



Adding Flavour to Tribal Lives: Primary Processing of Spices and Coffee in the Eastern Ghats

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Krishi Vigyan Kendra (KVK), Namakkal is being implemented **Paramparaghat Krishi Vikas Yojana (PKVY)** and **ICAR –Tribal Sub Plan Schemes** at Elangiyampatti and Ariyur Nadu villages of Kollihills, Namakkal District, Tamil Nadu since 2019 to promote organic farming activities in an area

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of 20 ha as well as utilization of machinery for primary processing of Spices and Plantation crops for getting good quality produce with assured net returns. These tribal villages are richly bestowed with **Black pepper, Cardamom, Coffee and Hill banana** more than 500 acres under cultivation. Usually the tribes follow the traditional method for threshing, pulping and cleaning of spices and plantation crops. So that the tribes got minimum returns due to poor quality produce. To address this issues KVK provided primary processing machinery to tribal farmer groups enabling timely processing, improved quality produce and increased net income. This intervention has significantly benefitted nearly 524 tribal farmers in and around Elangiyampatti. In the year 2021-22 alone, 42.5 tonnes of black pepper, 55.2 tonnes of coffee and 2.01 tonnes of Cardamom were processed by the tribes from Elangiyampatti with the help of primary processing machines viz., Pepper threshing machine, Pepper dust extractor, Pepper grader, Cardamom dryer and Coffee pulping machine supplied under ICAR- Tribal Sub plan Scheme and also got an additional income of Rs.82500/ household /year. This intervention not only improve the quality of the produce obtained from Elangiyampatti and Ariyur Nadu villages of Kollihills but also the tribes from other villages of Kollihills processed their produce in time and fetched good returns. Since Kollihills Pepper contains high Piperine content due to varietal nature as well as soil and climatic conditions prevails in this region and it is very familiar in this zone and also fetches a good market price. Hence establishment of essential primary processing machinery units at Panchayat level may facilitates easy and timely processing of Black pepper, Coffee and Cardamom thus in turn makes to help the tribes to improve their livelihood.

Keywords: *Black pepper; cardamom; coffee; primary processing; kollihills; agricultural value chains.*

1. INTRODUCTION

Kolli hills is a small mountain range located at the tail end of the Eastern Ghats in Namakkal District of Tamil Nadu at an altitude of 1200m. Kollihills is home to approximately 50,400 people living in 305 small villages and 14 village panchayats, primarily belonging to the Malayali tribal community. It is bestowed with spices, plantation, fruit crops, medicinal plants and minor millets (Shyam Kumar, 2011). Among the spices and plantations, Black pepper, Cardamom, Cinnamon, Nutmeg, Clove and Coffee is being cultivated by tribes more than 2000 ha. The black pepper from Kolli Hills is known for being spicy, black, and hard. Usually the tribes follow the traditional method of threshing, cleaning by winnowing and drying especially for black pepper, cardamom and coffee (Indumathi *et al.*, 2021 and Sharmila Bharathi, 2024). This practice allows more labour involvement which leads to high cost of production mainly for doing post-harvest practices. In addition to that the quality of the product is questionable, which is not graded and admixtures are also there. So the tribes could fetch low net income for their produce. To solve these issues, KVK, Namakkal has implemented Paramparaghat Krishi Vikas Yojana and ICAR - Tribal Sub Plan Scheme at Elangiyampatti and Ariyur Nadu villages, Gundurnadu panchayat of Kollihills since 2019. The main focus was given on organic farming in spices, plantations, fruits especially in hill

bananas and primary processing of spices and plantation crops by machineries during the implementation of above said schemes.

2. MATERIALS AND METHODS

The KVK Masila PKVY farmers group consisting of 21 tribal farmers covering in an area of 20 ha for organic cultivation has registered in PGS portal under Ministry of Agriculture and Farmers Welfare, Government of India and also obtained registration number LG 1800049279. Then KVK, Namakkal has established a primary processing unit with Pepper spike separator, Cardamom dryer, Disc type coffee pulping machine, Grader under Tribal Sub Plan project at Elangiyampatti village, Kollihills which has been maintained and operated by this tribal farmer group. Furthermore, training on primary processing and value addition of spices, condiments and plantation also given to tribal farmers then and there. Hence the tribes' could effectively do the primary processing, value addition of spices and plantation crops by using these machineries (Kabir and Fedele, 2018) since 2021 with the following objectives

- To minimize more labour involvement and reduce the cost of production.
- To make primary processing of spices and coffee in time by involving machineries and enhance the quality of the produce.

- To increase the net income of tribal farmer

3. RESULTS AND DISCUSSION

3.1 Pepper Threshing

The maturation period of pepper berries varies from 7- 8 months in Eastern Ghats. In Kollihills of Tamil Nadu, the matured pepper berries were harvested from December to January. Usually the tribes of Kollihills could follow trampling method for despiking of black pepper. In this method, the pepper have been separated from its spikes by spreading the pepper spikes on a cement floor and stamping them manually with bare feet, until the pepper separates from the spikes. Furthermore this traditional method of despiking is crude, tedious and unhygienic. The threshed and dried black pepper has extraneous matter like spent spikes, pin heads, stones, and soil particles etc., mixed with it. After separation of pepper, cleaning is done by winnowing which removes some of the impurities. But it is very much time consuming process and it also requires more labour involvement.

By manual threshing method, the farmer could spent an amount of Rs.500/-as labour cost towards threshing of 40 kg of black pepper per day. Whereas by using the power operated

pepper threshing machine, 500 kg of pepper could be threshed per hour. In an average, nearly 2 tonnes of pepper can be threshed per day and the tribes charged Rs.2/kg as threshing cost (Table 1). So the tribes could earned the income of Rs.4000/- per day. Apart from time consumption, the tribes also got the end product free from dust and unwanted materials etc., In addition to that, the machine can be easily move from one place to another and the threshing operation of black pepper harvested from 200 acres is achieved within a month. This is in accordance with the findings of (Lakmali *etal.*,2023 and Wasim Savalg *etal.* ,2021).

The dried black pepper has extraneous matter like spent spikes, pin heads, stones, soil particles, etc. mixed with it. Cleaning and grading are basic operations that enhance the value of the produce thus helps to get higher returns. Normally the tribes adopt winnowing and hand picking to remove most of these impurities. By using machineries for pepper dust extracting and grading (Table 2), the farmers felt that in half an hour, 100 kg of pepper being graded in 3 grades with removal of impurities by using Pepper dust extractor and grader than manual means (100 kg/day). This is in conformity with the findings of (Heartwin and Korikanthimath, 2003 and Biju Babu,2020.)

Table 1. Pepper threshing efficiency – Manual vs electrically operated pepper threshing machine

Particulars	Manual threshing	Pepper threshing machine (Electrically operated)
Labour cost per day	Rs.500/-	Rs.500/-
Working hours	8 hrs	5 – 6 hrs
Pepper threshing and cleaning per hour	5 kg	500 kg
Total pepper threshing per day	40 kg	2000 kg



Fig. 1. Pepper threshing by using electrically operated pepper threshing machine



Fig. 2. Drying of threshed pepper

Table 2. Pepper dust extractor & grader

Particulars	Manual	Pepper dust extractor & grader
Pepper extractor	100 kg/day	100 kg / (1/2 hour)
Cost involved	Rs.300/100 kg	Rs.200/100 kg
Time	Laborious	Quick
Quality	Dust present	Clean (100% dust free)
Grading	Average by naked eye	3 grades based on size
Rate	Rs. 550 /kg	A- Rs.650/kg B - Rs.600/kg C - 550/kg

Because of this intervention, farmers could save up to Rs.100/100 kg. Normally the grader is used to grade the black pepper in to 9 grades viz., Malabar Garbled (MG), Malabar Un Garbled (MUG), Tellicherry Garbled Black Pepper Special Extra Bold (TGSEB), Tellicherry Garbled Extra Bold (TGEB), Tellicherry Garbled (TG), Pin Heads (PH Grade special and Grade 1), Garbled Light Pepper (GL Special, GL Grades 1 and 2), Ungarbled Light Pepper (UGL Special, UGL Grades land 2) and Black Pepper (Non specified). But the tribes used only 3 grades for marketing. Further the graded berries fetched better prices based on various grades and sale at a price of Rs.650/kg for Grade A, Rs.600/kg Grade B and Rs.550/kg for Grade C than the ungraded bulk berries @ Rs.550/kg. The rate may differ accordingly prevailing market price.

3.2 Cardamom Dryer

In Kollihills, 90% of the tribes cultivating Cardamom var.Njallani as mixed crop /intercrop in Pepper and coffee plantation with a spacing of 10 x 10 feet and maintains the plant population of 250 nos/acre, remaining 10 % of the farmers cultivating cardamom as sole crop with same spacing. This variety starts commercial bearing 4 years after planting with a yielding capacity of 15 kg/plant and produces 1 tonne of green capsule yield per acre.

Traditionally the tribal farmer, dry the cardamom capsules by spreading the capsules uniformly in a thick layer of 15 – 20 cm on a bamboo mat placed over the frames of fire wood pit which is built either in outside of the house or in the field itself. By this method, capsules are dried by the combined effect of heat and smoke generated by burning of the wood in the fire wood pit. It took 24 - 28 hrs and frequent racking is very essential to make uniform drying of capsules. However, this method of drying causes blackening of capsules with cracks and smoky flavour. To prevent this situation, KVK installed flue pipe cardamom dryer under ICAR - Tribal Sub Plan scheme for the benefit of tribal farmers of Kollihills at Elangiyampatti village.

In this flue pipe cardamom dryer, the capsules should be dried at 45-50°C for 18 hours. Initially, the harvested capsules approximately 200 kg were placed in the drum. In that, the cardamom capsules are spread thinly and stirred frequently to ensure uniform drying. The dried cardamom capsules are rubbed by hands to confirm uniform drying. After drying, they are winnowed to remove any foreign matter. Then capsules are sorted according to size and colour and stored in black polythene lined gunny bags to retain the green colour during storage. This is in conformity with the findings of (Prem Ranjan *etal.*,2018, Rejo Daniel *etal.*,2020 and Kirtika Sharma *etal.*,2022.)



Fig. 3. Removal of dust by manual means



Fig. 4. Performance of Pepper dust extractor



Fig. 5. Pepper grading by Pepper grader



Fig. 6. Graded pepper by using pepper grader

Table 3. Drying of Cardamom capsules

Particulars	Manual	Cardamom dryer
Cardamom	100 kg/ 2 days	200 kg /day
Labour saving	Rs.600/day	Rs.800/ 200 kg
Time	Laborious	Quick
Quality	Blackened capsules with split or crack and smoky flavour	Uniform and green colour capsules without smoky odour
Rate	Rs.500 /kg	Rs.1600/kg



Fig. 7. Drying of Cardamom capsules by using Cardamom dryer

Table 4. Coffee pulping machine

Particulars	Manual	Electrically operated Coffee pulping machine
Drum capacity	-	10 kg of coffee fruit
Time requires for pulping	10 kg /2 hours	10kg /15 minutes
Pulping of coffee beans	80 kg/day	400 kg /day
Labour cost	Rs.600/Men/day Rs.250/women/day	Rs.600 /day
Time	Laborious	Quick
Quality	Peels and broken beans present	Clean
Output ratio	4:1, For depulping of 10 kg coffee fruit gave 7 kg beans and 3 kg peel, pulp etc., 2000 kg fresh – 500 kg coffee beans	
Rate	110/kg	150/kg

By using flue type Cardamom dryer (Table 3), totally 200 kg of Cardamom capsules were dried scientifically per day with retained colour, proper shape, uniform drying and minimum labour involvement when compared to manual method of drying (1 labour for 2 days by using

traditional method). The price fixed for drying of cardamom capsule is Rs.30/kg. The output ratio is 5:1. Further these capsules fetched a premium price of Rs.1600/kg than the capsule which was dried by traditional method (Rs.500/kg).

Traditionally, the tribes depulp the coffee beans with the help of grinding stone. But the quality of coffee beans is not much appreciable in this method. In addition to that it is laborious (25 labours), time consuming (25 days) and expensive (Rs.15000/-) when compared to electrically operated coffee pulping machine (5 days, 5 labour and Rs.3000/-) for pulping of 2000 kg coffee fruit. Some extraneous matter such as peels, dust and sand also present. In addition to the above, farmers also did the coffee processing by using coffee pulping machine (Table 4), which removes the pericarp from coffee beans @ 400 kg / day as against 80 kg/day by manual method and sale the machine pulped coffee beans @ Rs.150/800 gm. This may be due to quality and appearance of coffee beans. This is in accordance with the findings of (Jackson *etal.*,2016, Ogunjirin *etal.*,2021 and Kiromim Baroroh *etal.*, 2023). The tribes charged Rs.20 for depulping of 10 kg coffee beans by using coffee pulping machine.

3.3 Branding, Packing and Marketing

The primary processed spices and plantation crops are packed in good quality packing covers with various quantities starting from 250 gm to 1 kg pack. The produce are sale in the brand name

of KVK PKVY - MASILA ORGANIC PRODUCE. The farmers group could sale their produce at farmers market, Kollihills and shops in nearby town viz., Namakkal, Salem, Trichy and Erode Districts. Furthermore, sales outlet also opens in tourist places of Kollihills. Apart from these, the farmers group also got order through social media, based on this, they supplies the produce throughout Tamil Nadu. Because of packing and branding, the tribes could earn extra income of Rs.75 -100/kg.

3.4 Outcome

Because of this intervention, nearly 524 tribal farmers were benefitted in and around Elangiyampatti village of Kollihills. In the year 2021-22 alone, farmers from Elangiyampatti village, Gundurnadu panchayat of Kollihills were processed 42.5 tonnes of black pepper, 55.2 tonnes of coffee and 2.01 tonnes of Cardamom by using the primary processing machines viz., Pepper threshing machine, Pepper dust extractor, Pepper grader, Cardamom dryer and Coffee pulping machine supplied under ICAR-Tribal Sub plan Scheme. Because of this intervention an additional income of Rs.82500/ household /year has been earned through primary processing. In addition to that, tribal



Fig. 8. Pulping of coffee beans by using electrically operated mobile coffee pulping machine



Fig. 9. Tribal farmers with Organic certification



Fig. 10. Packed processed spices for sale

farmers from neighboring panchayat also utilized these machineries on cost basis and done the primary processing of their produce. By seeing the success of this interventions, 12 number of tribal farmers had purchased electrically operated and movable Pepper Threshing machine, Pepper dust extractor and coffee pulping machine and they doing the threshing cum dust extracting of black pepper and pulping of coffee beans at farmers field itself on cost basis (Indhumathi et al. 2021).

4. CONCLUSION

The promotion of primary processed black pepper, cardamom and coffee beans has increased the acceptability, contributing to the growth of the local economy, tourists are also increasingly interested in buying the primary processed spices and plantation produce. This approach has proven to be highly effective as it not only helps the tribes achieve sustainable income generation, but also encourages them to use of machinery against traditional method for primary processing and ensures good results for their efforts.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

COMPETING INTERESTS

Authors have declared that they have no known competing financial interests OR non-financial interests OR personal relationships that could have appeared to influence the work reported in this paper.

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