

Exploring the possibilities of introducing coffee in the forest based ecosystem of Bastar, Chhattisgarh

Coffee was introduced in India after Baba Budan carried seven coffee beans from Arabia that are said to have been planted near his hermitage in Dattatreya Peeth presently known as Chikmagalur in Karnataka. India has always been one of the major producers of coffee since ancient times and leads its production representing around 3.5% of the world coffee. Over a 50-year period, coffee has made significant contribution to the Indian economy among the other plantation crops. India is the only country that grows most of its coffee under shade. The Indian coffee is one of the most bizarre beverages in terms of its exotic flavour and aroma. For a sustainable coffee production, the protection of agro-ecosystems especially the forest biomass is a must which can be attained easily by planting more trees per unit area. This article explores the possibilities of introducing coffee in forest based ecosystem of Bastar region in Chhattisgarh.

CHHATTISGARH has emerged as one of the most practicable and efficient non-traditional coffee production areas in India. Bastar, Ambikapur and Kondagaon are the targeted zones of coffee production in Chhattisgarh wherein Bastar is rich and famous for its natural resources and dense forests. Although Ministry of Home Affairs, Government of India has demarked the Bastar Plateau of Chhattisgarh as a Left Wing Extremism (LWE) affected and one of the most backward districts in the country, the suitability of land and agro-climatic condition is well identified to be appropriate for the crops like coffee, black pepper, silver oak, jackfruit, coconut, kinnow and other wide varieties of fruit and plantation crops. The livelihood pattern in Bastar continues to be dictated by tradition, as even today, agricultural practices followed by the tribals are traditional. The usage of

traditional agricultural implements has lowered the production of agriculture and horticulture in the zone. In Bastar, it was introduced to check *podu* or shifting cultivation whereby to control denudation of forest and also soil erosion. Forest-related work, including collection and sale of forest produce, supplements the meager agricultural income of the population. Around 72% upland is available in Bastar in which only minor millets and maize are cultivated. These crops are comparatively very less remunerative. A total of 67% of the tree cover loss in Bastar occurred within natural forest with nearly 3.51 kha of the tree cover which is equivalent to a 100% decrease since 2000 and 7.8% of the global total.

This is the first attempt of commercializing coffee production in Darbha block of Bastar zone in Chhattisgarh. In view of the encouraging results from the old orchards and availability of new high yielding varieties, a new experiment in the forest land of Darbha block was started in the year 2017 under mixed forest conditions. The economic prospects and commercial benefits of the crop are attracting more number of youth and rural farmers towards itself. The soil and climatic conditions of Bastar is quite similar to the southern states of the country where coffee is cultivated in large areas.



Nursery raising of coffee

Table 1. Soil and climatic conditions recommended for coffee

Factor	Arabica	Robusta
Elevation	1000-1500 m	500-1000 m
Soil	Deep, friable, rich in organic matter, well drained and slightly acidic	Deep, friable, rich in organic matter, well drained and slightly acidic
Slope	Gentle to moderate	Gentle slope to fairly level
Temperature	15-30°C	20-38°C
RH	70-80%	80-90%
Annual rainfall	1600-2500 mm	1000-2000 mm
Blossom shower	March-April (20-35 mm)	Feb-March (20-35 mm)
Backing shower	April-May (50-75 mm)	March-April (40-60 mm)

Cultivation practices

Coffee is mainly cultivated in deep fertile jungle soils under a two-tier mixed shade canopy comprising evergreen leguminous and non-leguminous shade plants. When grown under shade, it has several advantages. Shade plants provide a natural habitat for vast population of birds and natural enemies of insect pests/diseases that helps in contributing towards the soil fertility and reducing the soil erosion by recycling nutrients from deep soil in the form of leaf litter and finally protecting the coffee bushes from vagaries of changing weather conditions. Coffee cultivation in Chhattisgarh offered a great scope for production of organic coffee, as the conditions are much favourable likewise any other coffee producing States.

The data regarding the recommended elevation and rainfall for Robusta and Arabica coffee varieties is given in Table 1. Bastar region purely satisfies the climatic requirement for its cultivation. The suitability of crop to the climatic factors is given Table 2. Bastar zone lies at an altitude of 500-1276 m above mean sea level and the soil ranges from shallow to deep and friable with a pH from 4.5 to 7.0.

The forest soils are very rich in nutrients. The rainfall ranges from 1300-1800 mm with frequent showers during summer season. Such a climatic condition is well suited for higher growth and yield of the crop. Darbha is located at 18°52' N and 81°55'E at an elevation of 678 m above MSL. The area of orchard is 20 acres having a plant population of 25,000. It is a mixed forest area where plantation of mango, silver oak and jackfruit has also been done to provide additional shade to the crop. Presently four varieties of Arabica (San Ramon, Chandragiri, Selection-8, Selection-9) and one variety of Robusta (C × R) have been planted in the orchard.



Field view of coffee plantation

Table 2. Major climatic factors affecting production in coffee

Factor	Arabica	Robusta
Blossom shower	Absence of rain till May	Absence of rain till March
Backing shower (if delayed)	Poor crop growth	Poor crop set
Hailstorm	Plant injury	Plant injury
Rain at blossom	Partial to full failure	Partial failure
Soil moisture	Partial to full flowering failure	Complete flowering failure
Water logging	Partial to complete crop failure	Partial to complete crop failure
Wind	Highly affected	Partial affected

Table 3. Plant characteristics of coffee

Coffee type	Arabica (<i>Coffea arabica</i> L.)	Robusta (<i>Coffea canephora</i> Pierre ex Frohener)	Plant coffee (<i>Coffea liberica</i> Bull ex Hiern)
Plant characteristics	The plant produces profuse branches and the matured leaves are dark green in colour while the young leaves are either green or bronze. The flower buds are produced in clusters in the axils of leaves at each node. Water is essential for flowering and usually the blossoms occur 8 to 10 days after showers. Arabica is self fertile. Arabica coffee is susceptible to major pests and diseases, viz. coffee leaf rust and white stem borer. Arabica is considered as superior in quality to Robusta having rich flavour and aroma.	Plants are green in colour. Flowers are fragrant and borne in compact clusters at each node. The number of flowers per node is comparatively higher than Arabica. The flowers generally open on the 7 th or 8 th day after showers. Unlike Arabica, Robusta is self-incompatible thereby the ovule of the same flower does not get fertilized with its own pollen. Hence cross pollination is essential in Robusta. Time gap for fruit maturity is 10 to 11 months and these generally get ready for harvest two months later than Arabica. Robusta is a shallow rooted crop and is susceptible to drought. It is tolerant to major diseases and pests like coffee leaf rust and white stem borer. The quality of Robusta coffee is inferior to that of Arabica in bean size as well as in organoleptic characteristics like aroma and flavour.	Liberica is known as plant coffee because of its growth habit and is cultivated along the fence and boundary line of estates. The leaves are dark green, leathery and are 2 to 3 times larger than Arabica. The flowers are large and fleshy. The plant usually takes about a year to start flowering and maturity of fruit. The fruits are larger in size than Arabica and yellow to reddish-brown in colour. Its cup quality is generally considered to be inferior to Robusta.
Popular varieties	Sln.1 (S.288), Sln.2 (S.333), Sln.3 (S.795), Sln.4, Sln.5, Sln.6, Sln.6 (S.2828), Sln.7, Sln.8, Sln.9, Sln.10, Sln.11, Sln.12 (Cauvery) and Sln.13 (Chandragiri).	Selection 1R (S.270, S.274), Selection 2R (BR series 9, 10 and 11), Selection 3R (C×R).	

Conceptualization of the project

The suitability of land and agro-climatic condition of Bastar is well suited for the crops like coffee, black pepper, silver oak, jackfruit, etc. Coffee based multitier cropping patterns along with value addition of horticultural crops like coffee, black pepper, turmeric, tamarind, chilli, tomato and coriander was thereby introduced to the farmers so that they could generate year round revenue from a single piece of land. The project was thereby formulated to utilize the fallow lands of the tribals for upliftment of tribal community. Understanding the challenges of the tribal farmers and highlighting the opportunities to empower themselves as agri-entrepreneurs has been the major emphasis of the work. In this view, self-help groups of tribal men along with the women has been made in order to put on a pedestal for women empowerment in the area by providing them vocational training on processing and value-addition of various crops. In the Dilmili area, coffee has been introduced in 100 acres of land involving 34 farmers in community mode. Apart from this village, in order to uplift the tribal dominated rural villages and to introduce innovative farming technologies, work of multitier farming under drip along with the value-addition of the produce has been initiated at Mundagarh, Urookpal and Dilmili.

Marketing and Government aids

The processed products have year round market demand without the fluctuation in their prices thereby generating regular income source for the growers. Establishment of marketing linkages of processed coffee and other horticultural produce among SHGs and National agencies was done priorly in order to avoid problems of marketing and to fetch optimum market price of value added products.

The site at Dilmili has targeted 100 acres of farmers land under coffee and other shade crops. A group of 34 farmer's has initiated the multitier coffee based plantation in community mode and the funding has been approved and sanctioned by the district authority under DMFT and MGNREGA scheme. Employment is being generated for the tribals at primary level by raising the crop and thereafter by processing and value-addition of the produce.

The members of self help groups are actively engaged in the crop production as well as value-addition of the produce. The value-added products like filter coffee and green coffee are fetching higher market rates. The products are being sold under the 'Bastar' branding. This in turn is enticing interest among the tribal farmers to cultivate their own piece of land and process the harvested

Flowering in *C. arabica* and *C. robusta*

Fruiting in coffee plant



Processed Bastar filter and green coffee

produce. Bhoomigaadi and SHG's have started the sale of Bastar coffee that is fetching a minimum sum up to ₹3000 per day.

Net returns to the farmers

Economic returns from coffee plantation starts from the 5th year of plantation while from the 7th year onwards, the yield gets stabilized. Through coffee cultivation, the farmers of the area are fetching an income of ₹15,000–20,000 per acre (after 5th year of crop) from the non-productive barren lands. Minimum sum of ₹5000 per acre (from 1st year) is availed from various intercropped vegetables during the initial stages of intervention. This amount may enhance during later years. Further, an additional income of about ₹15,000 per acre (after 4th year of crop) is generated through various fruits and spices intercrops. Thus, a total of ₹35,000-40,000 per acre net income is generated.

SUCCESS STORIES

Ishansh from Bakawand block: For his way from being an engineer to a progressive farmer, he adopted farming rather than working in any multi-national company. As of now, he is growing coffee in 10 acres, coconut in 5 acres and other horticultural vegetables as intercrops. He is now earning huge profits by growing these crops. Ishansh earns around ₹25 lakhs per year from his farm. He has now become one of the most successful progressive farmers of Bastar.

Jalnu Ram Baghel (Koykimari, Block Dilmili): Once a worried tribal wage labour who was unable to fulfill his family's requirement is now a farmer. He is now growing coffee under the DMFT and MGNREGA scheme. The rural population of Koikymari is now raising coffee under community mode and has started earning good profits.

Future prospects

Government of Chhattisgarh established State Tea and Coffee Board for expansion of area in the state. The tribal population is largely below the poverty line and the income generation from the rainfed crops is meagre. In addition to this, tribal farmers are also dependent on collection of Minor Forest Produce to sustain their livelihood. Multitier farming along with coffee and black pepper plantation in the lands of tribes has been found to provide sustainable income to the tribal farmers and the cultivation of coffee is seen to give relatively better income to the farmers than other crops. Mixed farming generates year round income to the farmers and regulates their livelihood and economic sustainability rather than depending on a single or forest based cropping pattern, thereby reducing the losses that the farmers usually face during climatic variations.

Sustainable enhancement in productivity and profitability of agriculture and allied sector through improved technologies were targeted in this research. As of now, there is no coffee processing unit in the Bastar zone till date. Keeping this in view for the sale of coffee beans and its processed products; market linkages were developed with TRIFED and BHOOMIGAADI NGO. Participatory involvement of the local tribes for value-added products and its marketing was planned prior to the commencement of the project. Coffee is one of the cash crops whose life is more than 50 years. Its value-addition will thereby provide employment for generations to come. Apart from this, the intercrops in coffee orchards will also fetch regular income for the tribals.

For further interaction, please write to:

Krishan Pal Singh (Scientist), College of Horticulture and Research Station, Jagdalpur, Bastar, IGKV, Chhattisgarh 494 001.
*Corresponding author email: drkpsingh2010@gmail.com