408126	900000	7272000	-5015126	6720500	2005374

- Cost recovery of Rs. 30 Lakhs is expected starting from Year II. In the 2nd year, only OPEX costs are recovered from the revenue from sales. In Year 3, all salary costs, blockchain and OPEX costs are recovered from sales. The honey business should break even during the third year.
- An analysis of the OPEX data indicates that processing, bottling and labelling and all labour costs pertaining to the production of honey come to about approximately Rs. 300/- per kg. Even if serious cost cutting is undertaken, it cannot come below Rs. 250/- per kg. All organization selling honey at the Rs. 700-800/- range are selling at a loss. Some level of cost recovery is only possible at about Rs. 1000/- per kg. Consequently, it may be difficult to reduce the selling price to below Rs. 1000/- per kg of honey, as anything below would be loss making.
- However, it is important to note that software costs including trainings, expert guidance on technical aspects of extension to honey gatherers and farmers would continue be funded through the grant.
- The Marketing Cell would be a separate entity housed with the RGR Cell at the Agri-Business Incubation Centre at TNAU, Coimbatore. This entity will exclusively focus on developing markets for honey and ensure quality assurance at production level. The Agri-Business Incubation Centre has the required expertise to help the marketing team negotiate the dynamics of the market. They will also assist the RGR Cell in getting access to vital credit and grant through their incubation funds and linkages with different financial institutions.

The financial projections for the honey production business plan as per the revised numbers would be as follows:





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- FY 2025-26: Total procurement of 1500 kg of wild honey and 1000 kg of box honey, with a total sales revenue of Rs. 2.27 Crores and profit after OPEX and subsidy deductions, and before tax would be Rs. 9.7 Lakhs. Operations in Year 1 would be fully subsidized.
- FY 2026-27: Total procurement of 2000 kg of wild honey and 1500 kg of box honey, with a total sales revenue of Rs. 33 Lakhs with a profit of Rs. 10 Lakhs before tax. However, in Year 2 only OPEX is being recovered from profits. All other costs are be subsidized.
- FY 2027-28: Total procurement of 2500 kg of wild honey and 2200 kg of box honey, with a total sales revenue of Rs. 45.7 Lakhs with a profit of Rs. 24,000/-. In Year 3, all OPEX, salary and blockchain costs would be recovered from profits. A more efficient use of resources and better sales would probably increase the marginal profit.
- FY 2028-29: Total procurement of 4000 kg of wild honey and 3000 kg of box honey, with a total sales revenue of Rs. 68 Lakhs with a profit of Rs. 6.4 Lakhs. In Year 4, the honey project would be self-financing and sustainable.

For Year 4 onwards, the honey business should start earning a decent profit with the availability of larger volumes of honey, better developed marketing networks, B to B and B to C tie ups and export markets. All OPEX would be covered by the profits including salaries and there would be sufficient funds with the Federation as working capital. However, management of the roll out over three years would be critical. Quality leadership will ensure success.

Addressing Key Risks and Challenges:

1. **Marketing:** The biggest challenge in the honey value chain in Jawadhu Hills is marketing and sales. Efforts are needed in branding and reaching premium markets, which is essential for differentiating the product and achieving higher profit margins. The **separate two-member marketing unit** established will ensure sales through different strategies – both in online and offline mode.
2. **Market Competition:** The honey market is competitive, and the business will need to differentiate its products through branding and quality to succeed. The packaging and design of the product needs to be exciting and attract the consumer – potentially, using eco-friendly materials which align with the ethos of a customer willing to pay a premium for wild honey. In the initial years, at least 50% sales should be focussed through institutional sales through FPOs, government entities and Tata Companies based in the region.





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3. **Adulteration and Quality Control:** Ensuring consistent quality and preventing adulteration are critical for maintaining consumer trust and accessing premium markets. The emphasis on lab certification and blockchain for traceability ensures that the honey produced meets high-quality standards, which is crucial for gaining consumer trust and accessing premium markets. The IPM component of the Phase II proposal will ensure minimal use of pesticides and fungicides in the region. This will ensure the box honey business remains viable.
4. **Environmental Threats:** The impact of environmental threats on bee populations needs to be monitored and mitigated through sustainable practices. This would include the training and capacity building provided in TNAU. Improved harvesting practices for wild honey will ensure sustainability of wild bee hives and IPM in project villages will ensure sustainability of bee population. Promoting sustainable harvesting practices and engaging local communities in the value chain will further enhance the environmental and social impact of the project. Active involvement of key stakeholders, including collectors, rearers, processors, marketers, and consumers, will ensure practices are monitored, quality ensured and agility in product improvement.
5. **Financial Management:** Effective financial management is crucial to ensure that the business remains profitable and can reinvest in growth and sustainability initiatives. The financial projections indicate positive profit margins and a high return on investment, suggesting that the business can achieve financial sustainability within three years. However, for this to be successful, the RGR Cell would have to manage operations through the Federation for the project duration. The Marketing Cell would function from the Agri-Business Incubator Cell at TNAU. In Year 4, the Federation should be in a position to hire a CEO to manage operations.

Recommended Monitoring and Evaluation Framework

A monitoring and evaluation framework should be established to track the progress and impact of the honey value chain and marketing plan. This will ensure continuous improvement and help achieve the desired outcomes.

OBJECTIVES

The primary objectives of the monitoring and evaluation (M&E) framework are to:

1. Track the progress of the honey value chain and marketing plan.
2. Assess the effectiveness of the implemented strategies.
3. Identify areas for improvement and make necessary adjustments.



4. Ensure the achievement of desired outcomes and impacts.

KEY INDICATORS

The following key indicators will be used to monitor and evaluate the honey value chain and marketing plan:

1. Production Indicators:
 - Total volume of honey produced (wild and box honey).
 - Number of honey collectors and beekeepers involved.
 - Average yield per hive.
2. Quality Indicators:
 - Percentage of honey batches passing quality tests.
 - Incidence of adulteration or contamination.
 - Customer satisfaction with honey quality.
3. Financial Indicators:
 - Total sales revenue from honey.
 - Profit margins.
 - Cost of production per kilogram of honey.
 - Return on investment (RoI).
4. Marketing Indicators:
 - Number of marketing channels utilized.
 - Volume of honey sold through different channels (institutional sales, retail, online).
 - Brand recognition and customer loyalty.
5. Sustainability Indicators:
 - Adoption of sustainable harvesting practices.
 - Impact on bee populations and biodiversity.
 - Reduction in colony loss due to improved harvesting methods.
6. Stakeholder Engagement Indicators:
 - Number of stakeholders (farmers, processors, marketers) actively engaged.
 - Frequency and quality of stakeholder meetings.
 - Stakeholder satisfaction and feedback.

OUTCOMES

The expected outcomes of the honey value chain and marketing plan include:

1. Increased Honey Production: A significant increase in the total volume of honey produced, leading to higher income for honey collectors and beekeepers.
2. Improved Honey Quality: Enhanced quality of honey, meeting national and international standards, resulting in higher customer satisfaction and reduced incidence of adulteration.





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3. **Financial Sustainability:** Achieving financial sustainability with positive profit margins and a high return on investment.
4. **Market Expansion:** Successful penetration of new markets, both domestic and international, leading to increased sales and brand recognition.
5. **Sustainable Practices:** Adoption of sustainable harvesting practices, contributing to the conservation of bee populations and biodiversity.
6. **Enhanced Stakeholder Collaboration:** Strengthened collaboration among stakeholders, leading to better coordination and more effective implementation of the value chain and marketing plan.

IMPACT

The long-term impact of the honey value chain and marketing plan should capture below data:

1. **Economic Development:** Significant economic development in the Jawadhu Hills region, with increased income and improved livelihoods for honey collectors and beekeepers.
2. **Environmental Conservation:** Positive impact on environmental conservation through sustainable harvesting practices and the protection of bee populations.
3. **Social Empowerment:** Empowerment of local communities, particularly tribal communities, through active participation in the honey value chain and marketing plan.
4. **Market Leadership:** Establishing BAYA - Jawadhu Hills honey as a premium brand, recognized for its quality and sustainability, leading to market leadership in the honey industry.

PROGRESS TRACKING MECHANISMS

To ensure effective monitoring and evaluation, the following progress tracking mechanisms will be implemented:

1. **Regular Data Collection:** Collecting data on key indicators through surveys, field visits, and stakeholder meetings on a quarterly basis.
2. **Performance Reviews:** Conducting performance reviews with the project team and stakeholders every six months to assess progress and identify areas for improvement.
3. **Annual Outcome Assessments:** Conducting annual outcome assessments to evaluate the overall effectiveness of the value chain and marketing plan and measure the achievement of desired outcomes and/or impact.
4. **Feedback Mechanisms:** Establishing feedback mechanisms to gather input from stakeholders, including honey collectors, beekeepers, processors, marketers, and customers, to continuously improve the value chain and marketing plan.
5. **Reporting:** Preparing and disseminating regular progress reports, including detailed analysis of key indicators, outcomes, and impacts.



By implementing this comprehensive monitoring and evaluation framework, the honey value chain and marketing plan can be effectively tracked, assessed, and improved to achieve the desired outcomes and impacts.

Log Frame Analysis for Honey Program

	Indicators	Means of Verification	Risks and Assumptions
Goal: Economic development in the Jawadhu Hills region, with increased income and improved livelihoods for honey collectors and beekeepers.	Increase in average income of honey collectors and beekeepers by 30% over three years.	Annual income surveys, financial records of honey collectors and beekeepers.	Destruction in habitat would have an impact on honey in the region. This may be due to climatic or human interventions.
Purpose: Establish a sustainable and profitable honey value chain in the Jawadhu Hills.	Achieve financial sustainability with positive profit margins and a high return on investment by the end of Year 3.	Financial statements, profit and loss account statement and ROI.	It is essential to develop new markets for wild bee honey. Sales and demand will mitigate the risks
Outputs: Increased honey production. Improved honey quality.	10 tonnes volume of honey produced (wild and box honey). 5% of honey rejected after quality tests. Rs. 1 Crore of Sales generated over three	Production records, field reports. Quality test reports by TNAU.	The need to integrate the project will the IPM field extension project in order to ensure that use of pesticides



Expanded market reach.	years from marketing channels (Online and Offline)	Sales and marketing records/reports.	minimized.
Adoption of sustainable practices.	90% Adoption of sustainable wild honey harvesting practices.	Field reports and program assessment	This will conserve the bee colonies. Proper training and capacity building to ensure farmers adopt sustainable harvesting practices.
Enhanced shareholder (Honey Collector/Rearer) collaboration	90% shareholders actively engaged.	Shareholder/Member meeting minutes and relevant records.	Developing niche markets for Jawadhu Hills honey.
Activities: Provide training on modern beekeeping practices and scientific harvesting methods for sustainable production and collection Set up honey processing unit and increase production through bee boxes. Develop and implement a three-year marketing strategy with improved packaging and branding.	5 annual training sessions conducted with TNAU. 1 honey processing units established. 30 rearers through bee box Marketing strategy documents, new packaging and promotional materials.	Training attendance records, feedback forms. Installation reports, operational records. Marketing reports, sales records, documentation.	Ensuring close collaboration with TNAU requires proactive engagement. Need to develop markets for

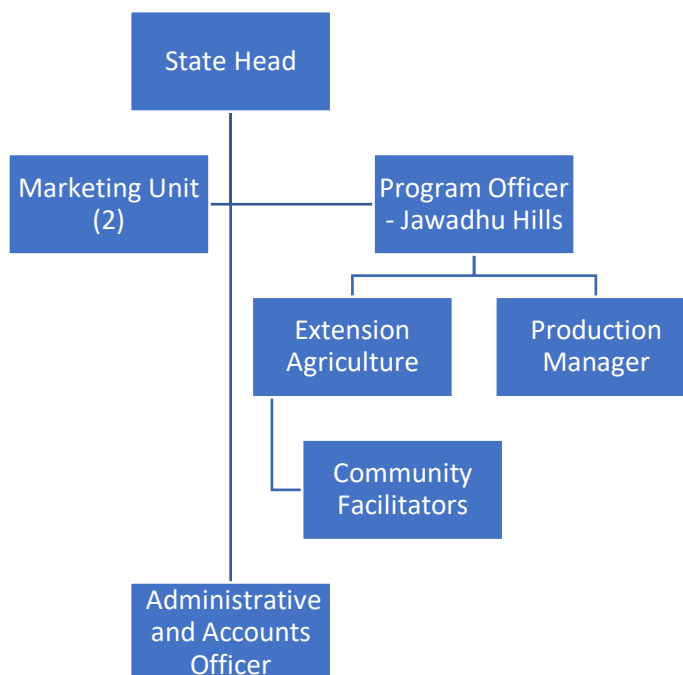




Facilitate stakeholder meetings and collaborations.	Sale of honey by individual members to Federation and meetings with potential buyers.	Meeting minutes, collaboration agreements.	Jawadhu honey. A sophisticated marketing strategy would be required.
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Proposed Human Resource Structure for executing honey business plan for Phase II



Chapter 3.2

CUSTARD APPLE VALUE CHAIN



Fruit orchards in Jawadhu Hills, illustrative of the horticulture base that Phase 2 agroforestry and value-addition plans will build on.



BACKGROUND – CUSTARD APPLE IN INDIA

Custard Apple (Annona Squamos L.) is one of the finest fruits introduced in India from tropical America. It is also found in wild form in many parts of India. It is cultivated in Andhra Pradesh, Maharashtra, Karnataka, Bihar, Orissa, Assam and Tamil Nadu. Besides India, it is common in China, Philippines, Egypt and Central Africa.

It is very hardy, medium in growth and deciduous in nature. The fruits are generally used as fresh, while some products or mixed fruits like custard powders, ice-creams are prepared from the fruits. Besides high nutritive value, it has also a high medicinal value. Unripe fruits, seeds, leaves and roots are considered and used in medicinal preparations.

All Annonas are tropical in origin and grow well in hot and dry climate with varying degrees of difference. Custard apple requires hot dry climate during flowering and high humidity at fruit setting. Flowering comes during hot dry climate of May, but fruit setting takes place on onset of monsoon. Low humidity is harmful for pollination and fertilization. Custard apple withstands drought conditions, cloudy weather and also when the temperatures go below 15 Centigrade. Annual rainfall of 50-80 cm is optimum, though it can withstand higher rainfall.

Custard apple is not very particular about soil conditions and flourishes in all types of soils like shallow, sandy, but fails to grow if the subsoil is poorly drained. It can grow well in deep black soils provided they are well drained. A little salinity or acidity does not affect it but alkalinity, chlorine, poor drainage or marshy-wet lands hamper the growth and fruiting.

The following are some of the varieties grown in different agro-climatic regions of India: (1) Red Sitaphal; (ii) Balanagar; (iii) Hybrid; (iv) Washington; and (v) Purandhar (Pune). Annonas are commonly propagated by seeds. Recently some researchers have developed some techniques in vegetative methods and budding can be adopted for multiplication. The seedlings of local custard apple have proved a good root stock for many improved varieties and hybrids.

Planting is done during rainy season. The pits of 60x60x60 cm at spacing 4x4 m or 5x5 m or 6x6 m depending on soil type are dug prior to monsoon and filled with a good quality FYM, single super phosphate and neem or Karanj cake under dry conditions and with drip irrigation system planting at 6x4 meters has given good growth and better fruit setting. For good plant growth, the weeding should be done to keep away the weeds. Intercropping with some legumes, peas, beans and Marigold flowers are commonly taken by the growers. Normally, no crop is taken during winter as the plants go under rest. The gap filling is to be done, as early as possible. Stagnation of water during first monsoon should be taken care of, if the planting is done on impervious soils or ill drained soils. For uniform flowering and for early flowering and also to check the flower and fruit drop and for improving fruit size, following growth regulators are used. For defoliation and bringing the plants under uniform rest Ethryl at 1000



ppm is sprayed one month after the harvest of the fruits. For better and early flowering Biocil 1 ml per litre of water is sprayed just prior to flowering. 10 to 20 ppm NAA is sprayed just prior to flowering period to reduce the flower and fruit drop. During fruit development 50 ppm GA + 5 ppm + 0.5 ppm CPPU foliar spray improves the fruit size and luster of the fruits.

In general, Custard apple is grown as a rainfed crop, and no irrigation given. However, for early and bumper harvest of the crop irrigation on flowering i.e. from May should be given till regular monsoon starts. For better flowering and fruit setting, mist sprinkling is better over flood or drip system of irrigation as it lower down the temperatures and tends to increase in the relative humidity.

Generally, no manures or fertilizers are applied to rainfed crop. However, for early and bumper harvest with a good keeping quality, the following dose is recommended to a fully-grown tree. Bio-meal 10 kg, 05:10:05. 1 kg Ormichem micronutrient mixture 0.25 kg at the time of flowering and another dose of 10:26:26 or 19:19:19 mixture after fruit setting. Foliar spray with 8:12:24:4 10 gm/ltr, twice during fruit development. Occasionally, zinc or iron or both deficiencies are noticed and can be taken care of by spraying zinc or Ferrous.

Though the crop is hardy, it suffers from the following pests: (i) mealy bug; (ii) scale insects; (iii) fruit boring caterpillar; and (iv) leaf spot, Anthrac nose, Black stone, etc. Spraying with neem oil, Meenark, and some herbal preparation is recommended.

The custard apple is a climacteric fruit and harvested at the maturity state when the fruit starts to change color from green to its varietal color shade. Immature fruits do not ripe. Swallowing some apical buds – showing inner pulp is also an indication of maturity. A grown tree yields above 100 fruits weighing 300 to 400 gm each. The season of harvest is from August to October.

The fruits do not withstand cold storage as well as handling after ripening. Firm but mature fruits can be kept at 6 Centigrade temperature for about a week, but such fruits loose aroma and attractiveness and also develop some insipid taste.¹⁹

¹⁹ (The above information has been culled from the:

https://indiaagronet.com/indiaagronet/horticulture/CONTENTS/custard_apple.htm)



CUSTARD APPLE PRODUCTION IN TAMIL NADU

Custard apple, also known as Seetha Pazham in Tamil, is suitable for cultivation in the plains of Tamil Nadu, especially in semi-arid regions. [1, 2, 3]. In Tamil Nadu, the best time to plant custard apples is May–June or August–September. [3] The fruit is in season from June–September. [2] Custard apple trees can be propagated by seeds, budding, or grafting. The pits should be dug before the monsoon and filled with a good quality FYM, single super phosphate, and neem or Karanj cake. To promote good plant growth, weed the area regularly and intercrop with legumes, peas, beans, and Marigold flowers. For uniform flowering, early flowering, and to improve fruit size, use growth regulators. The custard apple is also known as sugar apple or bullock's-heart in the West Indies. Custard apple can be eaten fresh or used to make juice or crush.²⁰

Custard Apple Value Chain:

A custard apple value chain refers to the series of activities involved in producing, processing, and marketing custard apple, including cultivation by farmers, harvesting, collection at collection centers, processing into pulp or other value-added products, packaging, and finally reaching the consumer through retailers, often with significant involvement from tribal communities in the collection and initial stages, where value is added at each step of the process. [1, 2, 3, 4]

Key components of a custard apple value chain: [1, 2, 4] Production Stage: [1, 2, 4] (i) Farming: Growing custard apple trees on farms, including planting, pest management, and proper harvesting techniques. [1, 2, 4]; (ii) Harvesting: Carefully picking ripe custard apples from the trees. [1, 2, 4]; (iii) Collection: Gathering harvested fruits from farms by traders or collection centers. [1, 2, 3]; (iv) Processing Stage: [4, 5] Sorting and Grading: Classifying fruits based on size, quality, and ripeness. [4, 5]; Washing and Cleaning: Removing dirt and debris from the fruit. [4, 5, 6]; Pulp extraction: Manually scooping out the

²⁰ [1] <https://dir.indiamart.com/chennai/custard-apple.html>

[2] <https://www.naturalmangoes.com/product/custard-apple/>

[3] https://agritech.tnau.ac.in/horticulture/horti_TNAU_varieties_fc_capple.html

[4] https://indiaagronet.com/indiaagronet/horticulture/CONTENTS/custard_apple.htm

[5] <https://theagropedia.com/fruit-science/crops/custard-apple/>

[6] <https://www.britannica.com/plant/custard-apple>



edible pulp, separating it from the seeds and peel. [1, 4, 7]; Value addition: Processing pulp into products like custard apple ice cream, jams, juices, nectars, or even dried fruit. [1, 8, 9]; Packaging: Properly packing the pulp or processed products for storage and distribution. [1, 2, 7]; Marketing Stage: [1, 3, 4] Wholesale Market: Selling processed pulp or fresh fruit to wholesalers or large retailers. [1, 3, 4]; Retail Sales: Reaching consumers through local markets, grocery stores, and online platforms. [1, 3, 4]; Direct Marketing: Farmers selling directly to consumers through farmers markets or online platforms. [1, 2, 3]

There are various challenges in the custard apple value chain: [1, 4, 6] (i) Perishability: Custard apples have a short shelf life due to their delicate nature. [1, 4, 6]; (ii) Post-harvest losses: Significant fruit loss can occur during harvesting, transportation, and processing if proper handling practices are not followed. [1, 6]; (iii) Lack of processing infrastructure: Limited availability of processing units in producing regions can hinder value addition. [1, 6]; and (iv) Market linkages: Difficulty in connecting producers with reliable markets, particularly for small-scale farmers. [1, 2, 6].

Strategies to improve the custard apple value chain include the following: [1, 6] (a) Improved farming practices: Adoption of advanced cultivation techniques to increase fruit quality and yield. [1, 6]; (b) Post-harvest management: Proper handling, storage, and transportation techniques to minimize losses. [1, 4, 6]; (c) Developing value-added products: Creating a wider range of processed products to extend shelf life and market reach. [1, 2, 8]; (d) Farmer Producer Organizations (FPOs): Establishing FPOs to collectively market produce and improve bargaining power. [1, 2, 6] and (e) Capacity building: Training farmers on proper harvesting, processing, and marketing practices. [1, 2, 6]²¹

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[1] <https://www.thepharmajournal.com/archives/2023/vol12issue7S/PartP/S-12-7-126-201.pdf>

[2] <https://www.cabidigitallibrary.org/doi/pdf/10.5555/20210506650>

[3] <https://media.neliti.com/media/publications/314661-prospects-of-custard-apple-value-chain-d-811b1e77.pdf>

[4] <https://www.ijpab.com/form/2021%20Volume%209,%20issue%205/IJPAB-2021-9-5-1-5.pdf>

[5] <https://www.freshplaza.com/north-america/article/9676488/custard-apple-prices-surge-due-to-30-percent-production-drop-amid-heavy-rains/>

[6] https://www.researchgate.net/figure/alue-chain-for-Custard-Apple-Fig-1-Value-chain-for-Custard-Apple-SWOT-Analysis-The_fig1_344287203





Case Study – Custard Apple Value Chain – Beed Maharashtra

The Banjara community is significantly engaged in cultivating custard apple in Maharashtra's Beed district. The case study demonstrates how a small tribal community-driven enterprise turns profitable by processing custard apples in the Beed district of Maharashtra.²²

The custard apple is a drought-tolerant fruit plant. It can remain healthy even in worse atmospheric conditions. The plant does not need much water and pesticides. In other words, custard apple needs less attention, low-maintenance cost, and low investment. It has a pleasant aroma and taste and is also a source of medical benefits when used as an antioxidant anti-diabetic medicine. Further, the custard apple has good acceptability in various value-added products viz., juice, ice cream, toffee, milkshake, vinegar, 'Ready to Serve Beverage', jam, and nectar usually in 10% to 55% concentration. According to The Agricultural and Processed Food Products Export Development Authority (APEDA), yearly yield of custard apple in India was over 298,000 tonnes in 2018. Custard apple grown in the Balaghat ranges of the Beed district has a phenomenal, sweet taste. The high potassium content and micronutrients in the rocky terrain with shallow, gravelly, well-drained soil of Balaghat ranges, especially in Dharur, Ambajogai, Ashti is more prominently responsible for Dharur custard apple's unique and distinct taste. The yield of Beed custard apple is 10.89 Kg/Plant. The perfectly round shape, attractive shiny green external fruit color with pleasant texture and flavor, and the distinct creamy white or yellowish color with wide space appearing on maturity are the key features to identify the custard apple from Dharur. The Beed custard apple is heavy and produces a high quantity of pulp. The pulp is juicy, white creamy, granular, edible, soft and fleshy, with a mild flavor and slight acidity (0.24%) (*Balaghat Sitaphal Sangh, 2016*). Maharashtra leads the country in custard apple production, with 92,320 tonnes, followed by Gujarat, Madhya Pradesh and Chhattisgarh. Custard apples are also grown in Assam, Bihar, Odisha and Rajasthan. (*Journal of Management & Public Policy, Vol. 14, No. 2, June 2023*).

[7] https://www.csrbox.org/India_organization_project_Madhya-Pradesh,Maharashtra,Rajasthan,Telangana-Custard-Apple-Value-Chain_8732

[8] https://www.researchgate.net/publication/375994441_Custard_Apple_Value_Chain_in_Beed_District_of_Maharashtra_India_A_Case_Study

[9] <https://www.custardapple.com.au/about-custard-apples/nutritional-benefits>

²² (*Alumnus of Development Management Institute, Development Professional involved in Social 9 Sector in India. Journal of Management & Public Policy, Vol. 14, No. 2, June 2023 and processing of custard apples among the tribal community, as an alternative means of livelihood and income augmentation.*).



The organization facilitated village level women organization to start a custard apple processing unit to make them sustainable. Earlier, they were involved in cotton harvesting as laborer and made Rs. 100/- per day. The government gave a grant of approximately Rs. 5 Lakhs to start a processing unit. It may also be noted that it is a perishable commodity and is available for a very short period of 1-2 months. An average of 10 women were involved in the whole process including procurement, processing, and market linkages. A technical agency facilitated their endeavors. The targeted customers for the processed pulp of custard apples were the ice cream industries, local juice vendors among others. Previously, the tribal women of Beed district depended on the local aggregator who in turn had a monopoly in this region. Hence the custard apple farmers in the district were not able to get good prices for their yields. The aggregators used to buy custard apples from the local farmers at rate of Rs. 4/- to Rs. 5/- kg and sell the same at the rate of Rs. 80/- per kg or more in the city markets. After the setting up of the custard apple pulp processing unit as part of government intervention, the local farmers were able to get Rs.12-14/- per kg. Also, the processing unit is engaged in extracting the pulp. However, there are several opportunities available to the local micro entrepreneurs. They can get involved in converting custard apple pulp into powder and sell the same on various online platforms. Thus, a seasonal venture can be converted into a round-the-year enterprise for the tribal women. For example, custard apple can also be used for making jam, fruit-flavored yoghurt, fruit drinks and syrups, with fruit extracts from custard apple (Hoyos, 1980), juices (Sinthiya and Poornima, 2017), candies, and wines (Kadam (2001), ice-cream (Yadav et al., 2010), squash (Sravanthi et al., 2014), milkshake (Bakane, 2016), vinegar (Raichurkar and Dadagkhair, 2017) or nutritional flour (Souza et al., 2018).²³

CURRENT STATUS OF CUSTARD APPLE PRODUCTION AND VALUE CHAIN IN THE JAWADHU HILLS

In the Jawadhu Hills, the custard apple has become valuable over the last few years. Historically, there has always been plenty of custard apple grown in the region, as an orchard fruit or in land close to the forests. Recently, as custard apple has become increasing popular as a health food in big cities; consequently, demand for it as fresh fruit has increased enormously. It has now become a much sought-after fruit in markets such as Chennai. Consequently, a lot of traders have started procuring custard apple from the Jawadhu Hills. The increasing demand for custard apple has also created village levels

²³ (Journal of Management & Public Policy, Vol. 14, No. 2, June 2023 Journal of Management & Public Policy, Vol. 14, No. 2, June 2023, Pp. 9-15 ISSN 0976-0148 (Online) 0976-013X (Print) DOI: <https://doi.org/10.47914/jmpp.2023.v14i2.002> Custard Apple Value Chain in Beed District of Maharashtra, India: A Case Study Amit Kumar Singh* and Himanshu Kumar).



entrepreneurs, who are now buying from local growers and directly selling to wholesalers in Chennai. The custard apple from Jawadhu Hills is known for its high quality and fruity nature.

1. LOCAL LANDSCAPE VIEW FROM A VENDOR

An excellent overview of the custard apple scenario in the Jawadhu Hills was provided by a farmer called Ganapati, who has been majorly involved in purchase and sale of fresh custard apple over the last three years.

In 2024, Ganapati purchased over 1600 tonnes of custard apple from 10 villages. The monthly purchase was approximately 562 tonnes per month over the three-month harvesting period. Usually, custard apple is purchased in 25 kg crates. The current season prices were at Rs. 800 per crate, which works out to Rs. 32 per kg. Selling price in the Chennai wholesale market in Rs. 1500/- per crate, which works out to be Rs. 60 per kg. Ganapati sold 1000 tonnes in the Chennai market and transported 600 tonnes to Kerala. Retail price in Chennai is approximately Rs. 130 to 140/- per kg. During the season, Ganapati hired and send over 15 truckloads to the Chennai market. After transportation, Ganapati has made approximately Rs. 450/- to Rs. 500/- per crate. Custard apple loses its water content rapidly, which can come down by over 25% in twenty-four hours. Consequently, discoloration is rapid and taste is not the same once the color starts to change. Therefore, most farmers harvest the fruit between 4 AM to 6 AM. Ganapati ensures that the fresh fruit reaches Chennai wholesale market by 3 to 5 PM. All the farmers expect spot payment. Consequently, Ganapati funds are mainly tied up in working capital for the famers. He is unable to further expand his business because of working capital shortage. In many cases, he also provides advance payments to farmers.

Ganapati was of the view that in all the 300 villages of Jawadhu Hills, custard apple was available in sufficient quantity. Overall like him, there were around 10 active vendors in the region. Consequently, his estimates that the total availability of custard apple in the Jawadhu Hills is around 15,000 tons.

2. TNAU & INTERVENTIONS IN CUSTARD APPLE

A meeting with Dr. J. Auxilia, Professor and former Head of the Department of Fruit Crops at TNAU was also held and their work on custard apple discussed. Unfortunately, TNAU has not done very much work on custard apple. Dr. Auxilia said that she would do some homework and revert vis-à-vis any specific work done by TNAU with custard apple and indicated that research can be taken up, if needed. Discussions on custard apple were also held with the Vice Chancellor of TNAU, Dr. V Geethalakshmi, who indicated it would be best to get in touch with the Community Science and Research Institute (formally Home Science College) in Madurai, who may have worked on custard apple-based products. The RGR Cell team is requested to get in touch with Home Science College and explore options.

3. CFTRI & INTERVENTIONS IN CUSTARD APPLE

A meeting was also held with Dr. Vijayalakshmi Subu of Technology Transfer & Business Development (TTBD) Department of the Central Fruit Technology Research Institute (CFTRI), Mysore who indicated that Dr. Vijayalakshmi MR of the department has worked extensively on custard apple. Unfortunately, Dr. Vijayalakshmi MR was on tour and a virtual meeting can be planned in the near future. CFTRI has an online recommended processing unit for custard apple. However, information on its efficacy would only be known to Dr. Vijayalakshmi MR.

CFTRI informed that a complete cold storage supply chain is required for custard apple. Potential clients can be the ice cream and dairy industries. However, in the market, artificial flavors of custard apple are available, which considerably reduce the costs of product manufacturers. There is also potential of converting the fruit pulp into powder, which adds additional costs.

CFTRI has an off the shelf production solution for processing custard apple. The plant and machinery include fruit pulper, pulp collection tank with transfer pump, blast freezer, deep freezer, mixing tank with agitator, micro filtration plant, etc. Total cost of machinery has been indicated at Rs. 34 lakhs. The recommended unit has capacity of 1000 kg of frozen pulp along with 1000 liters to RTS beverage and 500 kg of Jelly per day and working capacity of 300 days per year. The estimated model project developed by CFTRI has the following numbers:

1. Rented Building – Rs. 1.2 Lakhs
2. Plant & Machinery – Rs. 34 Lakhs
3. Miscellaneous Fixed Assets Rs. 5 Lakhs
4. Pre-operative Expenses Rs. 2.9 Lakhs
- Total Fixed Costs Rs. 43.1 Lakhs
5. Working Capital Rs. 16 Lakhs
6. Total project costs Rs. 59.10 Lakhs

CUSTARD APPLE VALUE ADDITION AND BUSINESS MODEL

There is scope of working in the value chain of custard apple in the Jawadhu Hills. Currently, there are very few players in South India working on the custard apple value chain. The case study in this chapter highlights scope and the possibilities. However, selling or trading in custard apple as a fresh fruit is already a big business in the Jawadhu Hills with a number of well embedded local players. In addition, the rate of purchase provides limited scope for interventions in the value addition space.

NEED FOR A COMPLETE COLD STORAGE SUPPLY CHAIN

Due to the high perishability of custard apple, a complete cold storage supply chain would be required. The cold storage of processed custard apple pulp permits the sale of stocks based on demand from vendors.



TECHNOLOGY GAPS – MANUAL PROCESSING OF FRUIT

Detailed discussions were held with Mukesh Sharma, formally of Centre for Microfinance (CMF), Jaipur, now running his own Agri start up called “Groww Greens”. Mukesh has extensive experience of developing cluster apple value chain in Rajasthan. The main problem with the processing units has been the breakage of the seed by the deseeding machine. The custard apple seed is mildly toxic. Consequently, the local women’s group had to commence manual removal of the seeds, which added majorly to the processing costs. The first major change since CMF’s venture into the cluster apple value chain in the improvement in the quality of the processing machinery. The latest deseeding machines, has reduced seed breakage to less than 1%. Therefore, manual deseeding is not required. This will automatically make the processing much more hygienic and pass quality assurance or procurement standards of serious vendors. This will also reduce labor costs substantively. It may be useful to get CFTRI input on the current available machinery and its efficacy.

HIGH CAPEX COSTS

The costing the machinery recommended by Groww Green is slightly less than the version promoted by CFTRI. The Groww Green version costs about Rs. 29 lakhs. In addition, their model required working capital of around Rs. 8 Lakhs, as against Rs. 16 lakhs recommended in the CFTRI version. Most of the equipment manufacturers are based in Gujarat or Maharashtra.

- The version recommended by Groww Green, has a capacity of 40 tonnes, while the CFTRI version has a capacity of 10 tonnes. Groww Green’s model can process 20 to 25 kgs per hour. It is important to note that the working season is only 3 months. Therefore, installed capacity in most cases is underutilized.

HIGH COST OF PRODUCTION & INELASTIC MARKET

CMF has sold over 170 tonnes in 2023, before their management decided to close operations, as margin were minimal and it was not possible to give returns to SHG members.

- All the processed fruit was kept in cold storage as frozen pulp and sold to vendors, as per demand.
- The economics of the CMF value chain were as following:
 - Custard apple was bought at Rs. 14/- to Rs. 15/- per kg. It is important to note 5 kgs of fruit gives 1 kg of pulp. The seed is sold to vendors, who extract the oil, which is then used for industrial purposes. Raw seed is sold at Rs. 15/- per kg. 10% of the waste is seed. The rest is skin and other items.
 - The bulk of the processing at the CMF plant was manual, due the constant breakage of the seed. Consequently, 30 laborers per day were employed during the season, especially on deseeding. It is estimated that two-thirds of the processing costs were towards the labor costs. Processing costs were quite high and work out to Rs. 125/- to Rs. 135/- per kg. It is important to note that 1 kg of fruit pulp costs Rs. 75/- (5 kgs of



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raw fruit give a kg of pulp). Consequently, the total costing worked out to Rs. 190/- to Rs. 200/- per kg. Costs of the cold storage can be added @ Rs. 2/- to Rs. 5/- per kg per month. Therefore, CMF was unable to sell the frozen fruit for less than Rs. 200/- per kg. CMF's price range was between Rs. 185/- to Rs. 250/- per kg depending on the fiber content.

- o CMF explored selling the custard apple's frozen pulp to ice cream manufacturers in Gujarat and Maharashtra. Vadilal was not ready to pay more than Rs. 80/- to Rs. 100/- per kg and Dinshaw's of Nagpur was ready to pay up to Rs. 180/- per kg depending on the quality. Eventually, their maximum sales were to fruit juice and milk shake makers and wedding and event vendors in Maharashtra, especially Pune.

LOW PROFIT MARGINS

- Overall, the margins were very small. Therefore, to make money it was important to deal in volumes. The volume processed by the CMF unit was quite large. SRIJAN handles an even larger volume of custard apple and processed nearly 350 tonnes per annum. However, their challenges are similar. It has become a volume business.

KEY GAPS AREAS

- The other key gaps areas are as follows: (i) ensuring fruit availability and quality; (ii) the need to train farmers on proper fruit collection methods to order to minimum days needed for ripening; and (iii) the serious problems of storage of the fruit including an end-to-end frozen value chain.

JAWADHU HILLS & THE POSSIBILITY OF DEVELOPING A CUSTARD APPLE VALUE CHAIN

In the context of Jawadhu Hills. The following can be concluded:

- Jawadhu Hills has sufficient volumes of custard apple available for exploring the setting up of a processing unit. However, the costing is critical.
- Currently, there is no work whatsoever happening in processing of custard apple. As on date, custard apple is being sold, as fresh fruit in large cities in Tamil Nadu and Kerala. The rates are quite high as compared to other parts of India. Farm gate price in Rajasthan and Maharashtra is between Rs. 13/- to Rs. 17/- per kg. In Tamil Nadu, it is Rs. 32/- per kg. The high rate for fresh fruit in Tamil Nadu changes the whole dynamics of the value chain in the state.
- The cost of 1 kg of fruit pulp will cost Rs. 160/- in the Jawadhu Hills. In Rajasthan, it costs Rs. 75/- per kg of pulp.
- As there has been a considerable improvement in the processing technology, the volume of labor used in Rajasthan may not be required, if a new plant has to be set up in the Jawadhu





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Hills. This may bring down the processing costs by nearly 50%, which would work out to Rs. 80/- per kg, which could go up to Rs. 100 per kg, if the machinery develops some problems and manual processing has to be resumed.

- Therefore, the cost per KG in the Jawadhu Hills would work out to between Rs. 240/- to Rs. 280/- per kg. An additional amount of Rs. 2/- to Rs. 5/- can be added per kg per month towards cold storage charges.
- The Jawadhu Hills Federation running the pulping plant would not be able to sell the frozen pulp for less than Rs. 300/- plus per kg. It is possible that they may face serious competition from imported frozen custard apple fruit from Rajasthan and Maharashtra, which would cost around Rs. 250/- per kg. Therefore, many vendors may prefer to import frozen pulp, as against favoring local manufacturing.

CONCLUSION

Post Analysis, it is recommended the RGR Cell through the new federation **currently avoid getting in the custard apple value chain**. The option which can be explored, would be to **assist in the marketing of fresh fruit**, if the local vendors start undercutting the farmers. Currently, they are offering quite a decent rate. The RGR Cell can add **horticulture extension to their agriculture extension activities**, so that farmer yields can be maximized and **unnecessary money not wasted on excessive pesticide application**, etc.

In case the scenario changes over the next couple of years, RGR can explore developing the custard apple value chain as explained in detail in this section.



Chapter 3.3

LITTLE MILLET VALUE CHAIN²⁴



Paddy and millet cultivation in the lowland areas surrounding Jawadhu Hills.

²⁴ The Tamil Nadu government has run a dedicated Tamil Nadu Millet Mission since 2023, with an allocation of approximately Rs. 55 crore in the 2025–26 Agriculture Budget for expanding millet cultivation area, farmer producer groups and processing infrastructure – a state-level policy tailwind relevant to scaling little millet and ATL-1 seed multiplication in Jawadhu Hills. (Source: Government of Tamil Nadu Agriculture Budget 2025–26, reported in Deccan Herald, March 2025.)





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Sunset over one of the water bodies in Jawadhu Hills that support surrounding agriculture.



LITTLE MILLETS BACKGROUND - TAMIL NADU

Little millet (*Panicum Sumatrense*), known as "Samai" in Tamil, is a small-grained millet widely grown in Tamil Nadu. It is a nutritious and drought-resistant crop, often used as an alternative to rice and wheat in traditional Tamil cuisine. In Tamil Nadu it is grown in regions like Salem, Dharmapuri, Krishnagiri, Coimbatore, Erode and Tiruvannamalai.

Little millets thrive in drylands and requires minimal water. They are sown mainly in the Kharif season (June–July) but also in the Rabi season (September–October). The crop is harvested within 90–100 days of sowing. It is grown primarily for food security, as it is rich in fiber, minerals, and antioxidants. The nutritional benefits of little millets are as following: (i) rich in fiber, protein, iron, and B vitamins; (ii) helps in diabetes management due to its low glycemic index; and (iii) good for weight loss and digestive health. Little millet is gaining popularity due to the "Millet Revolution" in Tamil Nadu, promoted by the government to encourage farmers and consumers to adopt millets as a staple food.

Little millet is well-suited to warm and dry conditions, thriving in areas with 600–900 mm of rainfall. It can grow in a variety of soils, including sandy loam, red soil, and lateritic soil, but well-drained, fertile soils with a pH of 5.5–7.5 are ideal. Varieties grown in Tamil Nadu include CO4, CO6, ATL1 and Paiyur2. The following fertilizers are recommended: (i) Organic: 5–10 tons of farmyard manure (FYM) per hectare before sowing; and (ii) Inorganic: 40:20:0 kg of NPK per hectare. Half of the nitrogen should be applied at sowing, and the rest after 30 days. The crop requires minimal irrigation; rainfed cultivation is common. One or two intercultural operations are needed to remove weeds. Herbicides like Pendimethalin (1 kg/ha) can be used as pre-emergent weed control. Some of the prominent pest and diseases are the following: (i) Shoot fly – use neem-based pesticides or treat seeds with Imidacloprid; (ii) Earhead bug – Spray neem oil (5%); (iii) Blast – use resistant varieties and fungicides like Carbendazim; and (iv) Smut – treat seeds with Thiram before sowing.

On an average, little millets mature within 80–100 days after sowing. Harvesting is done when grains turn golden brown. Average yield is approximately 1–1.5 tons per hectare. The harvesting is done mainly by threshing. In more backwards areas it is still done manually. Grains are sun-dried before storage to reduce moisture content. Little millet is used for porridge, dosa, upma, and rice substitutes. There is high market demand due to its health benefits and gluten-free nature.

LITTLE MILLETS – VALUE CHAIN – TAMIL NADU

The Little Millet (*Panicum sumatrense*) Value Chain in Tamil Nadu involves various stages, from cultivation to consumer markets.

Some of the key features of its value chain are as follows. Little millet grains have a hard husk, requiring specialized dehulling machines. Thereafter, it goes to the mills to be processed into flour, semolina,



flakes, and ready-to-cook products. Most of the processing is done by small-scale processors and farmer producer organizations (FPOs) operating in millet-growing regions. Some value addition is done through modern mills in Coimbatore, Salem and Madurai. The value-added products developed from little millets include: (i) Millet rice (dehusked grain); (ii) Flakes & Porridge mixes; (iii) Millet flour for dosa, idli, and chapati; (iv) Snacks like murukku and biscuits; (v) Millet-based ready-to-eat foods. However, the bulk of little millets is still sold in village markets or farmer markets or retailed in local grocery stores under organic/natural labels.

Some of the prominent efforts by the government include the following: (i) Tamil Nadu Millet Mission – Supports farmers with seeds, training, and subsidies; (ii) ICAR & TNAU Research – Developing high-yielding varieties and processing innovations; and (iii) FPOs & SHGs (Self-Help Groups) – Enabling small farmers to access markets and improve incomes. The government has also made a serious effort to promote millets under the "International Year of Millets 2023" initiatives. Finally, there are a lot of agro-based startups – emerging brands marketing millet-based snacks and health foods.²⁵

The main challenges in the value chain are the following: (i) low yields – need for better seed varieties and mechanization; (ii) processing gaps – dehulling remains a bottleneck; and (iii) market awareness – consumers are still shifting towards millets in a very gradual manner. However, there are numerous opportunities for growth, as there is a rising demand for gluten-free and high-fiber foods.

CURRENT STATUS OF LITTLE MILLETS IN JAWADHU HILLS

The Jawadhu Hills are known for little millets. Farmers mainly grown little millet under rainfed conditions, which essentially provides food security at household level. The RGR Cell has extensively intervened under little millet under Phase 1 of support under TITAN. Details are covered in the introductory chapter.

MARKET SCENARIO IN JAWADHU HILLS

A detailed meeting was held with a leading trader in Jamunamarathur called Irshad Ahmed. Bismillah Traders run by Irshad Ahmed family has been trading in Jamunamarathur since 1920 and is one of the key private procurement players in the little millet business in the Jawadhu Hills. Irshad explained that this year was a bad year, as 60% of the crop has been destroyed because of drought type conditions. Apart from Bismillah Traders, there is another two traders in the market. Irshad handles 225 tonnes, while another even larger trader handles 375 tonnes, annually. However, volumes are down 50% this year, due to the drought. These traders handle 90% of the millets procured in the Jawadhu Hills and are into the volume game. They are only involved in the procurement of the basic commodity, which is

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then loaded onto trucks and transported to processing units in different parts of the state and outside. Bulk of the raw material is transported to 4 or 5 mills in Theni or to mills in Nashik, Maharashtra, who give far higher rates.

The spot price for procurement is Rs. 35/- per kg, which works out to Rs. 3500/- per quintal. Selling price is Rs. 3925/- per quintal. The margin of Rs. 425/- between the selling and cost prices, which covers all transportation, levies, taxes, brokerage, profits, etc. As can be seen, currently profit margins are razor thin and the traders are not making any real money.

INSTITUTIONAL PLAYERS INVOLVED WITH LITTLE MILLET IN THE JAWADHU HILLS

Some level of local procurement of little millet is undertaken by Devine Pure, TVS – SST and Hand-in-Hand, who in the current FY handled 5 tonnes, 1 tonne and 15 / 18 tonnes, respectively.

- Divine Pure has procured little millet at Rs. 37/- to Rs. 40/- per kg and after processing sold it to wholesalers at Rs. 140/- per kg and retailers at Rs. 180/- per kg. However, it is important to note that they are totally reliant on the government system for sales. Therefore, Devine Pure cannot be considered a serious market player, as they are not competing in the market.
- TVS-SST has purchased small millet at Rs. 45/- per kg from farmers and retailed it at Rs. 110/- per kg. Their margins were under pressure due to extremely high transportation costs considering their small volumes. Sales were through their factory outlets and the online portal.
- Hand-in-Hand is more serious player in the small millet business. However, they are also struggling, as margins are exceedingly thin. Furthermore, there are large number of players in the market, which in itself has become very crowded. Hand-in-Hand procured 15 to 18 tonnes of little millet and did a total business of Rs. 25 Lakhs through their Producer Company. They also have a product called “Healthy Mix”, which is a combination of different millets, Ragi, etc. Healthy Mix had a turnover of Rs. 8 Lakhs last year. Hand-in-Hand purchased little millet @ Rs. 40/- through their Producer Company. They also have their own cleaning and processing plant. 70% of the processed millet was sold to wholesalers and to other B to B at players @ Rs. 45/- per kg. Only 30% is being directly sold to super markets and other retail outlets @ Rs. 100 per kg in one of five kgs bags. Hand-in-Hand were not happy with the current business, as the razor thin margins were putting a lot of pressure on the viability of the business.

Due to the increasing popularization of millets mainly as a health food, there has been a substantive increase in the demand for millet products amongst consumers. However, supply is limited, as little millets are grown in marginal or uplands by farmers with very limited care. Consequently, yields are low. Nevertheless, farmers are getting a good gate price. Retail market seems inelastic and consumer is not ready to pay extra for millet products.



TNAU & INTERVENTIONS IN LITTLE MILLETS

A meeting was also held with Dr. Vaithiyalingan the Director of TNAU's "Centre of Excellence in Millets" in Athiyandal and various aspects of production of little millets were discussed. Some of the key highlighted are captured below:

- Dr. Vaithiyalingan admitted that there are some lodging related problems with ATR1. Work is underway within TNAU on developing ATR2, which will be resistant to lodging. However, it will take another two to three years before it is made available to farmers.
- One of the key ways of tackling lodging is to change the sowing practices of farmers in Jawadhu Hills. Farmers continued to sow small millet using broadcasting, which is not recommended. Farmers in the region do not take little millets seriously, as it is considered a secondary crop. Due to its hardy nature, some returns are always ensured. The PoP and all the demonstrations laid out in Athiyandal emphasize on transplanting and line sowing of little millet. This would to a large degree tackle the lodging problem.
- The Centre of Excellence for Millet was keen to work with the RGR Cell team in Jawadhu to help better implement the PoP for little millets including field demonstrations and training of all RGR Cell personnel at both Athiyandal and at field level.
- The RGR Cell need to tie up with Dr. Vaithiyalingan and team to access the latest millet technologies for extension purposes. Currently, the RGR Cell's extension model is nonexistent. Apart from basic trainings, the overall extension strategy needs to be reviewed and revived. This needs to be the primary focal area going into the Phase II proposal. Consequently, all assistance required from TNAU should be accessed.

BUSINESS PLAN FOR LITTLE MILLET

Considering the ground situation, it may be advisable if the RGR Cell avoiding working extensively on the millet value chain. The following is recommended:

- Focus on Agriculture Extension for Dryland Farming: The RGR Cell in the Jawadhu Hills needs to focus its efforts on agriculture extension for little millets, as against getting into the value chain business. As this chapter has indicated, margins are minimal, as there are already a large number of players in all aspects of the little millet value chain. Therefore, it may not be a great idea to get involved in any major type of value addition in little millets. Focus needs to remain on dryland agriculture extension with a lot of emphasis on little millet and horse gram.





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- Dryland Farming: Agriculture extension around dryland farming is at the core of the Phase II proposal. The dryland farming extension would also require the provision of supplementary irrigation, and cover crops like horse gram, which is grown in the same piece of land after little millets are harvested. It is advisable to explore promoting tomatoes and other vegetables under trellis or in open fields. This will require the RGR Cell to put in place a fully staffed and trained agriculture extension team.
- Focus on Animal Husbandry The above interventions need to be dovetailed with goat rearing. Goatery has played the primary role in ensuring that most households reached income levels Rs. 1 Lakh per annum under Phase I. Under Phase II, it is important that most households now move towards semi stall feeding of goats, which will reduce ecological damage usually associated with goats. Another linked intervention is fodder development for the goats, which can be linking to dairying as livelihood option. For the long-term development of the rural community, it is imperative to link the farmers who have cattle to dairy. Dairy is the mainstay of livelihoods in the areas surrounding Jawadhu Hills. Promoting dairy in Jawadhu Hills will have a long-term impact on stabilizing and sustaining livelihoods in the region like elsewhere.

A basket of livelihood options is required at the house hold level. This will ensure a steady income to each household and ensure they remain **Latchathipathi**. However, in order to get all the pieces gel, it is important to get full control on the production process with quality agriculture extension.

RGR Cell technical capacities needs to be enhanced considerably during the next Phase in keeping with the reputation of the organization vis-à-vis excellence in agricultural extension. Once work at field level is under control, it will become much easier to deliver and ensure sustainability at household level.



Chapter 3.4

HORSE GRAM VALUE CHAIN²⁶

²⁶ Horse gram (*Macrotyloma uniflorum*) is among India's most drought-resilient pulses, tolerating rainfall as low as 300 mm and poor soils, and is widely grown by resource-poor and tribal farmers in Karnataka, Andhra Pradesh, Tamil Nadu and Odisha; it is increasingly positioned as a nutrient-dense "climate-resilient" crop rather than a purely subsistence one, supporting the case for a horse gram RTE snack line. (Sources: Down To Earth, "Why horse gram is a neglected, climate-resilient crop", 2024; Crop Trust, "Horse gram" crop profile.)



BACKGROUND: HORSE GRAM

Macrotyloma Uniflorum (horse gram), also known as horse gram, kulthi bean, gahat, hurali, or Madras gram^[2] is a legume native to tropical southern Asia, known for its distinct taste and texture, widely used legume in many cuisines. It is also known for human consumption for its rich nutrients and reputed medicinal properties. It is commonly grown for horse feed, hence the name “horse gram”. Horse gram grown in parts of India, as well as Nepal, Malaysia, Sri Lanka, and is introduced to the West Indies.^[3] It is consumed whole, sprouted, or ground. It is consumed in many parts of India and is also known as a superfood. Horse gram is also allowed to be eaten on some Hindu fasting days. Medical uses of these legumes have been discussed and is described in the Ayurveda.

Description: *Macrotyloma uniflorum* is a perennial climbing plant with a rhizome, growing to a height of about 60 cm (24 in). The stem sprouts from the rhizome each year. It is clad in varying amounts of whitish hairs and bears alternate, trifoliate leaves with petioles up to 7 cm (2.8 in) long. The leaflets are obovate or elliptical, and up to 7 cm (2.8 in) long. The flowers are borne in twos or threes in the leaf axils, and are typical of the bean family with banner, wings and keel. They are cream, yellowish or green, often with a purple blotch inside. These are followed by linear-oblong, upcurving pods up to 8 cm (3.1 in) long, containing up to ten reddish-brown, speckled or black seeds.^[4] The seeds have a length of 3–6 mm (0.1–0.2 in).^[5]





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Young Plant





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Flowers





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Young Fruit





Horse Gram Seed

Distribution: Horse gram is native to tropical southern Asia and has been found in archaeological sites in India, starting from 2500 BC.^[6] The plant was probably first domesticated in India, and is now grown as a legume from India to Myanmar. Additionally, the crop is also grown for fodder and green manure in tropical countries in southeastern Asia, and in northern Australia.^[4] Generally, the major growing areas of horse gram are located in India, Africa and Australia.^[7]

Cultivation: Horse gram is drought tolerant^[8] and also withstands harsh environmental conditions such as salinity or metal stresses.^[9] Generally, Horse Gram is planted with low agronomic inputs and without weeding. Furthermore, the crop grows on a broad range of soil types with different pH ranges. Cultivation is also possible on soils with poor organic matter and nitrogen availability.^[5] Horse gram thrives where the temperature is in the range of 20 to 30 °C (68 to 86 °F). Frost temperatures are lethal.^[7] Due to the drought-resistance horse gram is grown in areas with low precipitation (300–900 mm (12–35 in)). In wetter areas, horse gram is usually sown at the end of the rainy season to still facilitate cultivation. Nonetheless, horse gram does not tolerate waterlogging.^[10]



The plant is not only cultivated as a monoculture, but also as an inter-or mixed crop together with groundnut, sorghum, sesame, niger, maize, finger-millet, pearl-millet, amaranth, marvel grass or kidney bean. Furthermore, horse gram can also be grown along with trees such as neem, white siris or babul. Both, grain and green forage yield are highly dependent on the growing region as well as the selected cropping system. Substantial yield differences in the various growing regions exist: In India green forage yield varies from 5 - 14 t/ha and in Australia approximately 4.4 t/ha are reported. Grain yield in India is around 0.13 – 1.2 t/ha and 1.1 – 2.2 t/ha in Australia.^{[5][7][11]}

Pests: Yield-impacting diseases are anthracnose (*Colletotrichum lindemuthianum*), the yellow mosaic virus as well as powdery mildew. Other diseases affecting horse gram are dry root rot (*Macrophomina phaseolina*), rusts, aerial blight (*Rhizoctonia solani*) and leaf spot (*Cercospora*). The pod borer (*Etiella zinckenella*) and the pod fly (*Melanagromyza obtusa*) are the most damaging insect pests.^{[5][7]} Others are aphids (*Aphis craccivora*), hairy caterpillar (*Azazia rubicans*), pod caterpillar (*Helicoverpa armigera*), American serpentine leaf miner (*Liriomyza trifolii*), thrips, leaf hoppers and *Callosobruchus* as a storage pest.^{[5][7]}

Nutrition: Horse gram and moth bean are legumes of the tropics and subtropics, grown mostly under dry-land agriculture. The chemical composition is comparable with more commonly cultivated legumes. Like other legumes, these are deficient in methionine and tryptophan, though horse gram is an excellent source of iron and molybdenum. Comparatively, horse gram seeds have higher trypsin inhibitor and hemagglutinin activities and natural phenols than most bean seeds. Natural phenols are mostly phenolic acids, namely, 3,4-dihydroxybenzoic, 4-hydroxybenzoic, vanillic, caffeic, *p*-coumaric, ferulic, syringic and sinapic acids. Though both require prolonged cooking, a soak solution (1.5% NaHCO₃ + 0.5% Na₂CO₃ + 0.75% citric acid) has been shown to reduce cooking time and improve protein quality.^[12]

Horse gram seed contains carbohydrate (57.2% w/w), protein (22% w/w), dietary fiber (5.3% w/w), fat (0.50% w/w), calcium (287 mg), phosphorus (311 mg), iron (6.77 mg) and calories (321 kcal) as well as vitamins like thiamine (0.4 mg), riboflavin (0.2 mg) and niacin (1.5 mg) per 100 grams of dry matter. The nutritional content is partly dependent on soil conditions and the weather. The less appealing taste has led it to be not commonly eaten.^[13]

The carbohydrate-fraction of horse gram flour consists of oligo-saccharides and starches. The starches can be divided in terms of digestibility in those that can be digested and uptake in the small intestine, and those that partly will fermented in the colon by the microflora. The latter ones, called resistant starches, account for 43.4% of the carbohydrate content of horse gram flour. Oligo-saccharides such as raffinose and stachyose contribute to digestion difficulties. The fermentation in the colon often may lead to flatulence and diarrhea, given the high concentration of both, resistant starches and oligo-



saccharides, for horse gram longer cooking times, and other treatments are needed.^[9] Enzymatic treatments with xylanase has the goal to improve the functional and expansive properties of horse gram seeds in order to facilitate the use as an ingredient in the food industry. By following a high temperature short time (HTST) treatment, the content of phytic acid, tannins and protease-inhibitors could be reduced by 46%, 61% and 92% respectively. The flour resulting from this treatment had higher water- and oil-absorption capabilities. Those improvements in digestibility and processability could make horse gram an interesting protein- and flour source for the food industry.^[14]

Breeding: Globally, southwest India and the African continent are regarded as horse gram gene-rich regions.^[7] From the 1970s, germplasm of horse gram has been conserved.^[15] The *US Department of Agriculture's (USDA) Germplasm Resources Information Network (GRIN)* has preserved 35 accessions of horse gram, the *Australian Tropical Crops and Forages Genetic Resources Centre*, has 38 accessions and the *Kenya Agricultural Research Institute (KARI)* has conserved 21 accessions.^[7] A large amount of drought resistance genes exist in horse gram and grain yield enhancement represents the main breeding goal.^{[7][15][8]} Little attention has been given to the genome structure and organization of horse gram. The use of new genes for horse gram breeding could benefit from genetic data on numerous phenological and morphological features. These may impact agronomic methods and crop productivity.^[16] Many unfavorable traits such as late flowering, indeterminate twining growth habit, long and thin stem, thermo- and photosensitivity and a poor harvest index exist in horse gram.^[7] The digestibility and processability improvements described in nutrition section implicitly suggest to consider the reduction of phytic acid content, tannins and protease-inhibitors as additional breeding goals.

Medicinal Uses: Scientists from the Indian Institute of Chemical Technology have found that unprocessed raw horse gram seeds not only possess antihyperglycemic properties, but also have qualities which reduce insulin resistance. The scientists made a comparative analysis between horse gram seeds and their sprouts and found that the seeds have greater beneficial effects on the health of hyperglycemic individuals. The majority of antioxidant properties are confined to the seed coat and its removal would not do any good. Raw horse gram seed is rich in polyphenols, flavonoids, and proteins, major antioxidants present in fruits and other food materials. The seed has the ability to reduce postprandial hyperglycemia by slowing down carbohydrate digestion and reducing insulin resistance by inhibiting protein-tyrosine phosphatase 1 beta enzyme.^[17]

Indian regional specifics: In India, it is also known as *ulavalu*, *gahat*, *muthira*, *kulath*, *khollu* or *kulthi*. It is used to make popular dishes like *Kulitan Saaru*, *Kulitan Upkari*, *Kulitan Ghassi* (coconut curry preparation), and an *idli*-like preparation (but not fermented) called *Kulitan Sannan*.





- In Telangana and Andhra Pradesh, horse gram, called ఉలవలు (*ulavalu*) in Telugu, is prescribed for jaundice or as a diuretic, and as part of a weight-loss diet. It is considered helpful for iron deficiencies. *Ulavacharu* (horse gram soup) is popular dish in Telangana, Andhra Pradesh, it is served with cooked rice in some of the Telugu-speaking people's weddings and ceremonies.^[18]
- In Darjeeling and Sikkim, horse gram called गहत (*gahat*) in Nepali is considered a medicinal food. It is given to children suffering from mumps. Water in which gahat is soaked is taken by people suffering from kidney stones in the belief that this dissolves the crystals. Gahat's use is specially reserved for the cold winters, when its heat-producing properties are most useful.
- In Kerala, horse gram, called മുതിര (*muthira*) in Malayalam is used in special kinds of dishes.
- In Tamil Nadu, horse gram, called கொள்ளு (*kollu*) in northern districts and காணம் (*kaanam*) in southern districts is commonly used in Tamil dishes, including *kollu chutney*, *kollu porial*, *kollu avial*, *kollu sambar* and *kollu rasam*.
- In Maharashtra and Goa, horse gram is called हुलगा/हुलगे/कुलीथ (*hulage/hulaga/kulith*) in Marathi and कुली (*kulith*) in Konkani is often used to make *aamati*, *kulith usal*, *pithla* and *shengule/shevanti*.^[19]
- In Karnataka cuisine, ಹುರಳಿ ಸಾರು (*hurali saaru*) is more popular, because of ಹುರಳಿ (*hurali*) is a main ingredient. *Hurali* is also used in preparations such as *usali*, *chutney*, *bassaru*, and *upsaaru* or *upinsaru* (particularly in the Old Mysore Regions Mandya and Chamrajnagara Districts).
- In South Canara region of Karnataka, in Tulu, it is also called *kudu* (ಕುಡು).
- In Odisha it is known by the name କୋଳଥ (*Kolatha*).
- *Gahat* or *kulath* is a major ingredient in the food of Pahari region of northern India.
- In Himachal Pradesh, *kulath* is used to make *khichdi*. In Uttarakhand, it is cooked in a round iron saute pan (*kadhahi*) to prepare *ras*, a favorite of most Kumaonis. In Garhwal region, another more elaborate dish is *phanu* which is made in a *kadhahi* with roughly ground *gahat* (previously soaked overnight) boiled over several hours. Towards the end, some finely chopped greens (*palak* or spinach, *rai*, tender radish leaves, or *dhania* (coriander leaves) if nothing else is available) are added to complete the dish. Served with boiled rice, *jhangora* (a millet-like grain, used as a staple by poorer Garhwalis only a decade ago and now a prized health-food).

In Myanmar (Burma), horse gram is known as *pe bazat* (ပဲပိပိ) in Burmese. It is commonly used in making *pon ye gyi*, a fermented bean paste used in traditional Burmese cuisine.²⁷

²⁷ References
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1. ^ "Macrotyloma uniflorum (Lam.) Verdc". *Plants of the World Online*. Board of Trustees of the Royal Botanic Gardens, Kew. 2017. Retrieved 17 July 2020.
2. ^ "Taxonomy - GRIN-Global Web v 1.10.5.0". *npgsweb.ars-grin.gov*. Retrieved 24 September 2019.
3. ^ "Horse Gram" (PDF). Government of India, Directorate of Pulses Development. 3 April 2017.
4. ^ Jump up to:^{a b} Brink, Martin (2006). *Cereals and Pulses*. PROTA. pp. 102–104. ISBN 978-90-5782-170-7.
5. ^ Jump up to:^{a b c d e} Kumar D (2007) Production technology for horse gram in India, Central Arid Zone Research Institute. Evergreen Printers, Jodhpur, India, pp 1–27, [http://www.cazri.res.in/publications/KrishiKosh/113-\(PRODUCTION%20TECHNOGY%20\).pdf](http://www.cazri.res.in/publications/KrishiKosh/113-(PRODUCTION%20TECHNOGY%20).pdf)
6. ^ Pearman, Georgina (2005). Prance, Gillelan; Nesbitt, Mark (eds.). *The Cultural History of Plants*. Routledge. p. 144. ISBN 0415927463.
7. ^ Jump up to:^{a b c d e f g h i} Aditya, J. P.; Bhartiya, Anuradha; Chahota, Rakesh K.; Joshi, Dinesh; Chandra, Nirmal; Kant, Lakshmi; Pattanayak, Arunava (2019-09-01). "Ancient orphan legume horse gram: a potential food and forage crop of future". *Planta*. **250** (3): 891–909. Bibcode:2019Plant.250..891A. doi:10.1007/s00425-019-03184-5. ISSN 1432-2048. PMID 31115659. S2CID 160009881.
8. ^ Jump up to:^{a b} Bhardwaj, Jyoti; Chauhan, Rohit; Swarnkar, Mohit Kumar; Chahota, Rakesh Kumar; Singh, Anil Kumar; Shankar, Ravi; Yadav, Sudesh Kumar (2013-09-23). "Comprehensive transcriptomic study on horse gram (*Macrotyloma uniflorum*): De novo assembly, functional characterization and comparative analysis in relation to drought stress". *BMC Genomics*. **14** (1): 647. doi:10.1186/1471-2164-14-647. ISSN 1471-2164. PMC 3853109. PMID 24059455.
9. ^ Jump up to:^{a b} Prasad, Saroj Kumar; Singh, Manoj Kumar (1 May 2015). "Horse gram- an underutilized nutraceutical pulse crop: a review". *Journal of Food Science and Technology*. **52** (5): 2489–2499. doi:<https://doi.org/10.1007/s13197-014-1312-z>.
10. ^ Brink, Martin (2006). *Cereals and Pulses*. PROTA. ISBN 978-90-5782-170-7.
11. ^ Haq Nazmul (2011) Underutilized food legumes: potential for multipurpose uses. In: Pratap A, Kumar J (eds) *Biology and breeding of food legumes*. CAB International, UK, pp 335–336
12. ^ Kadam, S. S.; Salunkhe, D. K. (1985). "Objectives". *C R C Critical Reviews in Food Science and Nutrition*. **22** (4): 1–26. doi:10.1080/10408398509527416. ISSN 0099-0248. PMID 3899515.
13. ^ Bhartiya, A.; Aditya, J. P.; Kant, L. (2015). "Nutritional and Remedial Potential of an Underutilized Food Legume Horsegram (*Macrotyloma uniflorum*): A Review". *The Journal of Animal and Plant Sciences*. **25** (4): 908–920. ISSN 1018-7081.
14. ^ Sreerama, Yadahally N.; Sasikala, Vadakkoot B.; Pratapa, Vishwas M. (2008-06-01). "Nutritional implications and flour functionality of popped/expanded horse gram". *Food Chemistry*. **108** (3): 891–899. doi:10.1016/j.foodchem.2007.11.055. ISSN 0308-8146. PMID 26065750.
15. ^ Jump up to:^{a b} Chahota, Rakesh & Thakur, Nisha & Sharma, Reecha. (2020). Efficient Improvement in an Orphan Legume: Horsegram, *Macrotyloma uniflorum* (Lam.) Verdi, Using Conventional and Molecular Approaches. 10.1007/978-3-030-47306-8_12. }
16. ^ Katoch, Megha; Mane, Rushikesh Sanjay; Chahota, Rakesh Kumar (2022). "Identification of QTLs Linked to Phenological and Morphological Traits in RILs Population of Horsegram (*Macrotyloma uniflorum*)". *Frontiers in Genetics*. **12**. doi:10.3389/fgene.2021.762604. ISSN 1664-8021. PMC 8821879. PMID 35145543.



CURRENT STATUS OF HORSE GRAM IN JAWADHU HILLS

Background: Horse gram is a drought-resistant pulse widely grown in India, particularly in semi-arid and hilly regions like the Jawadhu Hills. The indigenous communities, mainly Malayali Tribes, cultivate horse gram as a staple crop due to its ability to thrive in poor soils with minimal irrigation.

Horse gram thrives in dryland conditions with low water requirements and grows well in rocky and red lateritic soils found in the Jawadhu Hills. It is rich in protein, iron, and antioxidants; traditionally used for health benefits, including weight loss, diabetes management, and treating kidney stones. It is a low-cost, high-nutrient crop that can be promoted for income generation among tribal farmers.

The main challenges in cultivation are the following: (i) low market price - farmers sell raw horse gram at low rates due to lack of value addition; (ii) limited awareness - traditional farmers often lack knowledge about improved processing techniques; and (iii) inadequate market linkages - limited access to larger markets and value-chain opportunities.

To improve income for farmers and create economic sustainability, value-added products can be developed from horse gram. Some potential value-added products include: (i) processed foods – flour (used for making rotis, porridge, and baked goods); (ii) sprouted horse gram - increases nutrient bioavailability and can be used in health foods; and (iii) horse gram malt - a nutritious beverage powder mixed with milk or water. It can also be consumed as a snack items, such as roasted horse gram - a protein-rich snack similar to roasted chickpeas, horse gram noodles / pasta. Horse gram can be included in energy bars - combined with jaggery, nuts, and dry fruits for a healthy snack. It can also be used in beverages & health products such as horse gram soup powder - used as a protein-rich dietary supplement. In addition, as an ayurvedic and herbal tea and processed as an herbal drink for weight loss and digestion. Finally, it is the potential for being used as animal feed, such as cattle and poultry feed - horse gram husk and flour can be used as a nutritious supplement for livestock.

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17. [Mallikarjun, Y. \(April 25, 2013\). "Raw horse gram good for diabetics". The Hindu. Retrieved May 31, 2017.](#)
 18. [Kashid, R. R., & Talekar, S. M. \(2021\). Horse Gram \(Macrotyloma uniflorum\): Nutraceutical Pulse Crop: A Review. \[1\]](#)
 19. [Shah, R. \(2018\). What About My Calcium?. CircleOHealth.\[2\]](#)



Horse gram has immense potential to improve the livelihoods of farmers in the Jawadhu Hills through value addition and better market strategies. Government support, technological advancements, and market integration can help transform this traditional crop into a profitable agribusiness.²⁸

Current Status of Horse Gram in Jawadhu Hills: Horse gram is grown in Jawadhu Hills as a secondary crop, post the harvesting of little millet. However, virtually no care is given and it is left to the elements. It is sold in the Jamunamarathur market @ Rs. 6000/- per quintal. Estimates are that approximately 120 tonnes were traded in the market during the last season. Bulk of the raw horse gram is sold to a Gujarati trader in Salem, who uses it for “Sabutdana” preparations. However, getting any information on the volume of horse gram or its processing or utilization is very limited. Even CFTRI and TNAU have not done very much on horse gram. Local people do some roasting of the horse gram and use it for their sambhar preparations. Value addition in horse gram is currently at a very nascent stage.

BUSINESS PLAN FOR HORSE GRAM IN JAWADHU HILLS

Horse Gram has RTE: The Interim Phase II proposal for TITAN approved in August 2024 has talked about value addition to horse gram and developing a Ready to Eat (RTE) snack enterprise. This may be a good idea; however, currently very little information is available either on production, processing or value addition on horse gram. Therefore, it may be a bit too early to jump directly into RTE enterprise.

Production Levels: Some real data is required on the production level of horse gram in the region. Secondly, currently zero agronomical interventions are undertaken on horse gram. Therefore, it can be assumed that yields are low. Extension for horse gram can be dovetailed with little millet, as the same piece of land is utilized for cultivation. Horse gram is grown once little millet is harvested. The focus under Phase II needs to be on first bringing some science into the production of horse gram in Jawadhu Hills. Yields need to be enhanced with implementation of proper Package of Practice (PoP). This will provide the RGR Cell some idea on yield levels, varietal issues, production levels, disease and pest problems, etc. Once production is brought under control, it would be easier to utilize the seed for RTE. Currently, an RTE strategy would be like shooting in the dark.

Horse Gram Products: There are virtually no horse gram products available in the market. Therefore, to assume that the consumer will suddenly take to horse gram, as a healthy snack may be wishful thinking. Both CFTRI and TNAU has done limited work on value addition to horse gram. There are no horse gram specific processing technologies available. A roaster from some other processing unit may have to be improvises to help with the roasting of the horse gram. Therefore, work on the processing technologies

²⁸ Chat GPT – Horse gram value addition in the Jawadhu Hills



is advisable. In parallel, piloting can also happen with the consumer vis-à-vis acceptance of horse gram as an RTE snack.

WAY FORWARD:

Consequently, the following is recommended:

- Dryland Farming Extension Strategy: Horse gram cultivation and production be covered as part of the dryland farming agriculture extension strategy under Phase II. Agriculture extension work needs to be started on horse gram to stabilize its production and ensure it is mainstreamed with farmers, and not treated as a subsidiary crop. This extension can form part of the overall agriculture extension strategy.
- Pilot on Horse Gram as an RTE Snack: A small pilot needs to be undertaken under the Phase II involving some procurement and processing of horse gram to explore its potential as an RTE snack in the Jamunamarathur market, at TITAN outlets or with TNAU Agri-Business Incubator Cell's outlets in Coimbatore. This will require a procurement of a roaster and a provision of working capital for the procurement and processing of raw material. The initial pilot would provide a lot of information on the potential and acceptance of horse gram as an RTE products by the local consumer.
- Budget: It is recommended that a total about of Rs. 15 Lakhs be kept aside for developing horse gram as an RTE snack during Year 1. In case it is successful, a full-fledged value chain can be developing for taking forward horse gram as an RTE snack.
- Outcome: Based on the results in Year 1, it can be scaled up and serious exploration can be commenced into using horse gram at an RTE or like in the case of millets, the focus can be changed to extension in order to help stabilize the crop's yields.



Chapter 3.5

TAMARIND VALUE CHAIN²⁹

²⁹ Under the Van Dhan Vikas Yojana, the Jawadhu Hills Tribal Farmer Producer Company (formed 2020) already targets around 9,500 households and 300 SHGs producing and selling over 90 tonnes of tamarind annually, alongside roughly 2,760 honey producers – underlining both the existing scale of NTFP-based livelihoods in the hills and the case for closer coordination between that FPO and the proposed Phase 2 Federation. (Source: Press Information Bureau, Government of India, “Van Dhan Vikas Yojana – Empowering the tribals of Jawadhu Hills”.)



BACKGROUND AND STATUS OF TAMARIND VALUE CHAIN IN THE JAWADHU HILLS:

JAWADHU HILLS:

Tamarind trees are found in abundance in the Jawadhu Hills and provide useful supplementary income to the rural community. In some villages, dealers come to the villages and directly procure from the community. This was observed in one the RGR project villages called Kurianur, where around 200 kgs of fruit was harvested from each tree and sold to dealers at Rs. 55/- to Rs. 60/- per kg.

TAMARIND BUSINESS SCENARIO IN JAWADHU HILLS

Detailed discussions were held with various tamarind players in the Jawadhu Hills. Based on these discussions, all players involved in procurement and processing of Tamarind were struggling. Some of the key features of the discussions are captured below.

TVS-SSF

TVS-SSF processed 12 tonnes of Tamarind in the previous Financial Year. Most of the processed product was sold at factory outlets. Tamarind in the Jawadhu Hills is harvested in March to May of each year. TVS-SSF purchased raw Tamarind at Rs. 80/- per KG and sold the processed commodity at Rs. 140/- per half kg block of pure fruit. It may be noted that one KG of raw Tamarind generates 65% waste, which includes skin, seed and shell. The Tamarind from the Jawadhu Hills has to compete in the market with imported Tamarind from Andhra Pradesh, which is available at Rs. 110/- per half kg block. TVS-SSF pointed out that transportation costs were high and cold storage was essential or the Tamarind lost colour and decayed due to impurities left behind during processing. If the above numbers are converted into per kg numbers, cost price of pure fruit would be Rs. 240/- per kg and selling price would be Rs. 280/- per kg. It does indicate that profit margins are minimal. TVS-SST admitted that the marketing of Tamarind was a problem. They also highlighted the need for some kind of a dryer to reduce moisture content and the rapid change in colour, which was a big disincentive while marketing.

Devine Pure

In 2024-25, Devine Pure purchased 24 tonnes of Tamarind @ Rs. 60/- to Rs. 70/- per kg. Selling price was fixed at Rs. 140/- per kg for the wholesale market and Rs. 180/- per kg for the retail market. In 2023-24, Devine Pure procured and sold 40 tonnes of Tamarind. It is important to note that Devine Pure mainly relied on government institutional sales for the bulk of its sales. As only 35% of the raw Tamarind can be converted into fruit for sale, it is difficult to see how Devine Pure is making any money from the sale of Tamarind. The processing of Tamarind is labour intensive and laborious and apart from



removal of the seed, skin and husk, no other processing is done. In the Jawadhu Hills, all players sell Tamarind in half kg blocks of pure fruit.

Hand-in-Hand

Hand-in-Hand did a business turnover of Rs. 35 Lakhs in Tamarind through the Jawad Hills Organic Farmers Producer Company. As with their other operations, raw Tamarind is only collected from their 1000 members spread over 52 villages in the Jawadhu Hills. The Producer Company handled 5 to 6 tonnes of Tamarind, which was purchased at Rs. 70/- to Rs.80/- per kg and sold at Rs. 120/- per kg and Rs. 135/- per kg to the wholesale and retail players, respectively. Hand-in-Hand also have their own processing unit like the above-mentioned players, which has a capacity of 1 tonne per day. The organization has an order of 12 to 13 tonnes from Big Basket, but is struggling to complete the order due to extremely low margins. Hand-in-Hand pointed out the following issues with Tamarind: (i) lack of cold storage in the vicinity, which increased transportation costs; (ii) there were payment issues with some of the online market players, which ends up blocking working capital; (iii) collection of Tamarind in Jawadhu Hills was a problem, as hamlets were scattered increasing the inward costs; (iv) the rapid change in colour of the harvested Tamarind has a negative impact on the consumer; and (v) it is very difficult to completely clean the tamarind. Consequently, some impurities are left, which majorly reduce its shelf life.

CFTRI

The Tamarind department was also visited at CFTRI, Mysore, which is headed by Dr. Chetana. CFTRI is working on various value addition products related to Tamarind. These include powder, paste concentrates, including by-products like Tamarind seed, etc. Dr Chetana was of the view that all issues pertaining to loss of colour were unfounded, if value addition was undertaken. Post-harvest, Tamarind rapidly loses its colour and changes from brown to black. The colour is immaterial, when Tamarind is converted into powder or concentrate. The seed can be utilized for soap production. She was of the view that money can be made from Tamarind, if you focus on value addition. As you would have noticed, all the players in Jawadhu Hills are selling half kg pure Tamarind fruit blocks. Nobody is either selling powder or concentrate. CFTRI field operations are focused on Madanpally in Chittoor district in Andhra Pradesh, where all the value addition and productization happens. The selling price for Tamarind seed was around Rs. 14/- per kg, which was bought by the soap industry. While the Tamarind skin was sold at Rs. 9/- per kg mainly for cattle feed.

Tamarind Market in Jamunamarathur

A leading Tamarind trader was met Jamunamarathur and an overview of the Tamarind business undertaken. The trader, Saddam Hussain bought 150 tonnes from the community in the previous year. He paid Rs. 120/- per kg for the best quality and on an average paid Rs. 80/- to Rs. 100/- per kg. 50%



was directly sources from villages, the rest was sold by villagers directly at his shop in Jamunamarathur. 100 tonnes were sold directly to processing units in Tirupathur. He has ended up selling Tamarind at Rs. 80/- per kg and has incurred major losses. He explained that the Tamarind market was down for the last four to five years and it was difficult to compete with imported processed Tamarind from Andhra Pradesh at Rs. 110/- per kg. As mentioned by the others, transportation was a major cost added Rs. 3/- to Rs. 5/- per kg. The nearest cold storages were either in Krishnagiri or Chennai, which added an additional cost of Rs. 3/- per annum to the product. Saddam Hussain also mentioned that he sold 60 tonnes of raw Tamarind to Devine Pure between the range Rs. 60/- to Rs. 80/- per kg. Overall, as he highlighted, margins were minimal and he was looking to develop alternate markets, as currently the business was running at a loss.

Business Plan and Value Chain Development for Tamarind.

The information provided above does clearly highlight that Tamarind was not a viable business unless someone was ready to invest into productization. All parties were either losing money or not making any money from the Tamarind business. RGR Cell under the Phase II grant may avoid the Tamarind value chain. As per of the extension Agri / Horti extension strategy, Tamarind farmers can be advised on how to better maintain their tamarind trees and the advice needs to be provided on pruning and reducing the pest and insect attack on the fruit.



Chapter 3.6

MILK SUPPLY CHAIN³⁰



A cattle shed in Jawadhu Hills housing both local and cross-bred milch animals.

³⁰ Tamil Nadu's dairy cooperative network – the Aavin system – procures milk through roughly 9,000–12,500 village-level Primary Milk Producers' Cooperative Societies, including over 2,000 exclusively women-run societies, at current procurement prices of about Rs. 28/litre for cow milk and Rs. 35/litre for buffalo milk; this established institutional architecture is the backdrop against which a Sreeja/RGR partnership for Jawadhu Hills milk pouring points would operate. (Source: Tamil Nadu Co-operative Milk Producers' Federation Ltd. (Aavin), "MPCS" and "About Us" pages.)



P-GREEN
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SUSTAINING GROWTH, SHARING PROSPERITY



A cow and calf at a beneficiary household – dairy is emerging as the largest untapped livelihood opportunity in the hills.



BACKGROUND

Tamil Nadu stands among India's top ten milk-producing states, achieving a daily production of approximately 2 Crore litres.³¹ The state's dairy industry was valued at Rs. 1,380.7 Crores in 2024 and is projected to grow at a CAGR of 12.61%, reaching Rs. 4,237.5 Crores by 2033.³²

Dairy development serves as a potent mechanism for enhancing food security, fostering economic growth, and alleviating poverty. It generates consistent income, guarantees employment opportunities, ensures financial stability, facilitates asset accumulation, and mitigates risk, as dairy farmers are not solely dependent on agriculture and require minimal land for dairy operations.

Notably, milk, unlike meat and poultry, can be produced with little to no land resources (FAO, 2024). Dairy production serves as a potent mechanism for improving livelihoods, fostering rural development, and ensuring a reliable income source, especially for small-scale farmers and marginalized communities.

DAIRY SECTOR IN TAMIL NADU

The Tamil Nadu dairy sector has undergone significant growth over the decades, establishing the state as one of the foremost milk producers. The estimated value of the Tamil Nadu dairy market in 2023 is Rs. 1,218.9 Crores. The dairy market is projected to expand further, reaching a size of Rs. 3,864.8 Crores by 2032, with a Compound Annual Growth Rate (CAGR) of 13.3% from 2024 to 2032 (IMARC, 2024). This advancement results from several critical factors, including proactive governmental policies, a succession of corporate initiatives, the enhancement of dairy infrastructure, technological advancements, and various socio-economic elements such as urbanization, population growth, changes in dietary preferences, increased awareness of the health benefits associated with milk and dairy consumption, a rise in per capita income, knowledge regarding the availability of milk and dairy products, and improved accessibility.

In addition to conventional methods of raising awareness about milk accessibility, the internet and the era of artificial intelligence have also contributed to the expansion of the dairy sector. The Government of Tamil Nadu is adopting and implementing various national and state indigenous schemes, programs, and initiatives to enhance milk production and promote dairy development. Additionally, numerous awareness camps are conducted to address livestock health, alongside training programs for fodder production and conservation. Initiatives such as the National Programme for Dairy Development (NPDD), Pradhan Mantri Formalization of Micro Food Processing Enterprises Scheme (PMFMEPE),

³¹ aavin.tn.gov.in

³² imarcgroup.com



Rashtriya Gokul Mission - Progeny Testing Programme (RGM – PTP), National Livestock Mission (NLM), and Nationwide Artificial Insemination Programme (NAIP) are executed in collaboration with the central government. The Peraringnar Anna Co-Operative Milk Producers' Welfare Fund was established in addition to NABARD-RIDF, DIDF, and SBGF to assist the families of dedicated milk producers.

The contributions of both public and private sector entities have been instrumental in shaping the industry's development. This section intends to examine the principal actors who have significantly contributed to this transformation. The coexistence of public and private dairy industries in Tamil Nadu significantly contributes to the supply of milk and dairy products.

The exclusively publicly owned dairy industry operated by the Tamil Nadu Milk Producers Federation Societies is branded as "Aavin." It is regarded as the cornerstone of the dairy sector in Tamil Nadu. It is integral to the procurement, processing, and distribution of milk. Its commercial operations have been established since 1981. Aavin functions through a strong cooperative framework, guaranteeing that dairy farmers, especially in rural regions, obtain equitable prices for their products, free from intermediary involvement. The organization has significantly enhanced milk production and offered various dairy products to consumers at reasonable prices. Secondly, in addition to Aavin, other private dairy industries play a significant role in the dairy sector of Tamil Nadu.

Hatsun Agro Private Ltd is the preeminent producer of milk and dairy products in Tamil Nadu, possessing multiple brands including Arokiya, Arun, Hatsun, HAP Daily, IBACO, HANOBAR, and HAVIA. In contrast to Aavin, they do not adhere to the cooperative model of TNMPF and instead procure from other unregistered societies. This enables them to function distinctively and serve a wider market with an array of products. In addition to this, other dairy companies such as Cavins and Milky Mist are competing in Tamil Nadu. Additionally, numerous state dairy cooperatives, private dairies, and international brands have established a presence in Tamil Nadu. The Karnataka Milk Producers Federation (KMPPF)-Nandhini, AMUL, Nestle, Thirumala, Dodla, Heritage, and Jersey collectively play a pivotal role in the state's milk supply, providing a diverse array of products to satisfy consumer demand.

Consequently, it can be concluded that the dairy sector in Tamil Nadu has become a significant entity in India's dairy industry, propelled by various factors. The state's proactive governmental initiatives, effective execution of cooperative models, technological advancements, and contributions from pivotal stakeholders have all significantly contributed to its growth. Despite encountering challenges such as price volatility, escalating input costs, and climate-related risks, the Tamil Nadu dairy sector endeavors to sustain its growth by achieving an average annual growth rate of 3.53%. The robust cooperative movement, as demonstrated by Aavin, offers farmers a reliable market and equitable prices. The emphasis on innovation and sustainable practices corresponds with changing consumer preferences and environmental issues. The dairy sector in Tamil Nadu exhibits favorable prospects. The rising demand for milk and dairy products, along with governmental support and technological innovations,



may propel additional growth and development. By tackling current challenges and leveraging opportunities, Tamil Nadu can reinforce its status as a premier dairy state in India and enhance the nation's economic prosperity³³

KEY PLAYERS IN TAMIL NADU'S DAIRY SECTOR

- **Aavin:** The Tamil Nadu Cooperative Milk Producers' Federation Limited, operating under the brand name Aavin, is an apex body comprising 17 district cooperative milk producers' unions. It procures milk from local farmers, processes it, and markets various dairy products.³⁴ Aavin procurement is around 36 Lakhs litres of milk per day.³⁵
- **Hatsun Agro Product Ltd:** A major private dairy company in Tamil Nadu, Hatsun Agro Product Ltd offers a diverse range of dairy products and has a significant presence in the state's dairy market.³⁶ Hatsun procures 19 Lakhs litres of milk per day.³⁷
- **Dodla Dairy Ltd:** Operating extensively in Tamil Nadu, Dodla Dairy Ltd is a notable private player in the state's dairy industry, providing a variety of dairy products to consumers.³⁸ Dodla procures about 13.5 Lakhs litres of milk per day.³⁹

³³ GROWTH TRENDS IN MILK PRODUCTION AND IT'S DETERMINING FACTORS OF TAMILNADU: AN ANALYTICAL STUDY Geethasaranya. R, Research Scholar, Department of Economics, Ethiraj College for Women, Chennai-08, E.Mail: ecwgsecophd@gmail.com; Dr. D.B.Usharani, Associate Professor and Head, Department of Economics, Ethiraj College for Women, Chennai-08

³⁴ ³⁴ en.wikipedia.org

³⁵ <https://www.newindianexpress.com/states/tamil-nadu/2024/Jun/18/as-heat-subsides-aavin-daily-milk-procurement-back-to-32-lakh-litres>

³⁶ salezshark.com

³⁷ <https://www.hap.in/>

³⁸ salezshark.com

³⁹ <https://dodladairy.com/procurement/>



- **Milky Mist Dairy Food Pvt Ltd:** This company is recognized for its wide array of dairy offerings and holds a significant position in Tamil Nadu's dairy sector. ⁴⁰Milky Mist procures 8 Lakh liters of milk on a daily basis. ⁴¹

These entities, along with numerous dairy cooperatives and private dairies, play a pivotal role in enhancing milk production and contributing to the economic development of Tamil Nadu's rural communities.

SHREEJA MAHILA MILK PRODUCER COMPANY (SHREEJA)

Since 2014, the National Dairy Development Board (NDDB) has set up 17 Milk Producer Companies in different parts of the country under Producer Company Act 2003. This was a departure from the previous focus on state milk cooperatives under Operation Flood and subsequent NDP-1.

Established in July 2014 under the guidance of the National Dairy Development Board (NDDB) Dairy Services (NDS), Shreeja Mahila Milk Producer Company Limited (Shreeja MMPCL) is the world's largest women-owned milk producer company, headquartered in Tirupati, Andhra Pradesh. Shreeja commenced operations in September 2014 with the mission to serve small and marginal women milk producers. ⁴² The company focuses on aggregating, procuring, processing, and marketing milk and its derivative products. As of 2023, Shreeja has a membership base exceeding 119,000 women, covering over 1,500 villages, with an average daily milk procurement of 561,000 liters. ⁴³ Shreeja is renowned for delivering high-quality, unadulterated milk and dairy products directly to consumers. Their product range includes fresh milk, curd, and other dairy items, all adhering to stringent quality standards to ensure purity and taste. ⁴⁴ The company's commitment to empowering rural women in the drought-prone Rayalaseema region has garnered national recognition. Currently, Shreeja procures over seven lakh litres per day. During 2022, Shreeja expanded its operations to Tamil Nadu and now collects 1.3 Lakh litres per day and is planning to majorly expand its operations.

⁴⁰ salezshark.com

⁴¹ https://en.wikipedia.org/wiki/Milky_Mist_Dairy

⁴² SHREEJAMILK.COM

⁴³ SHREEJAMILK.COM

⁴⁴ SHREEJAMILK.COM



MILK SCENARIO IN JAWADHU HILLS

As part of this study, an assessment was undertaken of dairy scenario in the Jawadhu Hills.

BACKGROUND

In India, dairy has had the ability of revolutionizing rural development. Dairy is the only source of regular disposal money for rural communities in India. Consequently, many parts of rural India have seen transformative change once dairy has taken off. There is no reason why the Jawadhu Hills should be any different. The rural community in the Jawadhu Hills do seem to have an affinity and desire to get into the dairy business. Therefore, to make a fundamental difference and stabilize tribal livelihoods in the region, gradually dairy as a key livelihood intervention needs to be introduced. However, this will require multiple interventions including ensuring regular procurement of milk at competitive rate, availability of feed and fodder, veterinary care and AI services, cattle induction, availability of sufficient water and capacity building and training of women, etc. It is important to note that dairy plays a critical role at household level in most of the regions surrounding the Jawadhu Hills by providing necessary financial security at household level. As observed, it is the most critical source of income for most households and many of their daily expenses are covered by the sale of milk.

CURRENT SCENARIO JAWADHU HILLS

Currently, the main dairy players in the Jawadhu Hills region are Aavin and Milky Mist. Both have collection centers in Jamunamarathur. Aavin has a fixed rate of Rs. 32 per litres with a Rs. 1 additional incentive and collects approximately 2500 litres from the Jawadhu Hills. Milky Mist has a 3000 litre capacity Bulk Milk Cooler (BMC) in Sathiram near Alangayam. Milky Mist collects about 1300 litres of milk. Milky Mist has computerized collection system with each beneficiary getting a slip and SMS indicated the volume of milk poured with its SNF & Fat content. Payment is dependent on SNF & Fat and is transfer to the beneficiary account for a 10-day period on the 12th or 13th day. Milky Mist rate is generally a Rupee more than Aavin. Finally, a milk company called Thirumala collected about 300 litres a day. Aavin system is manual and a register is kept to record each farmer's pouring. All these companies do not provide any additional service to farmers. Farmers are totally dependent on the market for all forms of feed and fodder and on the government services for veterinary care and AI services.

A couple project villages were visited in the Jawadhu Hills to figure out the volume of milk available. Most of the project villages, which are tribal, are deficit and have minimal milk. However, villages near roads has surplus milk, which was being sold to either Aavin or Milky Mist. In the village of Komunri, where the old Federation had 37 members, 12 had cattle. Approximately, 140 litres were sold on a daily basis; If this, 100 liters went to Aavin and 40 litres to Milky Mist. A number of HF and Jersey cows had been inducted into the village. However, nearly 50-60% of the farmers' income was being spent on



buying feed and fodder for the animals. These villages are also tribal, which does indicate that once sufficient fodder, feed and water is available, the people would take to dairying as a key occupation.

Some locations outside the Jawadhu Hills were also visited to better understand the dairy scenario in the region.

Villages in Alamgayam in Satyarum block of Tirupathur district were visited. This turned out to be a major dairy cluster with both Hudson and Milky Mist operating along with other private players. Aavin was not present. Most households had cattle mainly Jersey along with some HF and indigenous varieties. The region also has excellent mango orchards and farmers were also growing green fodder for the cattle. The area seems to well services by Hudson, who has been operating in the region for the last 10 years. In the village of Veerakolasi, out of 150 households nearly 100 were pouring milk into the Hudson pouring center, which was 10 KMs away. Nearly, 1000 litres was being collected from this village, itself. A transparent payment system was being followed by Hudson with payment going directly to the farmer's account within 10 to 12 days based on the amount of milk poured and on its SNF and Fat content. On an average, the milk rate was Rs. 34.8/- and it could go up to Rs. 40/- per litre depending on SNF and Fat. Milky Mist was also collecting from the village; however, their extension was weak. Hudson covers those villages properly, which are on its milk route. The villages off the milk route have to physically go to a Hudson collection center to pour milk. Like in Jawadhu Hills, Milky Mist depends on famers brining milk to their BMC in Sathiram. It does seem that they have some dedicated pourers and are not making extensive efforts to collect more milk. Consequently, the farmers seem to be more in favor of Hudson. Like in the case elsewhere, 50% of the farmers revenue was being spend on feeding their cattle. Both the companies were not providing any other services to farmers. Feed was available at the Hudson BMC at Malaireddyur, but at market rates. In Malaireddyur village, again nearly 1000 litres was being poured at the Hudson collection milk centre.

Similarly, villages were visited in the northern side of Jawadhu Hills in Thiruvannamalai district towards Polur including Kanchipuram and Athimoor. Various problems were noticed with Hudson's procurement system in the villages. Some of the farmers were pouring directly at the Hudson milk collection center, while other were going through an intermediary. Those pouring directly at the centre were being paid as per Hudson's norms and payment was based on the SNF and Fat. While those pouring through the intermediary were being paid at a fixed rate per litre, but were given a lower price. The intermediary was collecting from these people and then selling onwards to Hudson. It can be assumed that all the additional money derived from SNF and Fat was being milked by him. Many people in the village were quite upset with the on goings and Hudson had not been addressed these issues. Hudson has been operating in this region for 15 years and it is obvious that certain inefficiencies had crept into their procurement. Also, it indicates that there was surplus milk available. Athimoor was the next village, which has nearly 5000 households. There is a lot of milk available in this village with Hudson, Dodla, Jersey and Aavin all have collection centers.





It does seem that the regions around Jawadhu Hills have surplus milk and the population is positively inclined towards dairying. It may a good idea to add one of these cluster to Jawadhu Hills to generate sufficient volume of milk to make any dairy project viable.

PROPOSED DAIRY PROJECT IN JAWADHU HILLS



Bulk milk cooling and chilling infrastructure of the kind that would anchor a Sreeja/RGR Cell milk pouring point partnership.



Cattle grazing near fodder stores in a Jawadhu Hills village – fodder availability remains a key constraint for dairy scale-up.



As mentioned in the sections above, dairy has the potential for revolutionizing rural development. It is the only source of regular income for farming households in India. Dairy has played a critical role in the development process in any region and has helped considerably in stabilizing households' incomes. There is no reason why Jawadhu Hills are any different and cannot benefit from dairying.

PROPOSED PARTNERSHIP WITH SHREEJA

We propose a partnership with SHREEJA MMPC which already operates in Polur, Salem, Vellore and other northern areas of Tamil Nadu. SHREEJA is part of the NDDDB family. In 2016, we commenced partnering with NDDDB Dairy Service (NDS) to set up five large Milk Producer Companies (MPC)

(<https://www.dhanii.org/>) in Rajasthan, Punjab / Haryana, UP and Maharashtra. Today, nearly 1.8 Lakh women are members of these MPCs covering 4600 villages with over 6 Lakh litres of milk being collected per day.

The NDS promoted Milk Producer Companies follow certain community centric norms, which fit perfectly into RGR Cell's scheme things. (<https://www.nddbdairyservices.com/setting-up-mpcs/> and <https://www.nddbdairyservices.com/mpcs-operationalized/>). SHREEJA seems to be the best fit into any dairy partnership project in the Jawadhu Hills. Both organizations have a development focus, which is required, as developing dairy as a proper livelihood option in the Jawadhu Hills would require an investment spread over three to five years. Both Hudson and Milky Mist have a purely commercial approach, which is not suitable for poor tribal region like the Jawadhu Hills. A long-term approach is required, which involves investment into communities and extensively developing the milk supply chain.

The RGR Cell should explore developing a dairy project with SHREEJA in the Jawadhu Hills along with surrounding clusters near Alangayam and Athimoor. It will have to be a collaborative project, as a lot of effort will be required in the Jawadhu Hills itself to make some of the Milk Pouring Points (MPP) viable. This would involve cattle induction, increase the availability of feed and fodder, interventions in water, etc. The project villages will also benefit from SHREEJA's Productivity Enhancement Services (PES) services. It is advisable if the RGR Cell work on the backend and over a period of time ensure most of the MPPs become viable and add value to SHREEJA operations. In parallel, it is hoped that SHREEJA will work on the milk supply chain including procurement, MPPs, BMC, institutional building, finalizing the milk route, PES, etc.

SHREEJA is expected to undertake a field assessment visit during March 2025. Thereafter, both organizations need to commence work on jointly developing a Detailed Project Report (DPR) for creating a large dairy project in the region. These can be shared with TITAN. The project would provide an excellent opportunity to fundamentally change the ground situation in the Jawadhu Hills and bring about a major difference to the livelihoods of the tribal community.





Key features of the project would be as follows:

- **Joint Collaboration:** A joint collaboration with SHREEJA spread over three years is recommended. The RGR Cell would work on the backend and over a period of time would ensure most of the Milk Pouring Points (MPPs) become viable and add value to SHREEJA operations. To make an MPP viable, approximately 100 litres of milk should be poured daily. Currently most MPPs in Jawadhu would pour far less than 100 litres per day.
- **RGR Cell to Work on Backend:** RGR Cell would have to work at the backend would involve cattle induction, increase the availability of feed and fodder, interventions in water, etc. The community would have to be mobilized to take membership of the SHREEJA MMPC. Once membership is taken, they can benefit from all the other services provided by SHREEJA including Productivity Enhancement Services (PES) and various membership benefits include NDS' recommended high protein feed, various other products at subsidized rates, membership related bonuses, etc.
- **Milk Supply Chain and SHREEJA:** SHREEJA follow strict guidelines issued by NDS regarding membership of the MPC. These include, 300 pouring days per annum, minimum 500 litres per annum pouring, members avoiding any political office, board representation based on membership base to ensure that representatives of small and marginal farmers remain in majority on the board. SHREEJA will work on the milk supply chain including procurement, MPPs, Bulk Milk Cooler (BMC), institutional building, finalizing the milk route, PES, etc.
- **Similar Projects in Tamil Nadu:** SHREEJA has already implemented similar projects with TVS-SSF and Tata Electronics in Salem in Tamil Nadu.
- **Field Assessment and DPR:** SHREEJA has already undertaken a field assessment visit during March 2025. A debriefing is expected in the near future. Thereafter, both organizations need to commence work on jointly developing a Detailed Project Report (DPR) for creating a large dairy project in the region. This can then be shared with TITAN for support.
- **Hardware & Costing:** Initially, a BMC size of 15,000 litres may be recommended, which could be expanded in due course to 20-25,000 litres. A capital investment of Rs. 2 Crores is expected for the complete milk supply chain spread over three years. The RGR Cell would work on the backend, which should work out to be about Rs. 1.5 Crores spread over three years. Various government schemes would be tapped for cattle induction and better housing for the cattle. 200 tribal households should benefit, which would work out to Rs. 2 Crores worth of cattle (Jersey variety). 800 households will source capital from banks and other financial institutions through various Producer Groups for cattle induction (Rs. 8 Crores).
- **Beneficiaries:** There are 50 villages under Phase II of TITAN project. Numbers of households per village would be 100. It is expected that 40% of households will be involved with the dairy vertical. Each household will have a minimum of 2 cattle with minimum pouring five litres per day. With an average of 300 pouring days a year, each household will make Rs. 55,000/- per





annum. Some household will be involved with cattle induction, which will provide far higher returns. A cluster near Alangayam is also expected to be taken up. Around 1000 households would benefit. An average of 10 litres per household is expected from here. Within a couple of years, the milk from the Jawadhu and Alangayam should ensure that the BMC runs at full capacity.

- **Next Steps:** A detailed DPR would provide the exact numbers and should be ready by the middle of April 2025.



Chapter 4

RECOMMENDATIONS



A detailed analysis of the all the subject specific findings and recommendations has been shared with the relevant section. Herein, we provide a point by point summary of the key recommendations.

APEX COMMUNITY INSTITUTION (FEDERATION)

- Having a community institution at the center of interventions is critical. The Producer Groups (PG) have remained strong in their fundamentals despite the shutdown of operations of the old Federation. There is a need to be rewire functions of the Producer Groups for all key products, and thereby expand their scope vis-à-vis their women members. However, the engagement needs to be maintained with the old Federation, whose matters are currently sub-judice. The new Federation needs to cover all 50 villages propose under Phase II. It is critical to have a larger unified entity that combines all the PGs for sustainable and economical scale of operations. Once the legal issue around the old federation are resolved, all relevant assets such as the transport vehicle and any other resources can be transferred to the new entity, contingent to the terms and conditions as laid out by the courts. The old Federation would be merged into the new. Currently, all members of the old Federation will automatically be given membership of the new Federation.

HONEY VALUE CHAIN

A detailed analysis has been undertaken of the current honey value chain in the Jawadhu Hills (refer to the chapter). The strategy for taking forward honey has been developed under the BAYA brand.

Critical Points While Developing the Honey Value Chain the Jawadhu Hills

1. **Marketing Plan:** The biggest challenge in the honey value chain in Jawadhu is marketing and sales. Efforts are needed in branding and reaching premium markets. The biggest problem in the whole honey value chain in Jawadhu is the marketing and sale of both wild and box honey.
 - Marketing Cell: On the marketing front, the RGR Cell need to put in place a separate two-member marketing unit under the new Federation based at the Agri-Business Incubation Centre at TNAU, which will reach out to consumers through different marketing strategies and ensure sales. This will be a specialized unit, which will focus on developing markets for the honey. Expertise of TITAN Ltd would also be tapped to strengthening the marketing efforts of this two-member team.
 - Export Market: Furthermore, the new Federation should explore developing an export market for the honey. This requires certain changes in the extension strategy at field level with honey farmers, as there are specific requirements to meet export standards including





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ensuring zero pesticide residue in the honey. Developing this export market can be another critical task for the Marketing Cell.

- **Branding & Marketing:** BAYA brand needs to be promoted proactively. The branding focus needs to be on the uniqueness of wild bee honey from Jawadhu Hills. The health benefits need to be highlighted and certified using the labs in TNAU and Kerala. This certification and quality assurance will make it easier in due course to export the Jawadhu honey. Develop a strong brand identity for the honey product, emphasizing its unique qualities, such as being wild honey collected by tribal communities/artisanal honey. Invest in attractive and eco-friendly packaging that highlights the product's natural and health benefits. Ensure that the packaging is tamper-proof and maintains the honey's quality whilst communicating the health benefits, usage and sourcing.
- **Marketing and Promotion:** Develop a comprehensive marketing strategy that includes digital marketing, social media campaigns, and influencer partnerships. Highlight the health benefits of wild honey and its unique taste. Use storytelling to connect with consumers, sharing the journey of the honey from the forests of Jawadhu Hills to their table.
- **Distribution Channels:** Expand distribution channels to reach a wider audience from the current scenario. These would include institutional sales through FPOs, government entities and Tata companies, which are based in the region. Gradually, sales can be increased to elite and up-end markets through far better marketing. In the initial years, at least 50% sales should be through institutional sales and ensure that the manufacturing unit meets the necessary quality standards. Thereafter, rest of the honey needs to be sold in the open market, establishing partnerships with retailers and distributors to ensure the product is widely available. A budget of Rs. 20 lakhs are being kept for sales and marketing. This includes selling through e-commerce platforms, supermarkets, health food stores, and specialty stores.
- **Product Diversification:** Introduce different variants of honey, such as flavoured, infused, and organic options, to cater to diverse consumer preferences.
- **Consumer Education:** Educate consumers about the benefits of wild honey through informational content on the packaging and online via social media. Recipes/usage tips can be added to encourage consumers to incorporate honey in their daily routines. Emphasize the sustainable and ethical practices involved in honey production. Highlight the positive impact on the livelihoods of tribal communities and the conservation of bee populations. This can resonate with socially conscious consumers and enhance brand loyalty.
- **Promotional Offers and Loyalty Programs:** Offer promotional discounts, bundle deals, and loyalty programs to attract and retain customers. Provide incentives for repeat purchases.





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- Collaborations and Partnerships: Collaborate with health and wellness social media influencers to promote the honey product. Explore partnerships (in different packaging sizes) with institutional buyers, hotels and cafes.
- Customer Feedback and Improvement: Proactively gather feedback from customers and stakeholders to improve the product and address concerns. Feedback forms or WhatsApp Business can be utilised for quick feedback from customers.

2. QUALITY ASSURANCE, CERTIFICATION, BLOCKCHAIN AND TRACEABILITY:

- Explore and obtain certifications from recognized bodies such as FSSAI, AGMARK, and organic certifications. TNAU lab certification, this will build consumer trust and ensure that the honey meets high-quality standards. Implement blockchain technology for traceability, allowing consumers to verify the authenticity and origin of the honey. Most people acknowledge that Jawadhu honey is unique vis-à-vis its health-related benefits and has sufficient demand amongst consumers. The RGR Cell should get each batch of processed honey certified by TNAU technical Lab at the Centre for Post-Harvest Technologies, which has the required lab technologies to certify the actual qualities of this wild honey for the Jawadhu Hills. As indicated by TNAU, there are laboratories in Kerala, which can also test enzymes in honey, which is a major value addition vis-à-vis branding. This would be essential if an export market is to be developed for the Jawadhu honey. Blockchain is another possibility, which would provide traceability to each batch and add premium value. Traceability and blockchain would add another 5% to the overall cost, which is necessary if the premium market has to be targeted.

3. REDUCING BOTTLE-SIZE

- BAYA honey is sold in 500 ml bottles, however, a rapid assessment of the general honey market, shows dominance of smaller bottles of honey. Especially in the 200-250ml size. This has many advantages, including making the product more “affordable” and increasing the likelihood of consumers willing to “try” a new product. A competitive pricing would need to be worked out.

4. PROCESSING FACILITY

- The plan includes setting up a manufacturing unit with an installed capacity of one quintal per hour, which should be sufficient to meet the projected demand. Approximate costing is **between Rs. 10 to Rs. 15 Lakhs**. Most vendors are Punjab based with few manufactures in Kerala. Both options





need to be explored. After sales service, is one of the most critical factors, should be the key deciding factor while finalizing the vendor, as the machinery does have occasional problems.

5. BUDGET

- A budget of Rs. 1.51 Crores is proposed over three years for the honey value chain. This includes all management supervision costs for the project including developing the horse gram value chain. Consequently, the human resource costs for the horse gram RTE are not being budgeted separately. The proposed budget is inclusive of all CAPEX and OPEX costs. An amount has been kept separately for the marketing efforts and for salaries of the Marketing Cell. Furthermore, an amount can be made available for working capital for the procurement of honey (Rs. 32.2 Lakhs). An assessment undertaken of the 50 project villages by the RGR Cell indicates that an additional amount of 1.5 Tonnes of wild honey is available over and above the amount already being procured by other organizations. It is also expected that 1 tonnes of box honey will also be procured in Year 1. Box honey will probably be sold in B to B format and institutional sales. While wild honey will be targeted at the premium market. To make the project viable, Rs. 30 Lakhs would be recovered from sales over Year 2 and Year 3. The project would break even at the end of Year 3, with all OPEX costs being recovered from sales.

A budget of Rs. 1.51 Crores is proposed over three years, inclusive of all CAPEX and OPEX costs. The project aims to break even at the end of Year 3, with all OPEX costs being covered from sales including salaries in Year 3.

CUSTARD APPLE VALUE CHAIN

- It is recommended the RGR Cell through the new federation **currently avoid getting in the custard apple value chain**. The option which can be explored, would be to **assist in the marketing of fresh fruit**, if the local vendors start undercutting the farmers. Currently, they are offering quite a decent rate. The RGR Cell can add **horticulture extension to their agriculture extension activities**, so that farmer yields can be maximized and **unnecessary money not wasted on excessive pesticide application**, etc. In case the scenario changes over the next couple of years, RGR can explore developing the custard apple value chain as explained in detail in this section.

MILLET VALUE CHAIN



Considering the ground situation, it may be advisable if the RGR Cell avoiding working extensively on the millet value chain. The following is recommended:

- Focus on Agriculture Extension for Dryland Farming: The RGR Cell in the Jawadhu Hills needs to focus its efforts on agriculture extension for little millets, as against getting into the value chain business. As the millets chapter has indicated, margins are minimal, as there are already a large number of players in all aspects of the little millet value chain. Therefore, it may not be a great idea to get involved in any major type of value addition in little millets. Focus needs to remain on dryland agriculture extension with a lot of emphasis on little millet and horse gram.
- Dryland Farming: Agriculture extension around dryland farming is at the core of the Phase II proposal. The dryland farming extension would also require the provision of supplementary irrigation, and cover crops like horse gram, which is grown in the same piece of land after little millets are harvested. It is advisable to explore promoting tomatoes and other vegetables under trellis or in open fields. This will require the RGR Cell to put in place a fully staffed and trained agriculture extension team. A basket of livelihood options is required at the house hold level. This will ensure a steady income to each household and ensure they remain **Latchathipathi**. However, in order to get all the pieces gel, it is important to get full control on the production process with quality agriculture extension. RGR Cell technical capacities needs to be enhanced considerably during the next Phase in keeping with the reputation of the organization vis-à-vis excellence in agricultural extension. Once work at field level is under control, it will become much easier to deliver and ensure sustainability at household level.
- Focus on Animal Husbandry The above interventions need to be dovetailed with goat rearing. Goatery has played the primary role in ensuring that most households reached income levels Rs. 1 Lakh per annum under Phase I. Under Phase II, it is important that most households now move towards semi stall feeding of goats, which will reduce ecological damage usually associated with goats. Another linked intervention is fodder development for the goats, which can be linking to dairying as livelihood option. For the long-term development of the rural community, it is imperative to link the farmers who have cattle to dairy. Dairy is the mainstay of livelihoods in the areas surrounding Jawadhu Hills. Promoting dairy in Jawadhu Hills will have a long-term impact on stabilizing and sustaining livelihoods in the region like elsewhere.

HORSE GRAM VALUE CHAIN

- The Interim Phase II proposal for TITAN approved in August 2024 has talked about value addition to horse gram and developing a Ready to Eat (RTE) snack enterprise. This may be a good idea; however, currently very little information is available either on production, processing or value addition on horse gram. Therefore, it may be a bit too early to jump directly into RTE enterprise.





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- Production Levels: Some real data is required on the production level of horse gram in the region. Secondly, currently zero agronomical interventions are undertaken on horse gram. Therefore, it can be assumed that yields are low. Extension for horse gram can be dovetailed with little millet, as the same piece of land is utilized for cultivation. The focus under Phase II needs to be on first bringing some science into the production of horse gram in Jawadhu Hills. Yields need to be enhanced with implementation of proper Package of Practice (PoP). This will provide the RGR Cell some idea on yield levels, varietal issues, production levels, disease and pest problems, etc. Once production is brought under control, it would be easier to utilize the seed for RTE. Currently, an RTE strategy would be like shooting in the dark.
- Horse Gram Products: There are virtually no horse gram products available in the market. Therefore, to assume that the consumer will suddenly take to horse gram, as a healthy snack may be wishful thinking. Both CFTRI and TNAU has done limited work on value addition to horse gram. There are no horse gram specific processing technologies available. A roaster from some other processing unit may have to be improvises to help with the roasting of the horse gram. Therefore, work on the processing technologies is advisable. In parallel, piloting can also happen with the consumer vis-à-vis acceptance of horse gram as an RTE snack.
- Dryland Farming Extension Strategy: Horse gram cultivation and production be covered as part of the dryland farming agriculture extension strategy under Phase II. Agriculture extension work needs to be started on horse gram to stabilize its production and ensure it is mainstreamed with farmers, and not treated as a subsidiary crop. This extension can form part of the overall agriculture extension strategy.
- Pilot on Horse Gram as an RTE Snack: A small pilot needs to be undertaken under the Phase II involving some procurement and processing of horse gram to explore its potential as an RTE snack in the Jamunamarathur market, at TITAN outlets or with TNAU Agri-Business Incubator Cell's outlets in Coimbatore. This will require a procurement of a roaster and a provision of working capital for the procurement and processing of raw material. The initial pilot would provide a lot of information on the potential and acceptance of horse gram as an RTE products by the local consumer.
- Budget: It is recommended that a total about of Rs. 15 Lakhs be kept aside for developing horse gram as an RTE snack during Year 1. In case it is successful, a full-fledged value chain can be developing for taking forward horse gram as an RTE snack.
- Outcome: Based on the results in Year 1, it can be scaled up and serious exploration can be commenced into using horse gram at an RTE or like in the case of millets, the focus can be changed to extension in order to help stabilize the crop's yields.



TAMARIND VALUE CHAIN

- The ground situation clearly highlight that Tamarind was not a viable business unless someone was ready to invest into productization. Currently, all entities are either losing money from the Tamarind business. **RGR Cell under the Phase II grant may avoid the Tamarind value chain.** As per of the extension Agri / Horti extension strategy, Tamarind farmers can be advised on how to better maintain their tamarind trees and the advice needs to be provided on pruning and reducing the pest and insect attack on the fruit.

MILK SUPPLY CHAIN

- Dairy has the potential for revolutionizing rural development. It is the only source if regular income for farming households in India. Dairy has played a critical role in the development process in any region and has helped considerably in stabilizing households' incomes. There is no reason why Jawadhu Hills are any different and cannot benefit from dairying.
- Proposed Partnership with SHREEJA Mahila Milk Producer Company: We propose a partnership with SREEJA MMPC, which already operates in Polur, Salem, Vellore and other northern areas of Tamil Nadu. SHREEJA is part of the NDDDB family. The RGR Cell should explore developing a dairy project with SHREEJA in the Jawadhu Hills along with surrounding clusters near Alangayam and Athimoor. It will have to be a collaborative project, as a lot of effort will be required in the Jawadhu Hills itself to make some of the Milk Pouring Points (MPP) viable. This would involve cattle induction, increase the availability of feed and fodder, interventions in water, etc. The project villages will also benefit from SHREEJA's Productivity Enhancement Services (PES) services. It is advisable if the RGR Cell work on the backend and over a period of time ensure most of the MPPs become viable and add value to SHREEJA operations. In parallel, it is hoped that SHREEJA will work on the milk supply chain including procurement, MPPs, BMC, institutional building, finalizing the milk route, PES, etc.
- Joint Collaboration: A joint collaboration with SHREEJA spread over three years is recommended. The RGR Cell would work on the backend and over a period of time would ensure most of the Milk Pouring Points (MPPs) become viable and add value to SREEJA operations. To make an MPP viable, approximately 100 litres of milk should be poured daily. Currently most MPPs in Jawadhu would pour far less than 100 litres per day.
- RGR Cell to Work on Backend: RGR Cell would have to work at the backend would involve cattle induction, increase the availability of feed and fodder, interventions in water, etc. The community would have to be mobilized to take membership of the SHREEJA MMPC. Once membership is taken, they can benefit from all the other services provided by SHREEJA including Productivity Enhancement Services (PES) and various membership benefits include





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NDS' recommended high protein feed, various other products at subsidized rates, membership related bonuses, etc.

- Milk Supply Chain and SHREEJA: SHREEJA follow strict guidelines issued by NDS regarding membership of the MPC. These include, 300 pouring days per annum, minimum 500 litres per annum pouring, members avoiding any political office, board representation based on membership base to ensure that representatives of small and marginal farmers remain in majority on the board. SHREEJA will work on the milk supply chain including procurement, MPPs, Bulk Milk Cooler (BMC), institutional building, finalizing the milk route, PES, etc.
- Similar Projects in Tamil Nadu: SHREEJA has already implemented similar projects with TVS-SSF and Tata Electronics in Salem in Tamil Nadu.
- Field Assessment and DPR: SHREEJA has already undertaken a field assessment visit during March 2025. A debriefing is expected in the near future. Thereafter, both organizations need to commence work on jointly developing a Detailed Project Report (DPR) for creating a large dairy project in the region. This can then be shared with TITAN for support.
- Hardware & Costing: Initially, a BMC size of 15,000 litres may be recommended, which could be expanded in due course to 20-25,000 litres. A capital investment of Rs. 1.5 Crores is expected for the complete milk supply chain spread over three years. The RGR Cell would work on the backend, which should work out to be about Rs. 1.5 Crores spread over three years. Various government schemes would be tapped for cattle induction and better housing for the cattle. 200 tribal households should benefit, which would work out to Rs. 2 Crores worth of cattle (Jersey variety). 800 households will source capital from banks and other financial institutions through various Producer Groups for cattle induction (Rs. 8 Crores).
- Beneficiaries: There are 50 villages under Phase II of TITAN project. Numbers of households per village would be 100. It is expected that 40% of households will be involved with the dairy vertical. Each household will have a minimum of 2 cattle with minimum pouring five litres per day. With an average of 300 pouring days a year, each household will make Rs. 55,000/- per annum. Some household will be involved with cattle induction, which will provide far higher returns. A cluster near Alangayam is also expected to be taken up. Around 1000 households would benefit. An average of 10 litres per household is expected from here. Within a couple of years, the milk from the Jawadhu and Alangayam should ensure that the BMC runs at full capacity.
- Next Steps: A detailed DPR would provide the exact numbers and should be ready by the middle of April 2025.





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REFERENCES

Data on programme outputs, beneficiary incomes, market-player pricing and vendor interviews throughout this report is drawn from RGR Cell / Titan programme records and the field assessment conducted for this study (see in-text footnotes). The sources below are the external references consulted to strengthen and verify the market context in this revision; several sections (notably Custard Apple and Horse Gram) already carried hyperlinked citations in the original draft, which have been retained.

Government of Tamil Nadu, Aavin – Tamil Nadu Co-operative Milk Producers’ Federation Ltd., “About Us” and “MPCS” pages. <https://aavin.tn.gov.in/about-us> ; <https://aavin.tn.gov.in/mpcs>

Government of Tamil Nadu, Department of Agriculture, Agriculture Budget 2025–26 announcements on the Tamil Nadu Millet Mission. Reported in Deccan Herald and Tractorsdekho.com (March 2025). <https://www.deccanherald.com/national/south/tamil-nadu-lays-focus-on-millet-mission-and-organic-farming-in-agriculture-budget-1202327.html>

Press Information Bureau, Government of India, “Van Dhan Vikas Yojana – Empowering the tribals of Jawadhu Hills of Tiruvannamalai district, Tamil Nadu.” <https://www.pib.gov.in/PressReleaseframePage.aspx?PRID=1702267>

Down To Earth, “Why horse gram is a neglected, climate-resilient, nutritional powerhouse” (2024). <https://www.downtoearth.org.in/food/why-horse-gram-is-a-neglected-climate-resilient-crop-nutritional-powerhouse>

Crop Trust, “Horse gram” crop profile. <https://www.croptrust.org/knowledge-hub/crops/horse-gram/>
Research and Markets / IMARC Group, “Indian Honey Market Size, Share, Trends and Forecast to 2034.” <https://www.researchandmarkets.com/report/india-honey-market>

Mongabay India, “More climate literacy and diversification could help tribal millet farmers adapt to impacts” (February 2025). <https://india.mongabay.com/2025/02/more-climate-literacy-and-diversification-could-help-tribal-millet-farmers-adapt-to-impacts/>

M.S. Swaminathan Research Foundation, “Collective feed procurement by women dairy farmers reaps rewards,” case study from Kannivadi, Dindigul district, Tamil Nadu. <https://www.mssrf.org/our-stories/collective-feed-procurement-by-women-dairy-farmers-reaps-rewards/>

Wikipedia, “Javadi Hills” and “Aavin.” https://en.wikipedia.org/wiki/Javadi_Hills ; <https://en.wikipedia.org/wiki/Aavin>

