
Socio-economic Upliftment of Tribal Farmers:
CSIR-CIMAP Technological Interventions
सीएसआईआर-केन्द्रीय औषधीय एवं सगंध पौधा संस्थान, लखनऊ
CSIR-Central Institute of Medicinal and Aromatic Plants, Lucknow

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Cover Front
Tribal women of Malgaon (Bastar) working in Lemongrass field

Cover Back
Boro Tribal women of Tamulpur (Assam) celebrating the distillation of Lemongrass oil

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Dense forest of Anamalai Tiger Reserve

डॉ. जितेन्द्र सिंह

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भारत सरकार

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Message

The income of tribal households from land resources in insufficient to provide them livelihood security resulting in migration under distress. Therefore, there is a strong need to improve their incomes through scientific interventions and improved agro-based activities. Looking at this critical issue of distress migration, some technological interventions improving their agricultural incomes are of prime importance. The major bottleneck with tribal farmers is limited knowledge about recent advances or inputs in improving agricultural productivity because information or advisories do not reach optimally to the tribal areas.

CSIR has developed several agri-based technologies which can enhance farm incomes and promote livelihood of farmers. These technologies have been amply demonstrated under the CSIR Aroma Mission, where thousands of farmers have been benefited. An attempt has been made by the CSIR-CIMAP through introducing several improved varieties and agrotechnologies related to medicinal and aromatic plants in tribal areas, resulting a significant increase in their farm incomes. CSIR-CIMAP has compiled these success stories in coffee table book which depicts various technological interventions in tribal areas aiding their improved economic growth in different parts of the country.

I congratulate CSIR-CIMAP for deploying CSIR technologies for better health and life of tribal people. These success stories need to be replicated in other tribal areas for economic and social empowerment along with preserving their age-old culture and traditions

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Tribal women farmers of Dudhwa preparing the planting material of *Mentha*

सत्यमेव जयते

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Government of India
Ministry of Science and Technology
Council of Scientific & Industrial Research
Department of Science & Industrial Research

Message

CSIR-Central Institute of Medicinal and Aromatic Plants (CSIR–CIMAP) is an agro-based laboratory making ago-based inventions and innovations to enhance the income generation of farmers, including tribal people. Agriculture in the tribal areas near forests sometimes experiences crop damage from wild animals. Therefore, a need was felt to introduce some insurance crops which, apart from higher incomes, could also tolerate weather extremes and are not affected by wild animals. One of the main focuses is to improve the livelihood of tribal communities by introducing aroma crops in such areas which are tolerant to various stresses and are not attacked by wild animals.

CSIR-CIMAP, through its developed varieties and technologies, took this task to improve the livelihood of different tribal settlements. Technological interventions in more than 20 such settlements in Tamil Nadu, Jharkhand, Bastar, Uttar Pradesh, and several North-Eastern states have significantly improved agricultural productivity and income. These aroma crops were not affected by wild animals and extreme weather conditions and also resulted in negligible Human-Animal conflicts. A marked increase in their farm incomes has given them an opportunity of providing education to their children, accessibility to medical facilities, and improved housing along with persevering their age-old culture. Through efforts of CSIR-CIMAP, Aroma Industry has come forward for this cause and has provided processing units to several tribal areas.

This coffee table book depicts various technological interventions in tribal areas aiding their improved economic growth in different parts of the country. It is a worthy and plausible effort by CSIR-CIMAP stipulating CSIR's firm commitment to deploying CSIR technologies for better health and life of tribal people.

I congratulate TEAM-CIMAP, for this remarkable effort in developing Tribal Cluster Models. Such models can be easily replicated in other tribal settlements for their economic and social empowerment along with preserving their age-old culture, traditions, and customs.

September 23, 2022
New Delhi

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Tribal woman working in the lemongrass field of Bastar

Foreword

Improving the livelihoods of tribals, dependent on land and forest natural resources, has always been an important focus. Despite significant economic growth in the country, tribals remain at the bottom of income pyramids, usually struggling to meet their financial needs. This is mainly because many tribals untouched by modern technologies cannot adapt to the same. CSIR-Central Institute of Medicinal and Aromatic Plants (CSIR-CIMAP), Lucknow in the last several years, has introduced several medicinal and aromatic plant-based technologies in many tribal areas looking at the problems faced by tribal farmers in cultivating traditional crops. As most of the tribal colonies now exist on the fringes of dense forests, their farmlands are frequently attacked by wild animals restricting them from taking traditional food crops. Moreover, the wild animal threat does not allow them to rear poultry and livestock; therefore, their incomes are purely derived from agriculture, which depends on rainfall. Because of frequent monsoon failures, the income from the cultivation of food crops remains meager.

Several medicinal and aromatic plants (MAPs) can tolerate high levels of moisture, and other stresses and, therefore, can be easily grown in moisture deficient conditions. More importantly, because of their peculiar aroma, these crops are not liked by domestic and wild animals, making them suitable for vulnerable areas near forests. CSIR-CIMAP, depending on the agro-climatic conditions, has promoted the cultivation of MAPs in such areas. The farmers of this region were initially sensitized about the benefits of MAPs through hundreds of awareness cum training programmes. The interested farmers were provided the quality planting material of high-yielding varieties suitable for that region, and field demonstrations were conducted. The efforts of CSIR-CIMAP have been successfully translated into enhanced income, which at times is 3-4-fold compared to before interventions made by the CSIR-CIMAP. Many improved distillation units were also installed to process the harvested herb, and the techniques to store distilled essential oils were popularized.

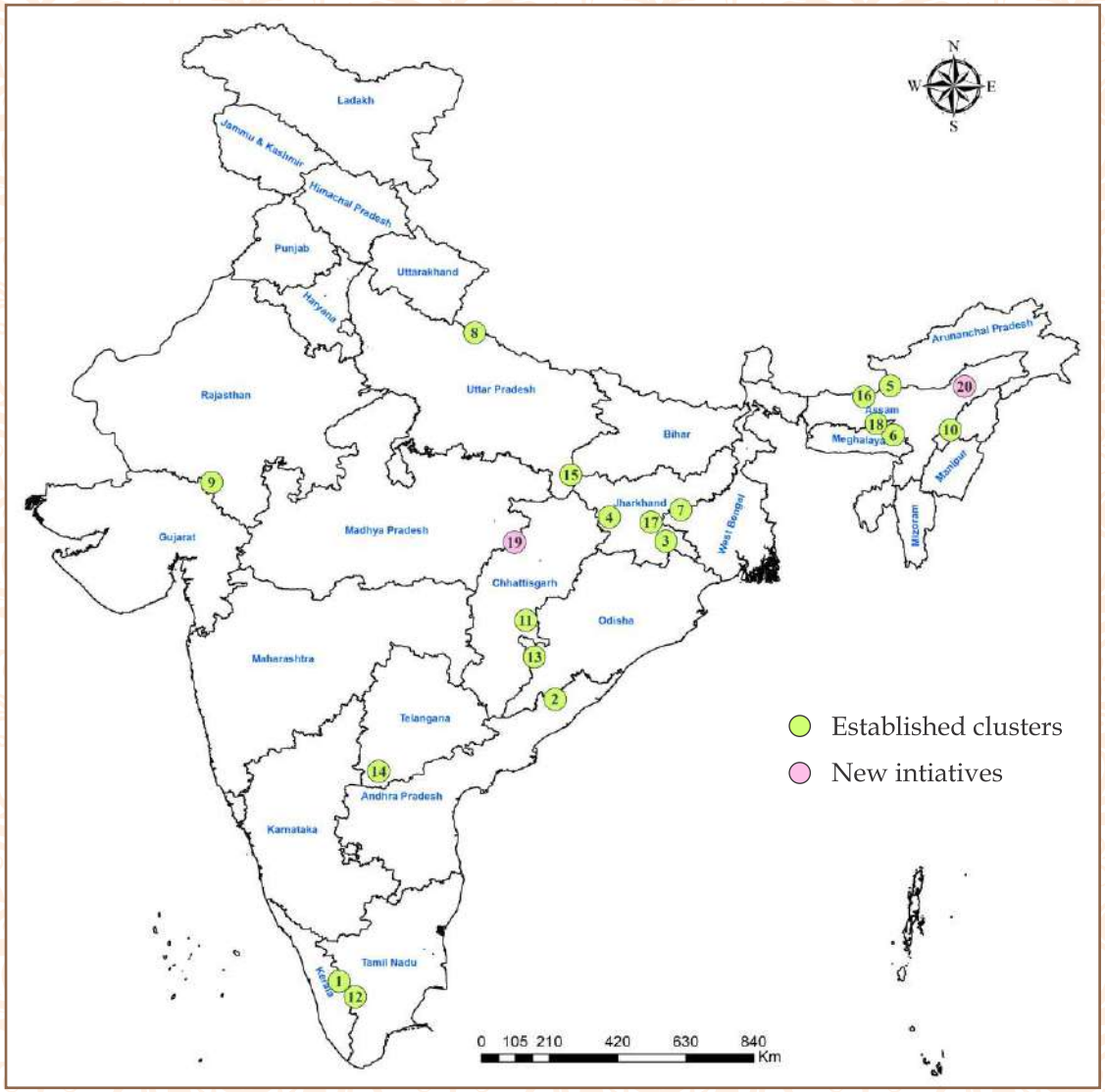
This Coffee Table Book illustrates the details of the 20 tribal clusters where successful implementation of CSIR technologies resulted in the improved socio-economic status of the tribal farmers. I must compliment the efforts of CSIR-CIMAP scientists and technical staff for taking this challenge to introduce these technologies in the remote tribal areas devoid of basic stay and food facilities. However, I am sure that the outcomes of their efforts must be giving them immense satisfaction in helping this section of society. I must thank the support of Director General, CSIR, for providing financial support to carry out such activities. The support from other funding agencies like DST, DBT, JSPLS, RKVY, MBDA, IGNTU, and the aroma industry like Ultra International Ltd. is acknowledged.

I am sure this successful model of uplifting the economic status of tribal farmers would also be replicated in other areas so that these benefits should reach the remotest difficult areas.

Prabodh Kumar Trivedi
Director, CSIR-CIMAP

Tribal woman from Tunju, Ranchi

Aroma clusters



Contents

Anamalai Tiger Reserve

Tribal cluster habitat details

Muthuvar, Kadar, Pulaiyar, and Malai Malasar are the major tribal settlements in the dense forest areas of Vellimudi and Kadambarai, located in Anamalai Tiger Reserve (ATR). ATR is carved out of the Tamil Nadu portion of the Anamalai's in the Western Ghats, a region designated as one of 25 Global Biodiversity Hotspots in India. It lies South of the Palakkad gap in the Southern Western Ghats and is located between the longitudes 76° and 77° E and latitudes 10° and 10° N. Around thirteen tribal settlement families are living in this forest area full of wild animals like Tigers, Elephants, Nilgiri Tahr, Gaur, and Sambar deer, posing a great threat to the conventional food crops as well as their domestic animals like livestock, goats, sheep, poultry, etc.

Status before interventions of CSIR-CIMAP

The tribal farmers, for long, had been dependent on conventional food and vegetable crops, barely sufficient for their livelihoods. However, there used to be a great threat from wild animals who were attracted to these crops, and this at times used to be the cause of animal-human conflicts causing loss of lives. About a few decades back, through some NGO, Lemongrass was introduced in this region to reduce this human-animal conflict as these crops are not liked by animals because of a typical fragrance/aroma in their leaves, making the crop unpalatable for the wild animals, thus significantly reducing the damages caused. However, the introduced variety possessed very low contents of essential oil, making this crop economically unattractive.

The farmers continued with this crop, being the only alternative to animal menace. Later, some spice crops were also introduced, which did not become an attractive proposition because of the lack of processing facilities. Afterward, with the interventions of the Forest Department, a field distillation unit was also installed there. Because of inferior variety (containing <0.3% oil) and primitive kind of distillation unit (leading to poor oil recoveries), the crop started losing its sheen. The officials of the Forest Department requested CSIR-CIMAP for some interventions so that the income of these tribal settlements could increase as the wild Lemongrass oil is one of the major sources of their livelihood.

Technological Interventions by CSIR-CIMAP

Three awareness and one field training programmes were conducted on Lemongrass cultivation and its processing at Attakatti and Vellimudi settlements of Anamalai Tiger Reserve with the collaboration of the Forest Department. About 115 tribal farmers attended these programmes. During these programmes, 2,50,000 slips of Lemongrass, Krishna variety, possessing higher oil content (0.8 – 1%) were provided, and the farmers were explained about the benefits of growing Krishna variety of Lemongrass than the local variety.

Huge awareness was created about Lemongrass cultivation through various training programmes. Later, another 3,00,000 lakhs slips of Krishna variety of Lemongrass were distributed to the tribal farmers of the Vellimudi region and Mavadaippu settlements. Two 250 kg distillation units were provided from the Mission, and another two were installed with financial support from M/s Ultra International. Special distillation process training was also organized at the tribal farmer's field, looking into better recovery and safety of the operators. Moreover, being fuel efficient and running on distillation waste as fuel, will considerably reduce their dependence on firewood, reducing the cutting of trees.

Benefits accrued to tribals

The successful interventions made through cultivation and processing technologies in the tribal areas have benefitted the tribal farmers through the introduction of a high yielding variety and providing of improved processing units which have resulted in enhancing the total essential oil yields to about three to four times and increasing their incomes to minimum 3-4 folds, considerably improving tribal farmer's livelihood.

Impressed and encouraged by the successful interventions made through the Mission programme and the income enhancements achieved by the Mission beneficiary farmers, tribal farmers from other settlements have also taken up Lemongrass cultivation. Few of the youngsters from the tribal settlements have taken this as an opportunity and started a small business of oils produced here. There is a remarkable increase in the number of school-going kids mainly due to this increased economy. The only teacher of primary school here also acknowledged the increased number of children in school education. Lemongrass has become an attractive crop, and farmers, whenever in need of money, can harvest a part of their field, extract the oil and sell it in the local market. Even the distillation waste of the crop is being used for thatching their houses. In the past 4-5 years, these tribal settlements have produced more than 3 tons of essential oil worth about Rs. 50 lakhs. One of the farmers has now bought a small car considering the health emergencies of the habitants.

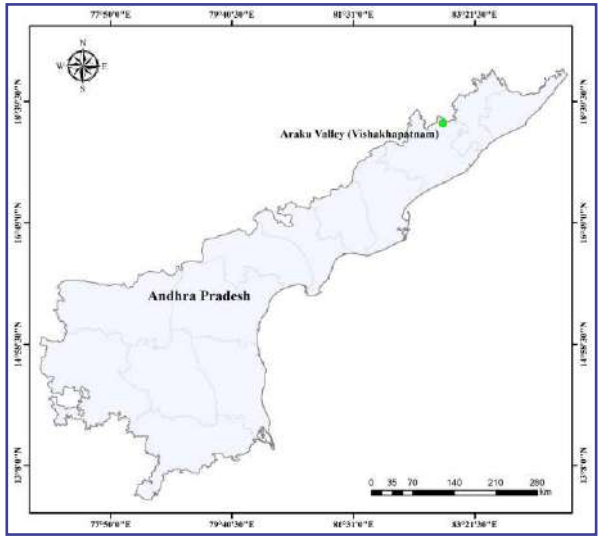
From the farmer(s).....

“ I am a farmer cultivating Wild Lemongrass for more than twenty years. I have got a new variety of Lemongrass, value addition information, and Lemongrass essential oil distillation unit from CSIR-CIMAP. Through this, Lemongrass slips and oil machine, I have produced around 100 kgs of Lemongrass oil. This Aroma Mission scheme made a lot of changes in tribal's poor economic life of our settlement. ”

Arjunan Muthuvar

Araku Valley

Tribal cluster habitat details



Gram panchayats, villages, and various hamlets of Dumbriguda, Chintapalle, and Ananthagiri mandals, and Araku Valley region in the district of Visakhapatnam, Andhra Pradesh are dense hilly forest areas and have major tribal settlements. The district of Visakhapatnam has 13.4% of the tribal population, with major tribal groups being Bagata, Kondadora, Konda Kapu, Gadaba, Mannedora, and Valmiki. Agriculture by tribals in these hilly regions is challenging in terms of slopy land, scarce irrigation, lower level of investment, absence of an efficient market environment, etc.

Status before interventions of CSIR-CIMAP

The tribal farmers, for long, had been dependent on conventional food, vegetable, and spice crops which are suitable for the hilly terrain and which are barely sufficient for their livelihoods. They were not introduced to aromatic crop cultivation and processing by any governmental or NGO agencies before the CSIR-CIMAP team visited them.

Technological Interventions by CSIR-CIMAP

Initially, during 2008-09, an initiative was taken to introduce Citronella and Lemongrass in Araku Valley mandal, and Dubriguda mandals of Visakhapatnam district, and 92 farmers were given hands-on training in planting, weeding, harvesting, and distillation of Citronella. Later, 120 tribal women farmers were provided planting material of a high-yielding variety of Citronella (Bio 13). Later, with the establishment of CIMAP's FDU distillation facilities, the recovery of Citronella oil doubled. This distillation unit worked on the spent distilled grass and saved the valuable firewood and the forests. This has doubled the income of about 40 tribal families who were completely dependent on Citronella for their livelihood. Further, aromatic crop cultivation and processing of essential oil was popularized in the other regions of the district like Chintapaka and Pinakota panchayats by frequently conducting training programs, by providing genuine and improved planting materials of high-yielding varieties like slips of Lemongrass (var. Krishna) and seeds of Palmarosa (PRC-1) free of cost to hundreds of tribal families and by setting-up field distillation units (500 kg capacity each) at strategic positions with the help of an NGO, to improve the economic condition of the tribal farmers. CSIR-CIMAP's continuous efforts influenced the tribals to cultivate aromatic grasses in more than 300 ha of area in the tribal, hilly regions of Visakhapatnam in Andhra Pradesh today.

Benefits accrued to tribals

The successful interventions made by introducing the cultivation of aromatic grasses and improved processing technologies in the tribal areas have benefitted the tribal farmers mainly through the introduction of a high-yielding variety and providing improved processing units, which have resulted in increasing their income to 2-3 folds, considerably improving their livelihood. Tribal families of Ananthagiri and Chintapalle mandals are now generating income sufficient for their livelihood by selling the essential oil produced in the CSIR-CIMAP's distillation units. Additionally, some of these tribal families are also generating an income of about Rs. 10,000/- to 20,000/- annually by selling CIMAP's genuine and high-quality planting material to the farmers and entrepreneurs of the state as well as neighbouring states.

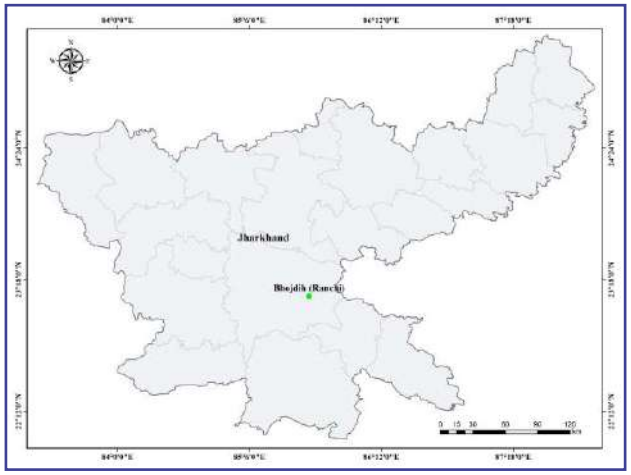
From the farmer(s).....

"I am Gemmela Pothuraj S/o Bhimanna. I am a tribal farmer from Chintapaka (village), Pinakota (GP), Anantagiri (Mandal), Visakha (District). Through CIMAP Hyderabad support I have planted Lemongrass slips in my own farm. By distilling the lemongrass oil and selling the genuine planting material as seeds to neighboring farmers, I frequently earn at least Rs. 5000/- to 10,000/- income regularly. Also seeing me, 31 farmers of our village came into cultivation of Lemongrass in 5 acres in our unit. I would like to express my special thanks to CIMAP organization for providing me this help."

Gemmela Pothuraj

Bhojdih

Tribal cluster habitat details



Bhojdih is a medium-sized village located in Bundu block of Ranchi district in Jharkhand state. It is block headquarters, situated 40 km East of district headquarters Ranchi. Sonahatu in the East surrounds Bundu, Tamad in the South, Arki in the North, and Khunti block in the West. Barugutu, Khunti, Ranchi, and Chandil are the nearest cities to Bundu. Dassam Falls is a natural waterfall situated on a tributary of the Kanchi and Subarnarekha rivers. The water of this spring falls from a height of 44 meters (144 ft). Bundu is located at 23.18° N and 85.58° E. Munda, Oraon, and Bhumij are the main tribes living in this area. Farmers, mostly tribals, depend on agriculture, but because of low incomes, many have now opted to work in the industry as labour.

Status before interventions of CSIR-CIMAP

Farming is not intensive in this area, mainly because of small landholdings and the lack of irrigation water in the area. Because of rainfed agriculture, the tribal farmers can only have one crop during the rainy season in a year. The tribal farmers mainly depend on paddy, maize, and vegetable cultivation only during monsoon. However, the production of these crops is hampered if the rainfall is insufficient. This results in poor yields leading to low farm incomes. Therefore, tribal farmers are slowly losing interest in agriculture, looking for some other small jobs in nearby cities. The incomes earned from small, petty jobs are very low, and it is gradually becoming difficult for tribal farmers to run their livelihood. Most of the fields remain fallow as most of the farmers have abandoned the cultivation. They were desperately looking for alternatives to enhance their incomes from their farmlands.

Technological Interventions by CSIR-CIMAP

During our routine awareness programmes, some of the farmers wanted us to intervene in this tribal area with CSIR-CIMAP agro-technologies. Though they were cultivating Lemongrass almost a decade back, the crop had lost its sheen because of poor genotype and improper agro and processing techniques. The analysis of the crop variety revealed that it was a poor yielder. CSIR-CIMAP organized 7 one-day awareness programmes and made farmers aware of the benefits of Lemongrass and its high-yielding varieties. It was made clear that the new high-yielding variety and improved distillation unit can enhance the yields and farm profits considerably, may be 3-4 times. Later, one field training programme on the cultivation, processing, and marketing of Lemongrass was also organized in Bhojdih village of Bundu block of Ranchi district. More than 140 tribal farmers participated in this programme. During these programmes, slips of high-yielding Krishna variety of Lemongrass were provided, and the farmers were informed about the benefits of growing Lemongrass. Before the crop matured, a special training programme on the distillation process was also organized in the areas of tribal farmers. Overall, 1.5 lakh Lemongrass slips were distributed to tribal farmers in the selected areas to multiply the planting material in their fields. Earlier, a distillation unit of 500 kg capacity was installed by CSIR-CIMAP under RSP project and special training to the farmers was also provided for proper maintenance of the unit, keeping in mind the safety considerations. Demonstrations of other aromatic crops on farmers' fields were also made by the CSIR-CIMAP team, in addition to regular visiting the area from time to time for technical guidance, especially on the distillation of aromatic crops (2018-2022).

Benefits accrued to tribals

Several awareness programmes on the cultivation of aromatic plants in tribal areas and their processing were successfully conducted, and as a result, many farmers came forward for the cultivation of an improved variety of Lemongrass. The growth of the crop was quite good, and in a short period, they could multiply sufficient planting material for expansion. With the introduction of the high-yielding variety Krishna and the presence of an improved distillation unit, farmers are now getting about 3-4 times higher yields. This has considerably enhanced their incomes which is now clearly visible through their livelihood status. Encouraged by the successful interventions made through the Mission programme and significant increase in farm incomes, many farmers from nearby areas have shown keen interest in the cultivation of Lemongrass and farmers have started earning by selling small amounts of planting material to the farmers of nearby districts and states. By selling planting material (5.0 lakh slips), farmers have earned an amount of Rs. 2,50,000/-. This has further enhanced their incomes, and two other crops, Palmarosa and Basil, have also been introduced and are growing well in this region. Many farmers who had left their villages for small, petty jobs in nearby cities have come back and started the cultivation of Lemongrass, which now covers an area of about 20 acres.

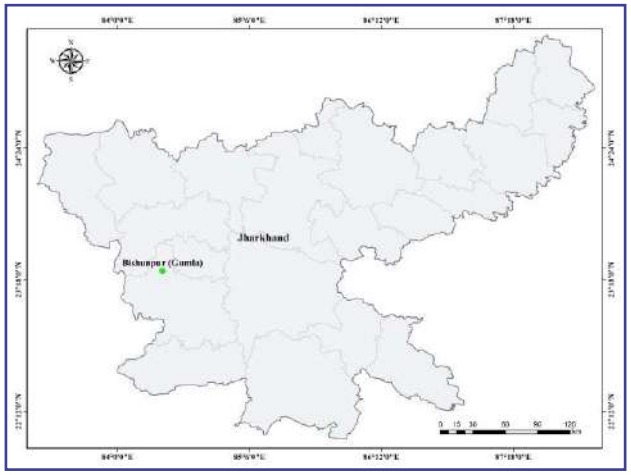
From the farmer(s).....

"I am Mukesh Kumar Munda, a farmer of Bhojdih in Bundu block, Ranchi district. I am cultivating Lemongrass, Palmarosa, and Basil crops for the last five years. Lemongrass variety, Krishna was given to me by CSIR-CIMAP under CSIR-Aroma Mission and RSP projects, and the CSIR-CIMAP team of scientists has provided important information related to cultivation and distillation. An improved distillation unit of 500 kg capacity has been set up for the distillation of Lemongrass. I have sold 100 kg of Lemongrass oil, and 4.00 lakh Lemongrass slips so far. We are earning 3-4 times more income from the cultivation of Lemongrass. Under this CSIR-Aroma Mission, the cultivation of Lemongrass has improved our lifestyle and economic condition. I have also bought many farm implements, including tractor, trolley, cultivators, etc. I am very happy and grateful for the efforts of the CSIR-CIMAP team."

Mukesh Kumar Munda

Bishunpur

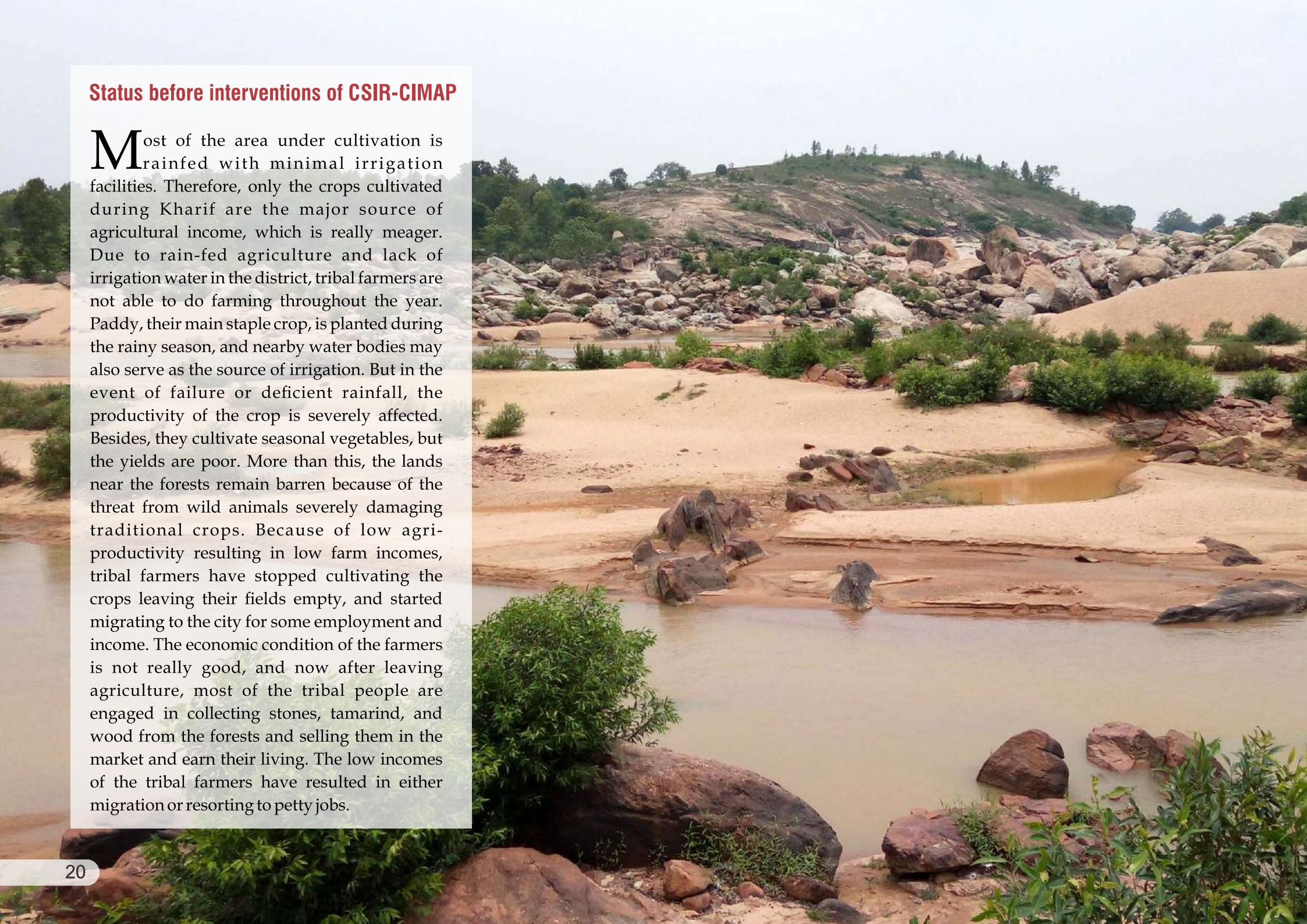
Tribal cluster habitat details



Bishunpur is a block located in Gumla district in Jharkhand. This block is situated at about 70 km from district headquarter Gumla. It is surrounded by Ghaghara block at its East, Palamu district at the North-West, and Chainpur block in its South. Asur, Brijiya, Korwa, Birhpr, and Topono are the major tribes living in this area. Most of the habitants in this block are dependent on agriculture. Also, they are forest produce collectors, and some are bauxite mine labourers. Located in the rural region of Jharkhand, it is one of the 12 blocks of Gumla district. The total population of Bishunpur block is 49,873, mostly living in kutcha houses spread across a total of 161 villages and 10 panchayats. The summer and winter temperatures are moderate. Netarhat, Lohardaga, Latehar, Gumla, Betla National Park are nearby important tourist destinations, which also give some opportunities to these tribals in terms of selling forest produce or handicrafts. This block has many bauxite mines, also providing some job opportunities to tribal farmers. The aroma cluster was established in and around Serka village with the support of Jharkhand State Livelihood Promotion Society (JSLPS).

Status before interventions of CSIR-CIMAP

Most of the area under cultivation is rainfed with minimal irrigation facilities. Therefore, only the crops cultivated during Kharif are the major source of agricultural income, which is really meager. Due to rain-fed agriculture and lack of irrigation water in the district, tribal farmers are not able to do farming throughout the year. Paddy, their main staple crop, is planted during the rainy season, and nearby water bodies may also serve as the source of irrigation. But in the event of failure or deficient rainfall, the productivity of the crop is severely affected. Besides, they cultivate seasonal vegetables, but the yields are poor. More than this, the lands near the forests remain barren because of the threat from wild animals severely damaging traditional crops. Because of low agri-productivity resulting in low farm incomes, tribal farmers have stopped cultivating the crops leaving their fields empty, and started migrating to the city for some employment and income. The economic condition of the farmers is not really good, and now after leaving agriculture, most of the tribal people are engaged in collecting stones, tamarind, and wood from the forests and selling them in the market and earn their living. The low incomes of the tribal farmers have resulted in either migration or resorting to petty jobs.



Technological Interventions by CSIR-CIMAP

Jharkhand State Livelihood Promotion Society (JSLPS) requested CSIR-CIMAP to identify some income-generating crops for tribal farmers in Jharkhand. Gumla was selected as one of the areas for making joint interventions under the CSIR-Aroma Mission. Looking at the difficulties faced by the farmers in undertaking agricultural activities, like lack of irrigation, the threat from wild animals, low incomes, etc., Lemongrass was initially selected as an aroma crop for introduction in Serka, Bishunpur. This crop can be easily grown as a rainfed crop and can sustain growth even under low moisture conditions. Moreover, the crop is not damaged by domestic and wild animals. Initially, CSIR-CIMAP organized two one-day awareness programmes just to make farmers aware of aroma crops, especially Lemongrass. Later, two field training programmes were also conducted on Lemongrass cultivation and processing at Bishunpur block of Gumla district. About 80 tribal farmers attended these programmes. During these programmes, slips of an improved variety of Lemongrass cv. Krishna containing higher oil content (0.8-1.0%) were provided, and the farmers were explained the benefits of growing Lemongrass. Special distillation process training was also organized at the tribal farmers' fields, especially highlighting the processing, safety, and maintenance of the unit. Also, farmers were trained about the storage of essential oils to maintain their quality. Around 1 lakh Lemongrass slips (Krishna variety) were distributed in small amounts to the selected tribal farmers. The tribal farmers were initially trained to grow this crop in a smaller area for multiplication so that the crop could be expanded to larger areas. Later, with an increase in area, farmers were also provided a 500 kg capacity distillation unit which was installed through the Jharkhand State Livelihood Promotion Society (JSLPS) under a collaborative project of CSIR-Aroma Mission Phase-I. CSIR-CIMAP team provided technical guidance and organized training and demonstration programmes from time to time, including demonstrations on the distillation of crops (2017-2022).

Benefits accrued to tribals

The successful interventions made through the CSIR-Aroma Mission, along with JSLPS, on the cultivation of aromatic plants and their processing technologies, have inspired many tribal farmers in those tribal areas, who have now started cultivating aroma crops, especially Lemongrass. This has benefitted the tribal farmers as the introduction of a high-yielding variety coupled with technical guidance has enabled them to take a bumper crop of Lemongrass, yielding around 60-70 kg of essential oil from one acre. Also, the presence of an improved distillation unit installed at the site has helped them to achieve higher yields resulting in handsome profits. Farmers' income has now enhanced by 2-3 folds, and they are not facing any threat from monsoon failure or crop damage by wild animals. As a result, the livelihood of the tribal farmers has improved considerably. Impressed with the interventions made through the Mission programme and the income earned through Lemongrass cultivation, the tribal farmers have now also taken up the cultivation of Palmarosa, Tulsi, Vetiver, and Geranium, which are now being grown successfully in this region. This has given the farmers ample incomes for sustaining their livelihood, and many farmers who had relocated to urban areas are back to their villages with their families. A large number of farmers have now opted for Lemongrass cultivation which covers an area of more than 20 acres. The farmers have handsomely earned profits by selling about 7.0 lakh slips of Lemongrass and 1 t of essential oil. Our honourable Prime Minister, Shri Modi ji, mentioned and appreciated the effort to develop the Lemongrass cluster of Bishunpur in Mann ki Baat on 26th July 2020.

A collaborative project of CSIR-CIMAP under CSIR Aroma Mission in collaboration with Jharkhand State Livelihood Promotion Society (JSLPS) initiated in 2017.

From the farmer(s).....

“ Myself, Basanti Devi, W\o Mr. Rajendra Oraon. I am a tribal farmer from Village-Serka, Block-Bishunpur, Gumla district in Jharkhand state. I have been cultivating Lemongrass, Vetiver, and Tulsi for the last four years. Lemongrass slips of Krishna variety and Vetiver slips of variety CIM-Vridhi were given to me from CSIR-CIMAP under the CSIR-Aroma Mission project with local support from Jharkhand State Livelihood Promotion Society (JSLPS), Jharkhand. Important information related to cultivation and distillation has been provided by the scientists of CSIR-CIMAP, Lucknow. An improved distillation unit of 500 kg capacity has been set up for the distillation of Lemongrass. 150 kg of Lemongrass oil along with 2.00 lakh Lemongrass slips and 1.00 lakh Vetiver slips have been sold to the interested farmers and aroma industry. We are earning 3-4 times more income from the cultivation of Lemongrass than traditional crops. Under this CSIR-Aroma Mission, the cultivation of Lemongrass has improved our lifestyle as well as economic conditions of our families. After achieving higher incomes from the cultivation of Lemongrass, I have also started poultry farming. The tribal farmers of our area and many other farmers are now earning handsome profits by cultivating aromatic crops. I am very happy with CSIR-CIMAP and JSLPS team and equally gratefully to both.”

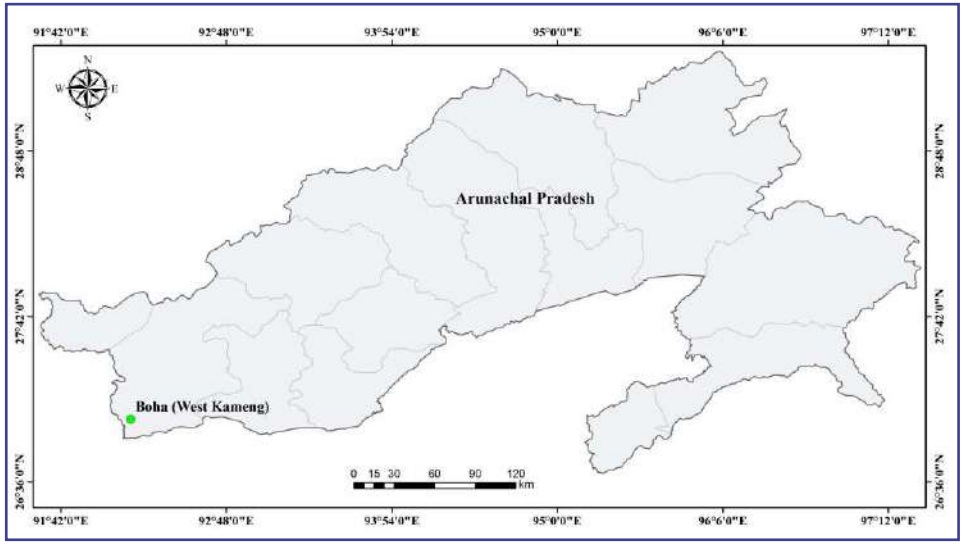
Basanti Devi

CSIR-CIMAP team is grateful to the Jharkhand State Livelihood Promotion Society (JSLPS) for providing local and partial financial support.

Tribal cluster habitat details

Boha village is located in Kalaktang block of West Kameng district of Arunachal Pradesh in India, where a cluster of farmers under the CSIR-Aroma Mission has been developed. Another cluster in Balemou has also been established in the same district. The total area of West Kameng is 7422 km^2. West Kameng lies approximately between 91°30′ to 92°40′ East longitudes and 26°54′ to 28°01′ North latitudes. The temperatures in West Kameng remain around 5-12 °C in winter season (November-February) and 20-40 °C in the summer season during the months of March-April. The topography of the district is mostly mountainous. A greater part of it falls within the higher mountain zone, consisting of a mass of tangled peaks and valleys. The tribal inhabitants of the district comprise mainly Monpa (Dirang, Boot, Lish and Kalaktang Monpa), Miji (Sajalong), Sherdukpen, Aka, and Bugun (Khawa). The Monpas belong to the Tibeto-Mongoloid stock and are the largest tribe of the district, inhabiting mainly the Dirang and Kalaktang circles.

The main occupation of the tribes is agriculture/horticulture. Most of the area is covered with slopy and undulated lands which are not fit for conventional crops. Moreover, the area is also inhabited by wild animals.



Status before interventions of CSIR-CIMAP

Before the interventions by CSIR-CIMAP, tribal farmers of Village Boha were into traditional agriculture, growing crops like potato, maize, rice, barley, wheat, soybean, rajma, and off-season vegetables. The landholding of tribal farmers is quite low, and the unavailability of water and invasion of wild animals further reduce their agri-profits. Over and above, a large chunk of the land area is sloppy or undulated, which will not accommodate many of the traditional crops. Because of the said factors, crop productivity is low, and the total net income from agriculture is almost negligible. Most of the farmers were cultivating the crops according to old traditional ways with minimal awareness of the latest agro-technologies and varieties. They were still following primitive kind of agriculture using old varieties. All this has resulted in low agricultural incomes, and therefore, farmers have abandoned their fields/farming, looking out for alternate income sources like petty jobs, and working as labourer in some state schemes.

Technological Interventions by CSIR-CIMAP

After a meeting in collaboration with the state government and University, where detailed discussions were held about the benefits of aroma crops, many farmers of this region contacted us to join the mission activities and showed keen interest in aroma crops. CSIR-CIMAP arranged two awareness programmes with the help of locals to make the farmers aware of the essential oil-bearing crops suitable for that area. Later, one field training programme was also conducted for the farmers interested in becoming a part of the mission. Field demonstrations of Lemongrass cultivation, as well as its processing, were undertaken in the villages – Balemu and Boha, West Kameng district. About 130 tribal farmers attended these programmes. During these programmes, 3.0 lakh Lemongrass slips of high-yielding Krishna variety were distributed to 20 tribal farmers to raise the crop for further multiplication. The crop has now spread to many nearby villages, especially in those areas where wild animals used to affect their crops frequently. More than this, several other aroma crops, like Geranium, Salvia introduced on a trial basis, have performed really well. An improved distillation unit of 250 kg was also installed to facilitate the processing of herbs under the CSIR-Aroma mission.

Benefits accrued to tribals

The introduction of Lemongrass in the tribal areas has really benefitted the tribal farmers. The introduced high-yielding variety has performed very well there and, coupled with an improved distillation unit, has enhanced the essential oil yields by 3-4 times. Their farm incomes, which used to be meager by growing traditional crops and were frequently damaged by wild animals, have increased considerably. The farmers who used to get net profits of around Rs. 10,000/acre are now achieving profits to the tune of Rs. 25,000-30,000/acre. It is hoped that many more farmers will join this mission and CSIR-CIMAP will also be introducing some other high-value crops to further enhance their incomes. Many other aroma crops like Geranium, Salvia, which are high-value crops, have also been introduced and are performing well; the planting material of these crops is being multiplied for expansion.

From the farmer(s).....

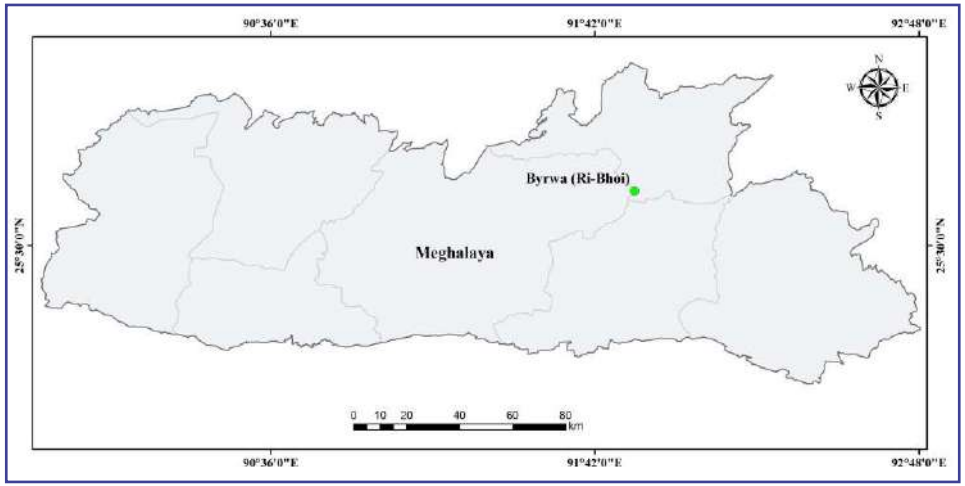
“ I am Mr. Norbu Jatso Namsa from Boha Village, P.O. & P.S. Kalaktang, West Kameng District, Arunachal Pradesh. With the help of CSIR-CIMAP Lucknow, we have started the cultivation of Lemongrass, Citronella, Clarysage, and Geranium at village Boha. We have developed two cluster comprising of 10-12 farmers. One cluster is focusing on cultivation of Lemongrass and Citronella covering 5-acre area in the foothills region of elephant corridor area bordering Bhutan and Assam. The other cluster of farmers are engaged in cultivation of high altitude and high value aromatic crops such as Clarysage and Geranium in an area of 1 acre each.

CSIR-CIMAP has also installed a cohobated stainless steel distillation unit of 250 kg capacity for the distillation of essential oil in the month of September 2020. Now farmers have started extracting essential oil using Geranium and Clarysage. The quality assessment of essential oil is being carried out. We are now in the process of expansion of area under cultivation of aromatic crops. High value aromatic crops are expected to provide livelihood support for the tribal farmers of Boha village as an alternative to *Cannabis* cultivation in future with the support of technical know-how from the experts of CSIR-CIMAP, Lucknow and Tezpur University, Assam.”

Norbu Jatso Namsa

Tribal cluster habitat details

Byrwa cluster developed under CSIR-Aroma Mission is situated in District Ri-Bhoi, Meghalaya. Ri-Bhoi is located in southern part of Meghalaya, having an area of about 2448 km2 which came into existence in June 1992. This district is situated between latitude 25°15' and 26°15' in North and longitude 91°45' and 92°15' in the East. Ri-Bhoi district is bounded in the North by Kamrup, Morigoan and Nagoan districts of Assam, in the East by Karbi Anglong district of Assam, in the South by East Khasi Hills, West Khasi Hills districts, and in the West side by West Khasi Hills district of Meghalaya. Nongpoh is the headquarter of the Ri-Bhoi district. Though Bhoi is the main tribal community of this district, which is the sub-group of the Khasi tribe, other groups of tribes like Garo, Karbis, Marngars, Mikirs, Bodos, and Lalungs also exist in small concentrations. The climatic condition of Ri-Bhoi/Byrwa is slightly warm as compared to Shillong and other hilly areas, and is located on low hills, with cultivation being carried out on slopes and most of the areas remaining underutilized on slopy lands. This area receives a good amount of rainfall.



Status before interventions of CSIR-CIMAP

Bhoi tribal farmers mainly depend on agriculture, their main occupation, for livelihood. They largely cultivate traditional crops such as rice, maize, and pulses on plains, which are in smaller proportions, but also grow crops like pineapple, ginger and turmeric on slopes. Wherever irrigation facilities are available, farmers are able to take 2 harvests of rice in one year. Ri-Bhoi district is surrounded by 9 main rivers so irrigation is not a major issue. A very small acreage under cultivation is plain, while most fields are on elevation and slopes. Sloppy area is not used much in cultivation as soil erosion is a significant problem on slopes, and therefore, the major area remains devoid of cultivation. The farmers of these tribes have very small landholdings, are very poor, and work as labour or are involved in transport activities.

Technological Interventions by CSIR-CIMAP

A few years back, the Meghalaya Basin Development Authority (MBDA), the Government of Meghalaya, showed interest in introducing medicinal and aromatic crops in Meghalaya. CSIR-CIMAP introduced a number of medicinal and aromatic crops for preliminary screening at Bio Resource Development Centre (BRDC) farm, Shillong. A few crops like Artemisia, Peppermint, Geranium, Lemongrass, Curcuma, etc., were found promising. Later, an MoU was signed with MBDA for the popularization of these crops in Meghalaya, and it was agreed upon to vigorously take up the CSIR-Aroma Mission's activities in Meghalaya. CSIR-CIMAP organized several awareness programmes in Ri-Bhoi district to make the tribal farmers aware of these crops. Through these awareness programmes, Bhoi farmers learned the skills of cultivating, processing and distillation of essential oils. Under CSIR-Aroma Mission, Bhoi farmers got the planting materials of high-yielding varieties of Lemongrass (Krishna), Citronella (Bio 13), Geranium (Bio171), Peppermint (Kukrail), Vetiver (CIM-Vridhi) and Palmarosa (PRC1). Initially, small amounts of planting material were provided, which they multiplied in their fields and increased the area under cultivation. CSIR-CIMAP provided 2.0 lakh slips of Lemongrass, 1.0 lakh slips each of Citronella and Vetiver, and about 0.25 lakh cuttings of Geranium to the Bhoi community. For the distillation of essential oils, CSIR-CIMAP provided an improved field distillation unit (capacity 500 kg per batch) under CSIR-Aroma Mission. A special training was also organized on the processing of essential oils and maintenance of distillation units, especially considering the safety and storage of oil. To further promote them for taking up value-addition of essential oils, a special visit of some women farmers was organized at CSIR-CIMAP, Lucknow, where information was provided to them related to essential oil-based formulations. Later, four small units of 250 kgs capacity were also installed to distill high-value crops like Geranium, Peppermint so that superior quality oil could be distilled for value-addition, which may enable women entrepreneurship. Further, with an increase in area, huge amount of biomass of aroma crops was being produced and to facilitate faster distillation of the produce, chain-pulley mechanism was installed and that enabled farmers to have two charges in a day, almost doubling their distillation capacity. This year, another aromatic crop suitable for slopy lands, Tagetes minuta, was also introduced, which requires minimal resources. It is hoped that this crop would provide additional benefits to the farmers.

Benefits accrued to tribals

The said successful interventions made in the Ri-Bhoi tribal area have greatly benefitted the tribal farmers, mainly through the introduction of high-yielding varieties and improved processing units; both together enhanced the total essential oil yields to about four times. This enhanced their farm incomes by at least 2-3 times. The farmers of Ri-Bhoi have started earning an income of Rs. 30,000-40,000/acre. Both these crops would give them long-term benefits as these crops, once planted, can be harvested every three months for 5 years. This would, therefore, ensure higher income for at least five years. The other advantages being that these crops are not affected by pests and diseases, and are not damaged by domestic or wild animals. Aromatic crops were also planted on slopes and areas that remained fallow because of erosion, which started providing them some additional income as the roots of Lemongrass and Vetiver bind the soil and check erosion. So, apart from obtaining higher yields, Lemongrass and Vetiver crops are now providing them a great environmental benefit, also by checking soil erosion. A total of more than 60 acres is currently under cultivation of Lemongrass and Citronella, and about 10 tons of essential oil worth Rs. 150 lakhs has been produced and sold in the local market in the last couple of years. More than this, farmers could sell this quality planting material to many farmers of Nagaland and Arunachal Pradesh, which has resulted in additional incomes from the same field. A small area has also been brought under the cultivation of Geranium, a high-value crop; if successful, this will further enhance the incomes. Based on the essential oils produced in that area, several women entrepreneurs have started making a few products like soaps, candles, agarbatti etc. (Brand SUHSEING). Many farmers have now started cultivating Citronella under Pine trees, obtaining higher incomes without disturbing the native biodiversity.

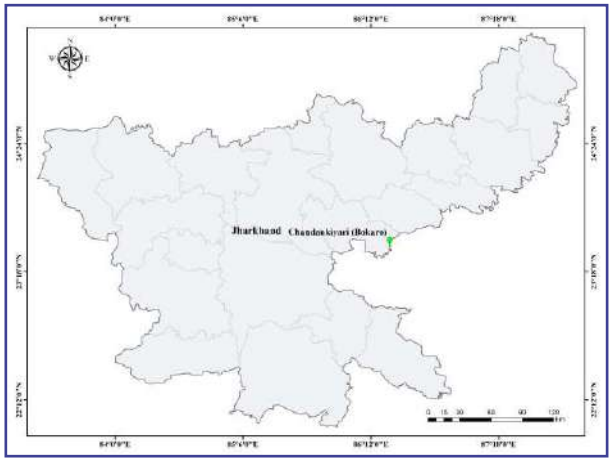
From the farmer(s).....

“ I am Bestarly Marwein from Byrwa, Ribhoi District, Meghalaya. First of all I am so grateful to the Institute of CSIR- CIMAP, Lucknow for giving me this opportunity regarding knowledge, technical help planting materials and distillation units for producing essential oils. At present, the area covered under Lemongrass is around 10 acres and citronella in around 25 acres, mint, geranium, basil, *Tagetes* etc. cover around 5 acres area. 200 kg oil is produced per month only from lemongrass and from others 10 kg. I would like to thank to CSIR-CIMAP that provides me the list of buyers also for purchasing oils. It had been a great blessing to me through this project (CSIR-Aroma Mission). ”

Bestarly Marwein

Chandankiyari

Tribal cluster habitat details



Chandankiyari block is situated in Bokaro district, a newly created district of Jharkhand. It is one of the highly industrialized coal belt districts in Jharkhand. Giridih bounds the Bokaro district in the North, Purulia (West Bengal) in the South, Dhanbad in the East, and Hazaribagh in the West, on the edge of West Bengal. Chandankiyari is located at 23°34′34″ N 86°21′03″ E. This area is dry land and totally dependent upon rains for agriculture. Paddy and some vegetable crops are commonly grown in this area. Santhal, Oraon, Munda, Ho, Kharwar, Kharia, and Bhumij are some common tribes living in this area. The farmlands are not really fertile, and also, with limited irrigation facilities, the agricultural derived incomes are very small, forcing the tribes to work in the coal mines.

Status before interventions of CSIR-CIMAP

Before the intervention of the activities under the CSIR-Aroma Mission, most of the tribal farmers depended upon cultivated vegetables and paddy during the rainy season. Because of poor soils and limited irrigation facilities, the income of the tribal farmers from farming is quite low. As the agriculture in this region is largely rainfed, farmers were able to take only a single crop in a year. Paddy and vegetables grown in this area are affected if rainfall is insufficient. Because of this reason, agri-productivity and farm incomes are very low. Therefore, most tribal farmers have left agriculture/cultivation of crops and are now engaged in mine-related activities. They used to bring coal from coal mines and sell them in hotels and markets to support their families. As they are not getting a good income from farming, tribal farmers have left their fields fallow and started migrating to the cities in search of employment and income enhancement.

Technological Interventions by CSIR-CIMAP

After initial surveys of the selected areas, it was found that Lemongrass could be a crop of choice for such areas where there is a lack of irrigation facilities and soils are not fertile. To start with, CSIR-CIMAP organized many awareness programmes in this area to make the farmers aware of the benefits of aroma crops, especially Lemongrass. Many farmers came forward as they were impressed by the ease of cultivation and higher income generation achieved through the cultivation of Lemongrass. Later, four one-day awareness programmes were conducted in different blocks wherein the benefits of aroma cultivation were discussed with the farmers. Many farmers decided to opt for the cultivation of Lemongrass cultivation, and one field training programme was conducted on Lemongrass cultivation in village Birkham, Chandankiyari in Bokaro district. About 85 tribal farmers attended this programme. During the programme, Lemongrass slips of Krishna variety were provided, and the farmers were explained about the cultivation practices and the benefits of growing Lemongrass. About 2.5 lakhs slips of Lemongrass were distributed to the selected farmers. Initially, small numbers of slips were provided, and the farmers were trained to produce planting material in their fields so that the area under cultivation could be expanded. These fields also served as nodes for the planting material to be distributed to neighbouring farmers. Later, a programme specifically on the processing/distillation of the Lemongrass herb was also conducted. The whole process of distilling the herb, right from harvesting, loading the material, collection of oil was demonstrated. The farmers were also trained on the maintenance of distillation units, and significant do's and don'ts, storage of essential oils, etc. Some other aroma crops, like *Ocimum* and Palmarosa, suitable for this region, have also been introduced and are growing successfully in this region. CSIR-CIMAP team has continuously guided the farmers, arranged demonstrations of aromatic crops, and helped the farmers in distilling aromatic crops (2018-2022).

Benefits accrued to tribals

The tribal farmers in this region are now successfully cultivating Lemongrass. The yields obtained from this high-yielding variety are higher, and coupled with an improved distillation unit, the farmers are able to achieve much higher yields (around 70-80 kgs oil/acre). The oil is being sold @ Rs. 1400/kg and is providing them handsome profits (> Rs. 50,000/acre), which is around 4-5 times higher than the average profit that they used to get from traditional crops like paddy and some vegetables. This has transformed the lives of many tribal farmers, which is clearly visible in terms of their housing, education of their children, new farm implements, etc. Many of the farmers who were working in the coal mines, in spite of health considerations, have started cultivating these crops. Many other farmers who had left their villages and migrated to urban areas for petty jobs have now come back and started Lemongrass cultivation. These aroma crops have set an example of higher incomes and attracted many farmers from neighbouring blocks and districts. The interventions under CSIR-Aroma Mission have greatly benefitted farmers who are now cultivating Lemongrass, Palmarosa, and *Ocimum*. Many farmers are now also selling planting materials for these crops to other farmers. Highly encouraged with the results of initial cultivation, farmers have extended it to quite a large area (around 40 acres) and also sold 50 lakhs of Lemongrass slips, earning around Rs. 25 lakhs apart from producing 1.2 t of essential oil. One farmer has installed his own distillation unit in the field and is also selling Lemongrass leaves for green tea at a price of Rs. 30 /kg.

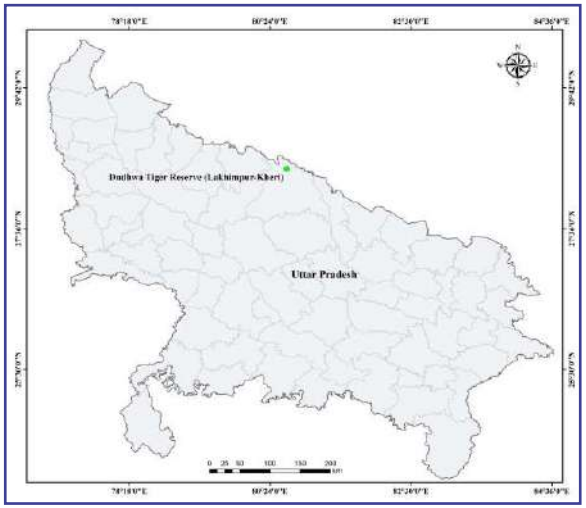
From the farmer(s).....

“ I am Rameshwar Prasad, a tribal farmer from Birkham, Chandankiyari, Bokaro district in Jharkhand state. I have been cultivating Lemongrass and Tulsi for three years now. I was given Krishna a variety of Lemongrass in 2017 from CSIR-CIMAP, Lucknow, under the CSIR-Aroma Mission project. The technical guidance has also been provided by CSIR-CIMAP on the cultivation, distillation, and marketing of Lemongrass oil. And also, I have produced and sold 25 lakhs of Lemongrass slips and 205 kg of Lemongrass oil. From these sales, I have self-established one distillation unit and have bought many agri-implements, etc. I have also started selling Lemongrass leaves for green tea. The tribal farmers of our area and many other farmers are now earning profit by undertaking the cultivation of aromatic crops. By cultivating these crops, I could earn a profit 3-4 times higher than from other crops. The farmers of this area are very happy to cultivate Lemongrass. ”

Rameshwar Prasad

Dudhwa Tiger Reserve

Tribal cluster habitat details



Dudhwa Tiger Reserve is located in the terai region of Lakhimpur Kheri district of Uttar Pradesh, India. Covering an area of 490.3 km^2 with a buffer area of 90 km, Dudhwa National Park is a part of Dudhwa Tiger Reserve. The region is located in the Lakhimpur Kheri district on the Indo-Nepal border, with reserved forest areas on the northern and southern sides. The climate during summer is typically hot, with temperatures rising to 40 °C (104 °F). During the winters, from mid-October to mid-March, temperature ranges between 20 and 30 °C (68 and 86 °F). The area is situated at the latitude of 28°30.5′N and a longitude of 80°40.8′E. The Tharu tribal community is living in and around this forest area, cultivating crops like maize, sugarcane, rice, etc., with a constant threat from wild animals, particularly elephants destroying their crops, having little or no options for cultivating non-agricultural crops.

Status before interventions of CSIR-CIMAP

The farmers of the Tharu tribal community living in this area depend on the buffer zone of dense forests inhabited by wild animals, which are not only a threat to crops but also to their livestock and poultry. For their basic accommodation, these tribes are dependent on wild grass for thatching and wood for building huts. They rely on firewood, fodder, fish, fruits, flowers, medicinal plants, etc., to supplement their meager incomes. Their economic condition is very poor, and they maintain their families by doing labor, and traditional farming like growing sugarcane, wheat, paddy, maize, etc. In addition, they are also involved in occupations like weaving, tailoring, mat weaving, and other artisan jobs. The landholding of tribal farmers is very small, mostly less than an acre, with 90% of tribal farmers. The crops like sugarcane, paddy etc. are generally damaged by wild animals giving rise to increased human-animal conflicts. There are years when these farmers cannot harvest any yields from their fields because of total destruction by the wild animals.

Technological Interventions by CSIR-CIMAP

Initially, under a DST-sponsored project, CSIR-CIMAP promoted the cultivation of Medicinal and Aromatic Plants (MAPs) in two villages of Dudhwa Tiger Reserve, and 40 field demonstrations of Menthol Mint and other crops were organized. As Menthol Mint grew very well there, having the least interference with wild animals, this crop was taken as a major crop for this region later under CSIR Aroma Mission. Menthol Mint clusters were established in more than 40 villages of Dudhwa Tiger Reserve. This time, more emphasis was given to introducing high-yielding varieties and an improved agro-technique, "Early Mint Technology" for further enhancing the essential oil yields and farm incomes. More than 20 awareness cum training programmes were conducted on the cultivation and processing of Menthol Mint and Lemongrass in different villages of Dudhwa Tiger Reserve, in which about 1832 tribal farmers, including 532 women farmers, participated.

Under CSIR-Aroma Mission, suckers of cultivars – Kosi, CIM-Kranti, and CIM-Unnati, the high-yielding varieties of Menthol Mint, were distributed to a large number of farmers. Awareness was created of the cultivation and distillation of Menthol Mint by regular visits of scientists, through field demonstrations and on-site training programmes. More than 160 quintals of Menthol Mint suckers were distributed to the tribal farmers of this region. In addition, *Artemisia annua* was popularized among the tribal farmers as this crop also is not affected by wild animals. Market linkages were also established with the Pharma industry with an assured buy-back arrangement.

Four improved distillation units, each of 500 kg capacity, have been installed for the distillation of the Menthol Mint crop. Many farmers have taken up this crop, which created pressure on the existing distillation units during the harvesting season of the crop. To ease this pressure, CSIR-CIMAP arranged the distillation by sending a mobile distillation unit to the Dudhwa Tiger Reserve for two months to take up the distillation of herbs at farmers' fields. Also, under the Aroma Mission, special hands-on-trainings on the distillation process were organized in the fields of tribal farmers so that the units could be appropriately operated and maintained, especially considering the operator's safety. Also, farmers were made aware of the good purification and storage practices to avoid the deterioration of essential oils. Menthol Mint is now being cultivated on more than 400 acres, slowly becoming a popular crop in this region. Many aroma industries in need of Mentha oil have been linked with these clusters so that fair prices of the oil are provided to the farmers.

Benefits accrued to tribals

The successful interventions made through cultivation, processing technologies, and marketing have benefitted the farmers of the tribal areas immensely by introducing *Artemisia* and Menthol Mint as new crops that fit well into their cropping system and do not get affected by wild animals. These crops actually act as bonus crops to them as they utilize this lean period when there are hardly any other crop options. With an assured buy-back from IPCA, Ratlam, during 2013-16, farmers were immensely benefitted by getting around 10-15 quintals/acre of herb yield and started reaping benefits of more than Rs 30-35,000 /acre. Later, installing improved processing units under various programmes has resulted in producing high-quality essential oil of mints, attracting the attention of many aroma industries from far away places. Due to these scientific efforts of CSIR-CIMAP, the incomes of tribal farmers had a minimum of 3-4 folds jump from the same piece of land. The cultivation of conventional crops was only providing them an income of Rs. 7,000-8,000 /acre because of the damages caused to these crops by wild animals has now gone up to Rs. 30,000-35,0000 /acre only from Menthol Mint. Besides, with the least interference from wild animals, they and their families, their livestock, poultry, etc., now have a minimal threat from wild animals. The farmers of Dudhwa have so far produced more than 150 tons of Menthol Mint oil with a market price of Rs. 1500 lakhs under the CSIR-Aroma Mission. With the increase in their incomes, farmers are no more dependent on local money lenders for the need of finance for farm inputs, children's school fees and social expenditure rather they have cleared their loans operative at an unusually high rate of interest. Apart from this, farmers have also created many assets like houses, motorbikes, and tractors. The farmers can now afford their children's education and reasonably well medical treatment for their elders. The farmers of the region are very satisfied and happy with the mint farming, which has encouraged so many other farmers from neighboring areas to take up the cultivation of Menthol Mint. Many industries from faraway places like the southern part of India are now approaching these farmers for high-quality mint oil, which they are directly purchasing at premium prices.

From the farmer(s).....

“ I am Ram Prakash, a farmer from Pipraula village of Dudhwa Tiger Reserve, Lakhimpur. Before the introduction of Menthol Mint crop in Dudhwa, we were cultivating sugarcane, paddy, wheat etc. These crops mostly got damaged by wild animals. But Mentha crop is a cash crop introduced by CSIR-CIMAP six years back. Under Aroma Mission, the farmers were provided high-yielding varieties, and distillation support, especially mobile distillation units in the peak harvesting season of the crop. Now mint is a cash crop for me and other farmers of the Dudhwa region. When we are in need of money, we sell the oil of mint and meet our requirement of children's school fees, fertilizers, seeds, etc., for the Kharif crop. Before Menthol Mint cultivation, we tribals were always in need of money and had to approach local money lenders, and were always in debt. Mint gave us financial freedom, and we are very much thankful to CSIR-CIMAP and its scientists. ”

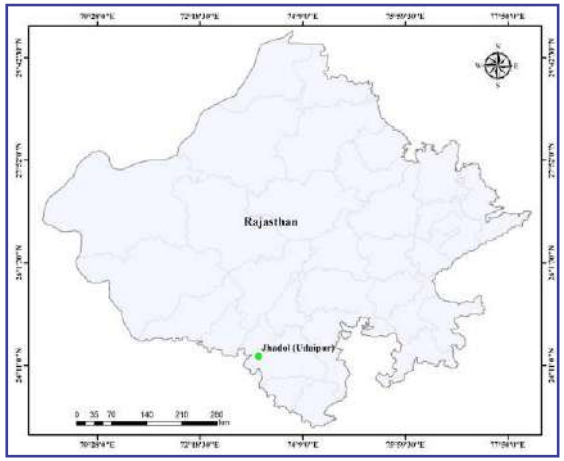
Ram Prakash

“ I am Bandhuram, a farmer of Dhuskiya village of Dudhwa Tiger Reserve. I am the first farmer of Dudhwa who planted Menthol Mint in the Dudhwa region with the support of CSIR-CIMAP. Mint changed our lives. It gave us Rs. 50,000/- to 60,000/- in just a 3-4 months period; our cropping pattern and environment are well suitable for mint. Our tribal farmers during summer used to migrate to cities like Bareilly, Chandigarh, Shimla for labour jobs. But after the introduction of mint, their migration from village to city has reduced drastically. After earning money from mint farming, I purchased a tractor. Menthol mint cultivation is transforming the lives of Dudhwa tribal farmers. ”

Bandhuram

Jhadol

Tribal cluster habitat details



Jhadol is located in the Udaipur district of Rajasthan, India. Jhadol tehsil covers an area of 1441 square km, and Phalasiya has been declared as a sub-tehsil of Jhadol. Due to the high proportion of the Bhil and Garasiya tribal populations in this area, Jhadol tehsil has been completely included in the tribal belt area. For this reason, the Jhadol tehsil has been designated as a scheduled area allowing special protection of tribal culture and other interests. The summer season runs from mid-March to June and touches temperatures ranging from 23 °C (73 °F) to 44 °C (111 °F) in June. It is located at a latitude of 24.3404 and a longitude of 73.3571. Tribal families live in this forest area which is surrounded by hillocks. The tribe's main occupation is agriculture, which gives them very low incomes because of small landholdings, and forces them to enter into small part-time jobs. Because of their limited exposure, the tribes are unaware of many health and education developments.

Status before interventions of CSIR-CIMAP

The majority of the population belonging to tribal communities is of poor economic status. This forces the communities to suffer in the vicious circle of poverty by taking loans from money lenders, and mortgaging their minimal assets at extremely high-interest rates. Small landholdings coupled with rainfed-dependent farming results in lower agricultural productivity and food insecurity for poor families. They have a strong bond with nature and derive their lifestyle and livelihood from nature and natural resources. Agriculture is the primary source of livelihood for these communities. Due to small landholdings and low agricultural production, the income from agriculture is not sufficient to support the family expenses, and therefore, almost all families depend on wage employment for the survival of their families. Maize and paddy are the major crops grown in this area, but the productivity is quite low as their agriculture is rainfed and dependent on minimal agri-inputs because of non-affordability.

Technological Interventions by CSIR-CIMAP

Under CSIR Aroma Mission, 03 awareness cum training programmes were conducted on the cultivation and processing of Lemongrass and Palmarosa at Koliyari, Jhadol, Udaipur district of Rajasthan. About 206 tribal farmers, including 50 women, participated in these programmes. Lemongrass slips and Palmarosa seeds were distributed to the farmers. About three lakhs of Lemongrass slips and 10 kg of Palmarosa seeds of high-yielding varieties, Krishna and PRC-1, respectively, were provided to the tribal farmers of Jhadol, Udaipur. One 500 kg improved distillation unit with higher oil recovery and lower fuel consumption was also installed under CSIR-Aroma Mission. A special distillation process training was also organized in the field of tribal farmers. Tribal farmers were also trained on the maintenance of distillation units and the storage of essential oils. Initially, demonstrations were made on the fields of 20 farmers, and seeing the success of these farmers, now more than 100 tribal farmers are cultivating Lemongrass on the slopes of hilly areas in their fields which otherwise remained fallow. A market linkage was also established with one industry from Udaipur, who is purchasing Lemongrass dry leaves and essential oil directly from these farmers. Besides, Ashwagandha var. Poshita, performing well under rainfed conditions of this tribal area, was also promoted. 50 kgs of seeds were distributed to the farmers under Phytopharmaceutical Mission of CSIR.

Benefits accrued to tribals

The successful interventions made through cultivation, processing technologies, and marketing in this tribal area has benefitted the farmers. The adoption of the aromatic crop, Lemongrass, and an important medicinal crop like Ashwagandha gave them higher profits as rainfed crops, as compared to other traditional crops, increasing their incomes by 2-3 folds. Before the introduction of Lemongrass, farmers were cultivating pulses, maize, and some other minor crops, thus providing them a meager income with limited resources, including irrigation. The cultivation of Lemongrass and Ashwagandha has given them an assured income even under natural weather extremes like low rainfall etc. Moreover, these crops face minimal damage from wild or domestic animals. Lemongrass has also checked the erosion of hilly slopes, which used to erode during heavy rainfall. CSIR-CIMAP improved processing unit has helped enhance the total essential oil recovery and quality, attracting buyers from Mumbai and other parts of the country. The wild animals do not damage the Lemongrass crop, and due to this reason, farmers are very happily adopting this crop and earning higher profits (to the tune of about Rs. 40,000 / acre) as compared to other crops where the incomes are low (Rs. 15,000 / acre).

From the farmer(s).....

“I am Prem Chandra, a farmer from Kolyari, Jhadol, Udaipur, Rajasthan. I have been cultivating Lemongrass crop for three years under Aroma Mission. I was given nucleus planting material of Lemongrass from CSIR-CIMAP under Aroma Mission. Our region is a mountainous region, and the availability of water from February to July is a significant problem for agriculture. Lemongrass is giving much more returns on sloppy and hilly lands than traditional crops like maize, wheat, etc. In our area, farmers have small landholdings, and we are suggesting them to cultivate it on the bunds as it will give extra profit to them. For the distillation of the Lemongrass herb, a distillation unit was also installed by CSIR-CIMAP. Apart from that, a company based in Udaipur is also purchasing the dry herb of Lemongrass. We are earning a good amount of profit (increase by 2 to 3 folds) from Lemongrass cultivation compared to traditional crops. More than 100 tribal farmers of 21 villages are now cultivating Lemongrass in Jhadol tribal region.”

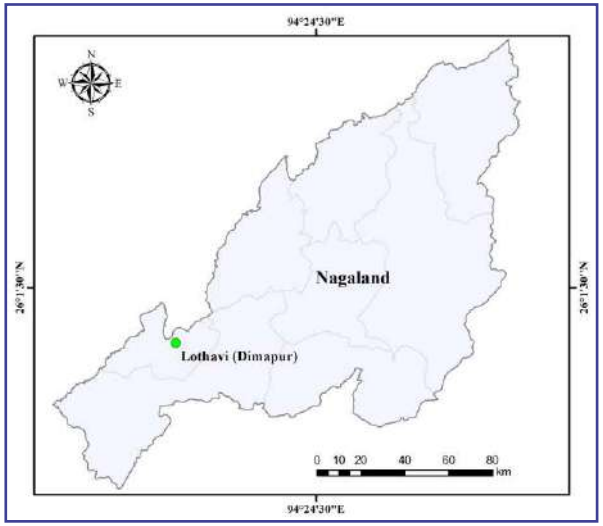
Prem Chandra

“I am Babulal, a farmer from Jhadol, Udaipur, Rajasthan. I have been cultivating the Lemongrass crop for three years under Aroma Mission. I was given a high-yielding Krishna variety of Lemongrass from CSIR-CIMAP under the Aroma Mission project. I am producing 20 quintals of dry leaves, which are sold out in the market @ Rs. 60-80 per kg. CSIR-CIMAP also established linkages with buyers for the sale of Lemongrass leaves and oil. Under this Aroma Mission project, the poor economic condition of the tribes of the area has improved. We are now earning more income than traditional crops by doing Lemongrass cultivation.”

Babulal

Lothavi

Tribal cluster habitat details



An aroma cluster was established in Lothavi village, located in Block Dhansiripar, District Dimapur, Nagaland. Sumi tribes dominate this region. The district Dimapur is surrounded by Assam on its North and West, Kohima on the East, and Peren district on the South. Dimapur district is the most prominent district in Nagaland, with a population of about 3.79 lakh. This population is approximately 19.17% of its state population. Dimapur district has shown a decline in rural male residents by 9% and an increase of 27.96% in the female population during the last decade. The average temperature is about 20°-35°C, and the rainfall is normal throughout the year. The main occupation of the tribes is agriculture, and most of the tribal farmers earn their livelihood by growing paddy and ginger.

Status before interventions of CSIR-CIMAP

Before the intervention of CSIR-CIMAP under the CSIR-Aroma Mission in Block Dhansiripar, District Dimapur, Nagaland, tribal farmers were engaged in farming traditional crops like paddy, mustard, pulses, and some vegetables, in the Kharif season. In the Zaid season, the cultivated area comes down drastically due to the unavailability of irrigation water and the invasion of wild animals in the fields. There has always been a threat from wild animals as once they invade the farms; they may destroy the whole of the crop. In general, being a rainfed area, traditional crops requiring less water were the farmers' choice. Overall, the total income from traditional rainfed crops over these small landholdings is meager (< Rs. 20,000/acre).

Technological Interventions by CSIR-CIMAP

Some tribal farmers, on their visit to CSIR-CIMAP, discussed the problems related to prevailing low-value agriculture and were desperately looking for some alternative crops providing them higher incomes. Initially, under the CSIR-Aroma Mission, CSIR-CIMAP organized two awareness programmes and one field training programme on Lemongrass and Palmarosa cultivation and their processing at Village Lothavi, District Dimapur, Nagaland. In this programme, 70 Sumi tribal farmers participated. During this programme, 2,00,000 Lemongrass slips of high-yielding Krishna variety and 30 kg Palmarosa seeds (variety PRC-1) were provided to the farmers who came forward to cultivate these crops. Field demonstrations involving Lemongrass and Palmarosa were also conducted to build confidence among the farmers, although later demonstrations of some other crops like Ocimum have also been carried out. For the distillation of essential oils, CSIR-CIMAP provided and installed an improved field distillation unit (capacity 500 kg per batch) under CSIR-Aroma Mission. The farmers were also trained to process the herb (distillation), maintain the unit and store essential oils. Later, with the success of the cultivation of aroma crops, Toka MPCS, an NGO also came forward and introduced Lemongrass and Citronella in about 50 acres by taking the high-yielding varieties of CSIR-CIMAP, involving about 250 farmers and later also installed 2 distillation units.

Benefits accrued to tribals

The successful interventions made under CSIR-CIMAP in the tribal areas have immensely benefitted the Sumi tribal farmers. Through the introduction of high-yielding varieties, tribal farmers are now achieving higher essential oil yields. Further, with the installation of an improved field distillation unit, the recovery of oil has increased considerably; the total yields increased about 2 times than what farmers used to achieve in the state a long time back. This has encouraged many more farmers to take up this cultivation as both the crops are hardy, flourish well even under low rainfalls, and are not affected by domestic or wild animals. The total income of the farmers has now been enhanced by 2-3 times than the income they used to get from the cultivation of traditional crops. So far, the tribal farmers have been able to sell 5 tons of essential oils. Sumi tribal farmers have started getting handsome benefits from aroma crop farming and have further shown interest in the value-addition of these oils. Now, other crops like Ocimum and mints have also been introduced, which the farmers are integrating into their cropping system. Vetiver has been introduced in low lands and areas prone to floods as an alternate crop in this region.

From the farmer(s).....

With introduction to CIMAP, the benefits I have received are:

1. Lemon grass distillation unit machine with a total quality oil production of at least 600 kg.
2. Supply of 3, 50,000 lemon grass shops, with a profit return of ₹ 3, 50,000 (₹ 1/ sapling).

Additionally, CIMAP has also extended support by allocating a guide four times to facilitate the workers with the regulations of machine use, lemon grass productions and oil extractions.

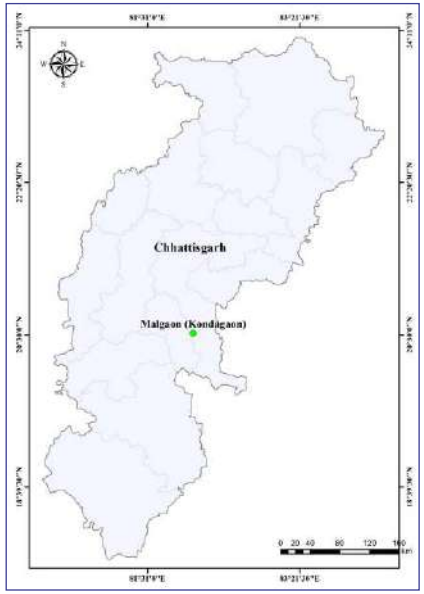
At present, a total of 8 acres has been maintained as planted area.

P. Khetoho Tsuqu Hd. GB
H.no. 04, Lhothavi Village, Sub div. Dhansiripar,
Dimapur, Nagaland, 797112.

Malgaon

Tribal cluster habitat details

Malgaon, a gram panchayat, is located in Kondagaon district of Bastar in Chhattisgarh State, India. It is known for its beautiful forests with tribal colonies. The total geographical area of the village is 1598.18 hectares.



Malgaon has a total population of 2,395 individuals. Kondagoan is the nearest town to Malgaon, which is approximately 25 km away. The average temperature of Malgaon is around 26°C, with a high of 41°C and experiencing a low of 17°C. Located at latitude 19.61°'N and longitude 81°881 E, the tribal families live in this forest area with a constant threat from wild animals and minimal basic facilities related to health, education etc.

Status before interventions of CSIR-CIMAP

The majority of the population in this area are tribal communities, such as Gond, Maria, and Dhruva. The Malgaon cluster is surrounded by dense forests, and wild beasts. The main crop of this region is paddy during the Kharif season. Because of the poor economic conditions of the farmers, the crops are cultivated with minimal agri-inputs. As most of the farm area (>90%) is rain-fed, and with minimal use of chemical fertilizers (4.6 kg/ha), generally inadequate to provide sufficient nutrients to the crop, the yields are too low.

The pattern of livelihood in Bastar region, including agricultural practices, is traditional. The housing uses more wood than iron. There are hardly any tractors, and most agriculture and transportation are bullock dependent. Using these traditional farm implements has not only affected the timely agri-operations but has also reduced agricultural production severely. Kharif crops grown in this region are paddy, urad, arhar, jowar and maize, whereas linseed, mustard, and gram are the major Rabi crops. Collecting and selling forest produce and doing other forest-related jobs supplement their lower agricultural incomes. Vanopaj (forest produce) collection remains one of the major sources of livelihood wherein Tendu leaves, Lac, Seeds, Tamarind, Amchoor, various tubers, plant-based drugs collected from forests are also the allied elements of the economy. The farmers are not aware of major scientific outcomes like improved agro-techniques, high-yielding varieties, etc., related to crop production and still grow the old traditional low-yielding varieties following unscientific methods, resulting in low farm incomes/profits. Many farmers have left their villages for small, petty jobs in nearby cities.

Technological Interventions by CSIR-CIMAP

Initially, 10 awareness cum training programmes were conducted on cultivating and processing aromatic crops, like Lemongrass, Palmarosa, and Mentha at Malgaon located in Kondagaon district of Bastar region. About 713 tribal farmers, including 40% women, participated in these programmes. In the beginning, large-scale demonstrations of Lemongrass cultivation on around 10 acres involving about 20 farmers were conducted in this cluster. The crop was harvested and processed at their farms. This gave the farmers of this region great confidence about the usefulness of this crop as the crop requires minimal water for its survival and growth and provides substantially higher incomes. These demonstrations also provided ample amounts of planting material for expansion of the crop involving many other farmers. Later on, awareness was also generated on the cultivation of *Mentha*, Palmarosa, and other aromatic plants through various training programmes. About five lakhs of Lemongrass slips, 10 kg of Palmarosa seeds, and 8 quintals of *Mentha* suckers were provided to the tribal farmers of Malgaon. Three 500 kg distillation units were installed under CSIR-Aroma Mission, and one was installed through the industry's financial support (Ultra International Ltd., New Delhi). A hands-on training on the distillation process and storage of aromatic oils was also organized in the tribal farmer's field. More than this, several farmers were trained in handling distillation units considering safety issues.

Benefits accrued to tribals

The successful interventions made in the cultivation, processing, and marketing of Lemongrass, Palmarosa, and *Mentha* oils in terms of introduction of high-yielding varieties, installation of improved processing units, and establishing market linkages, resulted in enhancing the total essential oil yields and increasing their incomes to minimum 3-4 folds, which actually improved tribal farmers livelihood. Before the introduction of these crops, the farmers' income was barely Rs. 8,000-10,000 per acre, which ultimately increased to around Rs. 40,000 per acre after the introduction of aroma crops under the Mission programme. The farmers of Malgaon are now cultivating aromatic crops on more than 100 acres and have so far produced and sold about 10 tons of Lemongrass, 100 kgs of Palmarosa, and 60 kgs of *Mentha* oils. The impact of achieving higher incomes through the cultivation of these aroma crops is now clearly visible. The farmers are now capable of sending their children to good schools, have added many agri-implements, and bought tractors and bikes. Amrit SeRve, a programme on making self-reliant villages through Mata Amritanandamayi Math (MAM) also supported the activities by providing local support. Looking at the success of the aroma cluster in Bastar, the local administration is planning to extend the activities to newer areas and have signed an agreement with CSIR-CIMAP to provide high-quality planting material and technical support to other tribal areas.

From the farmer(s).....

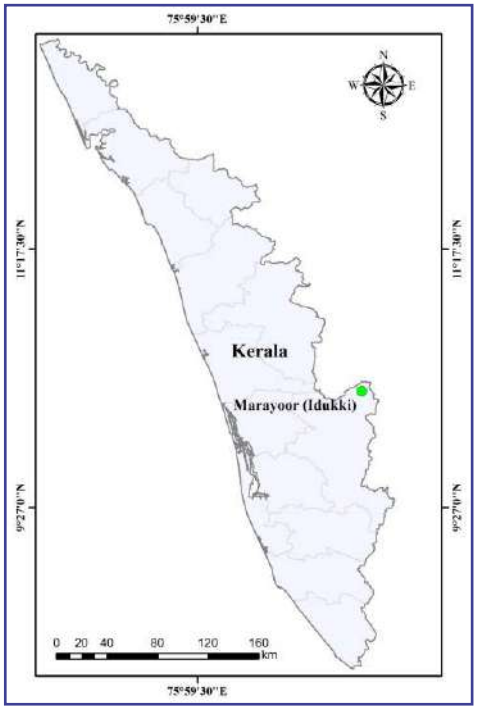
“I am Mohan Netam, a farmer from Malgaon, Kondagaon. I have been cultivating Lemongrass and Mentha crops for the last four years. I was given new varieties of Lemongrass from CSIR-CIMAP under the CSIR-Aroma Mission project, and CSIR-CIMAP scientists have provided important information related to cultivation and distillation. One distillation unit has been established for the distillation of the Lemongrass herb. I am producing 100 kg of oil per year from Lemongrass cultivation. CSIR-CIMAP also established linkage with buyers for the sale of Lemongrass oil. Under this Aroma Mission scheme, the poor economic condition of the tribes of the area has improved. We are earning 3-4 folds more income than traditional crops by Lemongrass cultivation.”

Mohan Netam

“I am Chandar Vaghel, a tribal farmer from Kalipura, Malgaon, Kondagaon. I have been cultivating Lemongrass for the last four years. I was given new varieties of Lemongrass from CSIR-CIMAP Lucknow under the CSIR-Aroma Mission project. CSIR-CIMAP has provided continued technical guidance on cultivation, distillation and marketing by organizing hands-on training. I am producing and selling about 300 kg of Lemongrass oil every year. Under CSIR-Aroma Mission, we are earning 4 times higher profits than the other crops. A new ray of hope is now clearly visible in our area, and many tribal farmers now earn profit by doing cultivation of aromatic crops introduced under the CSIR-Aroma Mission. I also purchased a motorbike by earning money under CSIR-Aroma Mission.”

Chandar Vaghel

Tribal cluster habitat details



Marayoor and Kanthalloor panchayats have more than 20 tribal settlements situated in the dense forest of Chinnar wildlife sanctuary and the Marayoor sandal forest divisions that are in close proximity to Anamalai Tiger Reserve. This forest area is located at 10.27° N, 77.16° E latitudes. Among all the tribal settlements, Puthukudy, Vellakalkudy, and Nellipattykudy are the major Lemongrass cultivating areas. For the last several years, Lemongrass has grown as wild, and has been their source of income. These tribal settlement families live in forest areas with a constant threat from wild animals, mainly Tigers, Elephants, Nilgiri Tahr, Gaur, and Sambar deer. These animals also greatly threaten conventional food crops, their domestic animals, and poultry.

Status before interventions of CSIR-CIMAP

The Marayoor and Kanthalloor tribal farmers have been cultivating Lemongrass since their age-old days. The present cultivating variety is the old one (probably OD-19) since the farmers are not aware of where and when the Lemongrass cultivation started. The existing Lemongrass variety possesses very low oil content, making the crop economically unattractive to the growers. These tribal areas could be the potential source of organic Lemongrass oil since they are not using any kind of chemical fertilizers or pesticides. In addition, this area, with moderate temperatures and relative humidity conditions, could also be highly suitable for the cultivation of many other aromatic and medicinal crops, and that too in an organic way. The Indira colony of Marayoor, where the Hill Pulayas tribal community resides, is frequently threatened by wild animals. To resolve the human-animal conflict issues, the forest department of Marayoor suggested the cultivation of Lemongrass and other economically important aromatic crops since the cultivation of major aromatic crops not only resolves human-animal conflict but also imparts livelihood security and sustainability to the tribal farmers. The majority of the tribal population residing in the Indira colony are cultivating an age-old variety, which has very low oil recovery (<0.40%) and poor citral content. Moreover, the process of the distillation method is also primitive and highly unscientific. At present, the farmers hardly achieve a yield of 40-50kg oil/ha, giving them considerably lower returns. Even though Lemongrass has been cultivated for a long time, farmers are propagating the crop through seeds for expansion of the area, which is an unscientific method resulting in reduced growth and herb yield, finally resulting in lower oil yield.

Technological Interventions by CSIR-CIMAP

Two awareness programmes were conducted at Marayoor and Kovilkaddavu. More than 100 farmers attended the programmes and got benefitted. During these programmes, 80,000 slips of Lemongrass Krishna variety, having about 60% higher oil content (around 1.00% recovery) than the old variety, were distributed to the farmers. The farmers were explained about the cultivation method and advantages of Krishna variety cultivation. More than that, training was also provided for using slips as propagative material, and the merits of the slips method of multiplication were also explained. This becomes essential as the propagation through seeds will also deteriorate the quality of this high-yielding variety. To maintain the purity of the introduced high-yielding variety, the use of slips as propagating material was strongly suggested for further expansion of the area rather than seeds as propagating material. Two energy-efficient distillation units of 500 kg capacity are being set up, one in the Puthukudy and the other one in the Indira colony. One training programme on the cultivation and processing of Lemongrass was also organized at the tribal farmer's field. This will enhance their skills in cultivating this crop, leading to better oil recovery and yield.

Benefits accrued to tribals

The successful interventions were made in terms of introducing the high-yielding Krishna variety of Lemongrass and setting up improved energy-efficient distillation units in the tribal settlements. Farmers have started harvesting the Lemongrass and are now obtaining around 60-70 kg oil/acre compared to the 30 kg/acre they used to get from the old variety. This will increase Lemongrass oil's production by a minimum of two to three folds. This, in turn, will result in increasing the farmers' income by at least 100%, considerably improving tribal farmers' livelihood. It is now our target to replace the old variety with Krishna, and for that, efforts are being made to educate farmers not to use seeds but slips of the high-yielding variety. There is a vast area (around 1000 acres) under cultivation of Lemongrass, and if replaced with a high-yielding variety, this tribal area could become a Lemongrass oil production region, a source of about 100t of essential oil annually. The success of Krishna variety cultivation and slip method propagation in the Mission area has also motivated farmers from other settlements to take up Krishna variety cultivation following the slip method of multiplication/propagation. The farmers from the region have happily shared their experiences of witnessing higher oil yield from Krishna variety cultivation. Efforts are also being made to further enhance their incomes by integrating some traditional crops like short-duration pulses, millets, etc.

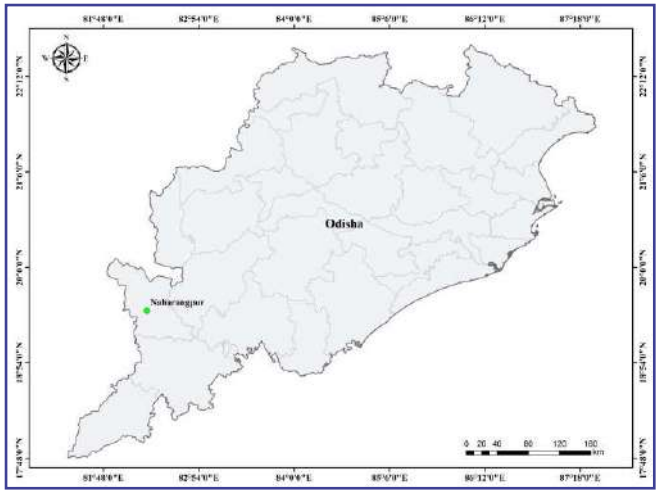
From the farmer(s).....

“ I am Ambika Ranjith a tribal farmer and Panchayat ward member from Indira Colony, Marayoor, Idukki (D) in Kerala state. It's an immense pleasure and we express our gratitude to CSIR-CIMAP, Research Center, Bangalore for providing us technical guidance, improved lemongrass variety Krishna and 500kg stainless steel improved energy efficient distillation unit to Indira Colony tribal settlement. We, tribal community farmers are very much happy and expanding the area under cultivation through lemongrass slips (Krishna). We witnessed the growth, oil recovery and monetary returns of improved variety of lemongrass Krishna two to three times as compared old variety (probably OD-19), the quality and appearance of lemongrass essential oil is superior as compared traditional/conventional distillation method. The farmers from the other tribal settlements are coming forward and happy for expanding the area under lemongrass cultivation.”

Ambika Ranjith
Indira Colony, Idukki – 685620
Mobile : 8547383582

Nabarangpur

Tribal cluster habitat details



Nabarangpur, also known as Nawarangpur, is an aspirational district of Odisha. The city of Nabarangpur is the district capital. Most of its population is tribal, and the land is heavily forested. It borders Kalahandi and Koraput districts. Nabarangpur district is situated at 19.14′ latitude and 82.32′ longitudes at an average elevation of 572 meters (1,877 ft). Nabarangpur is well-known for its tribal culture. Some of the largest tribes are the Bhottadas and Gonds. Four aroma clusters were developed under the CSIR-Aroma Mission, looking at the lower agri-incomes generated from conventional Maize crop. The net farm income is quite low, about Rs 5000/- per annum. Hence, it was decided to include the clusters, Tentulikhunti, Nandahandi, Papadahandi, and Raighar blocks of this district with a specific aim of enhancing their farm incomes through the introduction of aroma crops.

Status before interventions of CSIR-CIMAP

The main staple crop of this area is Maize, and the maximum area is under rainfed agriculture. Most of the farmers are poor, and their crops are grown with minimal or no agri-inputs. Most of tribal farmers do not have irrigation facilities, and therefore their livelihoods depend on a single rainfed crop. Some of the farmers of the area, who have irrigation facility are, benefitted by cultivating multiple crops in a year; however, such kind of farm area is too less. The poor economy of farmers in the rainfed areas is really a matter of concern. Further, the problem gets more complicated due to food crop damage by wild animals, and farmers are not even able to recover the cultivation cost. The net result is that a vast area of land is kept fallow, and farmers are gradually losing interest in the cultivation of food crops are leaving farming and migrating to urban areas for alternative livelihoods.

Technological Interventions by CSIR-CIMAP

CSIR-CIMAP made serious efforts to introduce and popularize some medicinal and aromatic crops and their high-yielding varieties, which can generate higher incomes. The crops and varieties were selected considering their tolerance to higher levels of water deficient stress; in case of a condition like a monsoon deficiency or failure. Presently, 300 acres of Lemongrass (vars. Krishna and CIM-Shikhar), 10 acres of *Ocimum* (vars. CIM-Saumya, CIM-Angana, CIM-Shishir), 10 acres of *Mentha* (vars. Kosi and CIM-Kranti), 5 acres of Vetiver (var. CIM-Vridhi), 3 acres of Citronella (var. BIO 13), 2 acres of Palmarosa (var. PRC-1) and 2.0 acres of Turmeric (var. CIM-Pitamber) are under cultivation with the efforts of CSIR-CIMAP. Interestingly, all these crops/varieties are not liked by animals, and hence the damage due to wild animals has become negligible. Three (03) improved distillation units have also been installed by CSIR-CIMAP in Saruguda, Niladriguda, and Duduriguda villages. More than 60 farming families are engaged in these cultivation activities.

Looking at the value addition as well as enabling women to establish cottage industries, CSIR-CIMAP conducted 03 Agarbatti making training programs in Nabarangpur district, in which more than 200 women have been trained on making the Agarbatti sticks and Cones. Later, seven (07) progressive women were also trained at CSIR-CIMAP headquarters on agarbatti and cone making and some other products utilizing essential oils. To date, five women self-help groups are making the Agarbatti and selling it in the local market, generating some extra income while attending to their household chores. For natural honey production, 10 honey bee boxes have been installed in the fields of aroma crops in this district, and now they have started honey production, which has been an additional income for them.

Benefits accrued to tribals

With the introduction of aroma crops, the farmers of this region have returned to agriculture as they feel that these crops are safe, can tolerate water stress, and cannot be damaged by animals. Even the frequency of wild animals visiting their fields has considerably reduced; this may be because of their typical aroma not liked by the animals. This has considerably reduced human-animal conflicts. Looking at the higher incomes, which have increased to at least three folds (now the average net income from aroma crops is >Rs 25,000/acre), many farmers who have left for small jobs in nearby towns have migrated back to their villages, happily living with their families. Higher-income generation has also impacted their livelihoods with plentiful food for their children and elders. To date, the farmers of this cluster have produced about 05 tons of Lemongrass, and 200 kgs of Menthol Mint essential oils, which have been sold by the farmers in the Nabarangpur district. One of the farmers has started production of herbal tea using Lemongrass and Tulsi leaves.

From the farmer(s).....

"I have been cultivating more than 20 acres of Lemongrass. I am now promoting the Lemongrass crop among my fellow farmers. I have also sold more than 20 lakhs of Lemongrass slips, getting a handsome income. Besides, I have extracted more than 500 kgs of Lemongrass essential oil and sold it. My income, as well as that of other fellow farmers, now has significantly enhanced."

Mr. Paresh Bisoi

"I am cultivating more than 15 acres of Lemongrass and 7 acres of *Mentha arvensis*. This year, I have multiplied *Mentha* and will expand this crop to larger areas. I could produce more than 400 kg of Lemongrass, 150 kg of *Mentha*, and 10 kg of Vetiver essential oils. CSIR-CIMAP has also installed a distillation unit in this cluster."

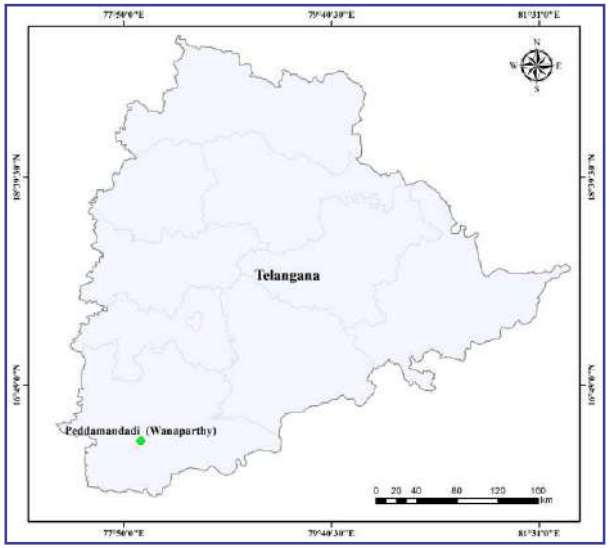
Mr. Ajit Nayak

"Mr. Krushna Chandra Nayak, Nandahandi block, a young entrepreneur. I was trained for value addition of aromatic crops under the CSIR-Aroma Mission at CSIR-CIMAP. I am now cultivating more than 30 acres of Lemongrass, and 3 acres of Tulsi along with producing green tea using the Lemongrass and CIM-Angana Tulsi leaves, with an annual turnover of more than Rs. 20 lakhs. I am now promoting Lemongrass cultivation to my fellow farmers, and CSIR-CIMAP has installed one distillation unit in this cluster."

Mr. Krushna Chandra Nayak

Peddamandadi

Tribal cluster habitat details



The tribal population of Wanaparthy district, having 14 Revenue Mandals, located in the southern part of Telangana, is 46,062, which is about 7.97% (2011 Census). Out of 14 Mandals, Peddamandadi Mandal is one of the most densely populated tribal areas. The Scheduled Tribes here have land holdings of 24,872 acres (about 6.4% of total agricultural land as per the World Agricultural Census, 2015-16) and they have been traditionally cultivating paddy and other conventional crops with low margins.

Status before interventions of CSIR-CIMAP

The major livelihood of these tribals is farming, and they cultivate crops such as paddy, cotton, vegetables, etc. Due to increasing input costs, wild and domestic animal menace, low crop yields, and marketing issues, farming gives them negligible profits. Therefore, they had always been looking for other economically attractive alternative crops.

Technological Interventions by CSIR-CIMAP

Under the CSIR-Aroma Mission, CSIR-CIMAP Research Centre, Hyderabad, in association with 'SERA SMART Villages Trust, an NGO operating its activities in the region, came to know about the existing problems of this tribal population and intervened through awareness programs which made them adopt the crop diversification involving aromatic crops cultivation. After assessing the soil and weather conditions, cultivation of Lemongrass and Palmarosa were suggested to the tribal farmers. An initiative was taken by the CSIR-CIMAP, through its Research Centre located at Hyderabad who played a lead role in introducing and extending the cultivation of Lemongrass and Palmarosa crops in this tribal region by supplying initially 65,000 Lemongrass (Krishna variety) slips and 10 kg Palmarosa (PRC-1) seeds of high essential oil yielding varieties to establish five acres of each crop in the farmers' fields under CSIR-Aroma Mission Phase-II. These planting materials were distributed to the tribal farmers of Chikarchettu Tanda, Pamireddypally, Chilakatoni Palle, and Veltoor in Peddamandadi Mandal, Wanaparthy district, Telangana.

Training programmes were organized on the cultivation of Lemongrass and Palmarosa. Frequent field visits were carried out during and after the plantation and imparted the know-how on crop management practices to the tribal farming families. Looking at the potential of these aromatic crops and in the interest of farmers, Smt. Shaik Yasmeen Basha, the District Collector, Wanaparthy, has sanctioned a steam distillation unit of one ton capacity per batch to these farmers' group, which was later commissioned by CSIR-CIMAP. The distillation plant was inaugurated by the Honorable Minister for Agriculture, Horticulture, Cooperative and Marketing, Shri Singireddy Niranjan Reddy, Government of Telangana. Practical demonstration cum training on Lemongrass oil distillation and post-distillation process, storage, and quality aspects were organized at the farmers' fields. Apart from the establishment of market linkages, skilled manpower was generated for tribal women's empowerment.

Benefits accrued to tribals

Many tribal farmers were benefitted from the introduction of high-yielding varieties of aromatic crops like Palmarosa and Lemongrass in this region. Also, with the installation of an efficient distillation unit, the recovery of the essential oil increased by at least two folds, and thus, their incomes were more than doubled. Later, under the CSIR- Aroma Mission, the Lemongrass crop is becoming popular among tribal farmers as within seven months from the introduction of the Lemongrass crop on about 5 acres, the farmers have already produced about 200 kgs of essential oil generating handsome revenue. This successful story from the Wanaparthy district of Telangana has become a headline in Times of India, Hyderabad Edition (1st September 2021, Pages 1 & 6), covering the CSIR-Aroma Mission project in India. In the next coming season, it is expected that the plantation will get expanded to 50 more acres benefitting 20-30 tribal farming families with an enhanced net income of Rs. 25,000 to 30,000 per acre as compared to conventional crops.

From the farmer(s).....

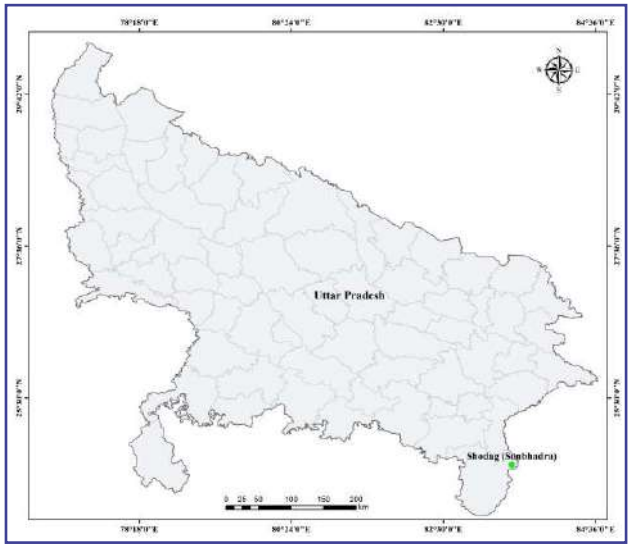
Respected CIMAP Institute,

The Scientific and Technical staff of CIMAP, RC, Hyderabad, on our request, have visited our Chikaru Chettu Tanda Village in the year 2021, organized an awareness camp and explained in detailed about the lemongrass cultivation and distillation methods to the women members of our Jhansi Laxmi Bai Group. Letter on, they also conducted demonstration at their CIMAP, RC, Hyderabad to some of our members. Due to their efforts, most of our group members came forward for the cultivation. CIMAP, RC, Hyderabad also encourages us by distributing Lemongrass plants and Palmarosa seeds for free of cost that is sufficient for 5 acres of each crop. Afterwards, on our request, Smt. Shaik Yasmeen Basha, District Collector, Wanaparthy District sanctioned 2 x 500 kg capacity SS distillation units, installed at our village. At present, about 15 families are cultivating Lemongrass in 15 acres and we are happy and satisfied with the income obtained by this Lemongrass cultivation. We are all highly thankful to the CIMAP, RC, Hyderabad staff for their continuous support and awareness on cultivation of aromatic plants.

Smt. V. Mothi Bai
Jhansi Laxmi Bhai JLG Group,
Lemongrass Farmers,
Chikaru Chettu Tanda Village,
Peddamandadi Mandal,
Wanaparthy, Telangana State.

Shodag

Tribal cluster habitat details



Shodag and Rampur, two medium-sized villages (the code of Shodag and Rampur villages is 241304), are located in Nagawa block in the Sonbhadra district of Uttar Pradesh. The villages are situated 36 km away from sub-district headquarters Robertganj and 42 km away from district headquarter Sonbhadra. Nagawa block is also a gram panchayat of Shodag and Rampur villages. The total geographical area of the village is 1322 hectares. Nagawa has a total population of 3,704 people. The block has 143 villages, and there are a total of more than 17,000 families in this block. Both Shodag and Rampur villages come under the Mirzapur division, and the nearest town is Robertganj. The primary source of income in these villages is agriculture, which is generally rainfed. Because of the low productivity of traditional crops, farmers are now migrating to nearby cities for some petty jobs.

Status before interventions of CSIR-CIMAP

The tribal farmers of these villages are mainly dependent on the cultivation of wheat and rainy season paddy. The benefits coming out of the cultivation of traditional crops grown by the farmers are very low. Due to the lack of irrigation water in these clusters, the tribal farmers are not able to cultivate multiple crops throughout the year. Paddy is planted by some farmers during the rainy season, but the production is not good, owing to poor soil conditions and less availability of water in that area. Because of low productivity resulting in lower incomes from agriculture, tribal farmers are leaving their fields fallow and are looking for other sources of income.

Technological Interventions by CSIR-CIMAP

During surveys conducted by CSIR-CIMAP teams, the problems of tribal farmers leaving their villages for petty jobs were highlighted. Initially, some awareness programmes were conducted in the year 2016-17 to make farmers aware of the alternate crops, including medicinal and aromatic crops. Based on the soil and climatic conditions, three crops, Palmarosa, Vetiver, and Lemongrass, were suggested to the farmers as these crops can tolerate low moisture stress and can be the crops of choice for rainfed conditions. Later, two one-day awareness and one field training programme were conducted on Lemongrass and Palmarosa cultivation and processing at both the villages, Shodag and Rampur. More than 65 tribal farmers attended these programmes. During these programmes, Lemongrass slips of Krishna variety possessing higher oil content (0.7-0.9%) were provided to the farmers. Interested farmers were explained the benefits of growing Lemongrass (Krishna variety) and Palmarosa (PRC1), which may provide them higher incomes. Special distillation process training was also organized later at the tribal farmer's field. At present, around 35 acres of Lemongrass, 18 acres of Palmarosa, and 10 acres of Vetiver are being cultivated by the tribal farmers in this area. One 500 kg capacity distillation unit was also installed under the CSIR-Aroma Mission Phase-I. The cultivation and distillation of the said crops were demonstrated from time to time, frequent field visits were made, and periodical technical guidance, especially related to the distillation of crops (2019-2022), was provided. Another field distillation unit was also provided with financial support from leading industry, M/s Ultra International, New Delhi. Some of the medicinal crops like Kalmegh, Turmeric, Satawar, and Tulsi were also introduced and demonstrated in the farmers' fields. The processing of these crops, especially that of Turmeric and Satavar was also demonstrated.

Benefits accrued to tribals

The successful interventions made through the cultivation of aromatic plants and improved processing technologies in the tribal areas have immensely benefitted the tribal farmers. The farmers were able to achieve bumper yields through the introduction of high-yielding varieties and proper technical guidance. As a result, their income has increased considerably, resulting in an improvement in the livelihood of the tribal farmers. The yield of conventional crops used to be quite low because of frequent failures/deficiency of monsoon, and therefore the income of the farmers was meager (< Rs. 10,000/acre). The introduction of drought-tolerant Lemongrass has completely changed the scenario. The farmers are now with a yield of about 50-60 kgs of Lemongrass essential oil per acre and can easily earn up to Rs. 40,000/acre annually. The income of the farmers has now increased almost two-three times because of the significant enhancement in the yield of essential oils, which resulted from the cultivation of improved high-yielding varieties and the installation of efficient distillation units under the mission programme. Impressed by the interventions made under the mission programme and the higher levels of income earned by the tribal farmers, many more farmers are now interested, and many of them have taken up the cultivation of Lemongrass, Palmarosa, and Vetiver. Many farmers are earning handsome benefits by selling the planting material of Lemongrass to the neighbouring states.

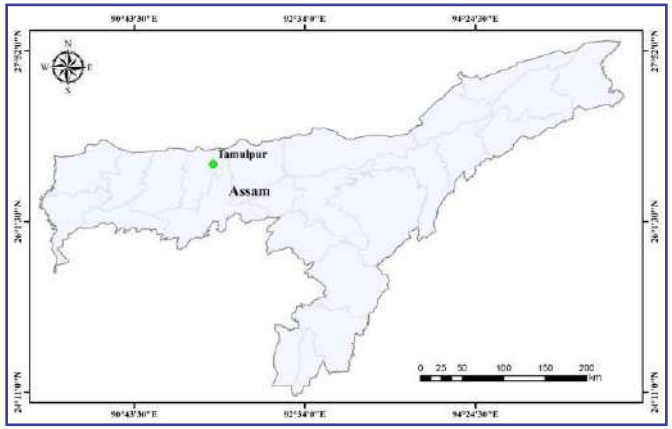
From the farmer(s).....

“ We are poor and marginal farmers having rocky stony and rain fed agricultural lands, growing traditional crops such as paddy, wheat, mustard, gram, lentil, field peas, sesame, finger millets, maize and sorghum etc. CSIR-CIMAP introducing Aroma Mission in our region and our group also joined Aroma Mission in 2017. Our group has started cultivation of aromatic crops such as Lemongrass, Vetiver Palmarosa, Basil etc. We have observed that these crops required least resources (such as fertilizers, irrigation, weed competition, labour input etc.) as compared to conventional crops and there is no crop loss by wild or domestic animals. By traditional crops we were getting an average net profit of Rs 10,000-15,000 and from aromatic crops average net profit is Rs. 35,000-40,000/ acre annually.”

Shambhu Nath

Tamulpur

Tribal cluster habitat details



Tamulpur, constituted as a new district, has been carved out from Baksa district of Assam. Tamulpur was the sub-division of the district, having an area of about 2400 km2; Mushalpur being the district headquarters of Baksa. The Baksa district is bounded by Bhutan in the North and dominated by tribal people. Boro is the largest tribal community. The name Baksa seems to have originated from a kind of rice grain known as Bagsa. Some people believe that Bagsa is originated from the Bhutanese language. They denoted the area as "Bagsa Daur", where Bagsa stands for a kind of rice and Daur means entrance point. The total population of the Tamulpur district is about 4.50 lakhs. The primary occupation of Boro tribes is agriculture.

Status before interventions of CSIR-CIMAP

The people of the Boro community living in this area mainly depend on agriculture for their livelihood. Their houses are made up of wood and bamboo. Before the intervention of the CSIR-Aroma Mission in this area, tribal communities used to cultivate traditional crops like paddy, maize, mustard, potato, and some other vegetables, etc. Most of the cultivation is rainfed and wild animals occasionally destroy their crops like elephants and wild boars, which are quite prevalent in the region. Also, the cultivation of crops, especially during Zaid season, is restricted due to the lack of irrigation water. The economic condition of these tribals is deplorable. These people maintain their families by doing other petty jobs like labour, driving, cloth weaving, and making attractive pots using bamboo and wood. Because of the limited land available for cultivation, Boro tribal farmers are just able to manage to produce food grains sufficient for their livelihoods.

Technological Interventions by CSIR-CIMAP

Some time back, some progressive farmers of Boro community contacted CSIR-CIMAP for other crop alternatives which could provide them with better returns under the conditions described above. Initially, under the CSIR-Aroma Mission, a survey was made in this region. Considering the environmental conditions, soil type, and available resources, Lemongrass and Citronella were found to be the most appropriate. CSIR-CIMAP introduced aromatic crops like Lemongrass and Citronella in Village Kasukata, Block & District Tamulpur and organized two awareness programmes and one field training programme on Lemongrass cultivation, processing, distillation, and marketing. About 85 Boro tribal farmers attended these training programmes. During these programmes, Lemongrass slips of Krishna variety (containing higher oil content of about 0.8-1.0%) were distributed, and the benefits of Lemongrass cultivation like low water requirements, no damage from wild animals, etc. were explained. The training cum demonstration programme for operation and maintenance of field distillation unit was also organized on the tribal farmers' fields. Also, methods to store the distilled essential oil were demonstrated. Around two lakh Lemongrass slips (Krishna variety) were provided to the tribal community in selected areas, and one distillation unit (capacity 500 kg per batch) was installed at Village Kasukata, Tamulpur, under CSIR-Aroma Mission in 2020. Later, *Mentha arvensis* was also introduced in the fields near the river, having sufficient water to irrigate. This will not only enhance their incomes but also be useful in utilizing the installed units more efficiently.

Benefits accrued to tribals

The successful interventions made by CSIR-CIMAP through cultivation, providing processing technologies of Lemongrass, and linking the cluster with the market has really helped the tribal community and economically benefitted the farmers. So far, high-yielding variety of Lemongrass covers around 25 acres which will be the source of planting material to other farmers. Lemongrass, as an industrial crop, fits well into their agroclimatic conditions, producing huge biomass not affected by wild animals. The introduction of improved high-yielding variety coupled with the installation of an improved field distillation unit has enabled them to produce large quantities of better quality essential oil, which is readily sold in the local market. Around 2 tons of essential oil (market value – Rs. 25.0 lakh) has already been produced by the tribal farmers. Apart from selling Lemongrass oil, tribal farmers are earning additional profits also by selling Lemongrass planting material (slips) to the farmers of neighbouring states. The crop is getting popular, and the area under aromatic crop cultivation is increasing rapidly as higher profits in comparison to traditional crops can be obtained without any threat from wild animals. It has played a significant role in the upliftment of their socio-economic conditions. The income enhancement because of the introduction of Lemongrass has been to the tune of Rs. 30,000/acre, which is around 2-3 folds, and this has significantly impacted their livelihood and living standards. Sufficient planting material, now available in this area, could be helpful in expanding the area under Lemongrass. Also, crop like Citronella, which was introduced a year back, is also growing well and may now spread to other nearby areas. It is also hoped that *M. arvensis* introduced recently in the fields having sufficient irrigation water would further increase their incomes.

From the farmer(s).....

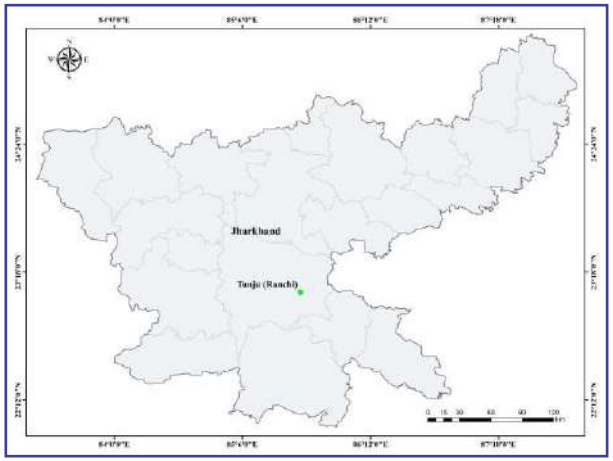
“ I am Raju Boro, Village - Kasukata District Tamulpur Assam. I am cultivating more than 18 acres of lemongrass and 2 acres of *Mentha arvensis*. This year I have multiplied *Mentha*, and would expand this crop to larger areas. I could produce more than 2000 kg lemongrass and 80 kg of *Mentha* essential oils. CSIR-CIMAP has also installed a distillation unit for the distillation of Aromatic Crops.

Due to support of CSIR-CIMAP, my socio-economic status has improved. Earlier my house was made of bamboo with mud, after selling lemongrass oil I made my house of concrete, and also able to spend on the education of my family's children. ”

Raju Boro
Village - Kasukata District Tamulpur Assam

Tunju

Tribal cluster habitat details



Tunju is a medium-sized village. It is located in Namkum block of Ranchi district in Jharkhand state. It is situated 19 km from sub-district Namkum and 32 km from district headquarters Ranchi. Bandhuwa is the gram panchayat of Tunju village. The total geographical area of the village is 169 hectares. The total village population is 545, and Tunju village has about 121 houses. Oraon, Munda, and Bhumij are the main tribes living in this area. Mostly tribal farmers are dependent on agriculture and forest produce which are the source of their small income.

Status before interventions of CSIR-CIMAP

Mostly tribal farmers are dependent on vegetable and paddy cultivation during the rainy season; most of the agriculture in this area is rainfed. The economic condition of the farmers is very pathetic because the whole of the crop cultivation depends upon sufficient rainfall, and any deficiency may lead to crop failure or, in other words, severe monetary loss. As the cultivation is rainfed, farmers opt for a single crop due to the lack of irrigation water. Most farmers generally plant paddy during the rainy season, but the production gets affected in case of a shortfall in rains. Also, soils with gravel are not that fertile. As the farmers are unable to obtain good income from agriculture, most of the tribal farmers leave their fields fallow and have started migrating to the nearby cities for employment and income enhancement. The total income from agriculture never exceeds Rs 10,000/acre.

Technological Interventions by CSIR-CIMAP

Lemongrass was selected as an aroma crop for this region as it can tolerate low moisture stress and can give higher incomes. Initially, a one-day awareness programme on creating awareness about aroma crops was conducted, where the benefits of aroma crops providing higher incomes under such rainfed conditions were explained. Many farmers came forward, and small amounts of planting material of a high-yielding variety Krishna of Lemongrass were distributed. These farmers started multiplying this on their farms to further extend the area. Later, a field training programme on the cultivation and processing of Lemongrass was organized at Tunju village in Namkum block of Ranchi district. More than 110 tribal farmers participated in this programme. The field demonstrations involving the Krishna variety were conducted, and farmers were apprised of the benefits of growing the Lemongrass crop. Later, looking at their farmland and resources, 50,000 slips of Vetiver var. CIM-Vridhi were also distributed, which are growing successfully in this area. Another training on the distillation process was also conducted in the field of tribal farmers. About one lakh slips of improved variety of Lemongrass were distributed. Later, one distillation unit of 500 kg capacity was provided to the tribal farmers under CSIR-Aroma Mission Phase-I. Looking at the encouraging results of Lemongrass and Vetiver under limited water availability, farmers were interested in other aroma crops which could also be cultivated under rainfed conditions. Therefore, demonstrations of other aromatic crops like Palmarosa, Tulsi, etc. were also made. CSIR-CIMAP team made periodic field visits and provided continuous guidance on technology for the cultivation and distillation of aromatic crops (2019-2022). The farmers were also trained in field distillation of aroma crops and maintenance of distillation units. They were also trained on the storage of essential oils, like the types of containers to be used, where and how to store the essential oils etc.

Benefits accrued to tribals

Through the efforts of CSIR-CIMAP, tribal farmers were made aware of the benefits of aroma crops, which can be cultivated under limited water conditions, and it was successfully demonstrated to them. Through the introduction of improved cultivation practices, including high-yielding varieties of aromatic plants, farmers' income has increased considerably. An improved processing unit installed under the CSIR-Aroma Mission has further improved the overall yields by better extraction of oil, both quantitatively as well as qualitatively. The essential oil of the high-yielding variety Krishna, distilled through energy-efficient improved distillation units, has a very good market acceptance and is being sold at relatively higher prices. Overall, as a result of interventions made by CSIR-CIMAP and under CSIR-Aroma Mission, tribal farmers are being benefitted from aroma crops, and their farm incomes have increased by 2-3 folds which have positively impacted their livelihood significantly. Influenced by the efforts made through the Mission programme and the higher incomes earned by tribal farmers, many more farmers from nearby villages have opted for the cultivation of Lemongrass and Vetiver. Other aroma crops, like Palmarosa and Basil, have also become popular, and many tribal farmers have initiated their cultivation. Not only the essential oil, but tribal farmers are also being benefitted from the sale of planting materials whose demand has increased manifolds in the neighbouring districts/states. More than 24.0 lakhs slips have been sold so far, and more than 200 kg of essential oil has gone to the aroma industry. Both Lemongrass and Vetiver now cover an area of about 20 acres besides Palmarosa and Basil, being grown in smaller areas.

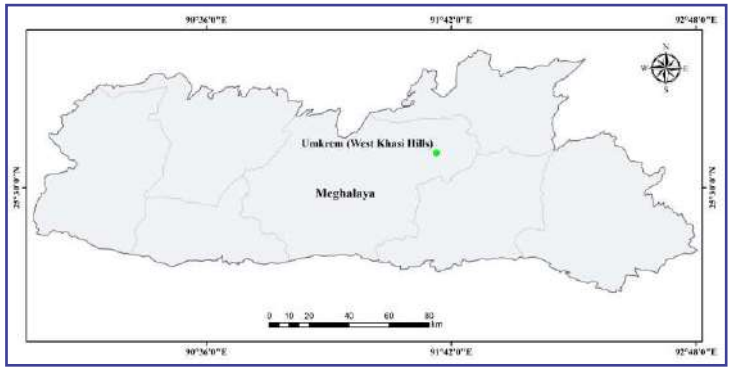
From the farmer(s).....

“ I am Charka Munda, a tribal farmer from Tunju village in Namkum block of District Ranchi in Jharkhand state. I have been cultivating Lemongrass, Vetiver, and Tulsi for the last two years. Lemongrass slips of Krishna variety and Vetiver slips of variety CIM-Vridhi were given to me by CSIR-CIMAP under the CSIR-Aroma Mission project. Important information related to cultivation and distillation has been provided by the CSIR-CIMAP team of scientists. An improved distillation unit of 500 kg capacity has been set up for distillation. 100 kg of Lemongrass oil along with 6.00 lakh Lemongrass slips and 1.50 lakh Vetiver slips were sold to the interested farmers of nearby states. We are now earning 3-4 times more income from the current crop of Lemongrass. Under this CSIR-Aroma Mission project, the cultivation of Lemongrass improved our economic and social conditions. The tribal farmers of our area are now earning good profits by doing the cultivation of aromatic crops. I am very happy and thankful to the CSIR-CIMAP team.”

Charka Munda

Umkrem

Tribal cluster habitat details



Umkrem cluster, developed under CSIR-Aroma Mission, comes under West Khasi Hills of Meghalaya. Considering the population, Khasi is the most prominent tribe in this district. The district is bounded by Ri-Bhoi district on the North, Karbi Anglong district on the North East, Jaintiya Hills district on the East, and Bangladesh on the South. West. The total area is 1341 sq km, and the population of over 1 lakh. The West Khasi Hills is located at a longitude of 25.4670° N, the latitude of 91.3662° E, and an altitude of 1520 meters. The minimum temperature may go up to 4°C, and the maximum temperature is around 33°C. It is a hill station with unique natural scenic beauty and is quite an attraction for tourists; an ideal tourist spot throughout the year. The district is well connected with motorable roads throughout the length and breadth. In general, the tribal population is poor, basically dependent on agriculture, which they had been carrying out on their small landholdings, that too on hilly areas and slopy and undulated lands.

Status before interventions of CSIR-CIMAP

More than 80% of the total population in West Khasi Hills is agrarian, agriculture being their main backbone of livelihood. This district is situated on hills, and therefore, besides limited landholdings, the fields are undulated, lack proper irrigation facilities and are dependent on rainwater. Soil erosion and landslides are the other major problems for this area which take away large chunks of their fertile soil. The tribal farmers had been cultivating some traditional crops like rice, maize, potato, and ginger in West Khasi Hills. The tribal farmers obtain only a meager income from conventional crops and, therefore always look for high-income-generating crops. A team of farmers, especially women farmers, visited CSIR-CIMAP, looking for high-value aroma crops for their region.

Technological Interventions by CSIR-CIMAP

CSIR-CIMAP initially conducted two one-day awareness programmes in the West Khasi Hills to make the farmers aware of the aromatic crops which could be suitable for the region. Two crops, Geranium and Peppermint, were initially shortlisted on the basis of our initial studies conducted with the help of Meghalaya Basin Development Authority (MBDA), Institute of Natural Resources (INR) and BRDC, Shillong at their farms. Later, one field training programme on the cultivation and processing of Geranium, Rosemary and Peppermint at Village Umkrem, West Khasi Hills, was conducted involving the interested farmers. About 50 Khasi tribal farmers attended this programme. During these programmes, 30,000 cuttings of Geranium and 100 kgs of Peppermint runners were provided and the farmers were explained the benefits of growing these crops. One improved field distillation unit "S.S." (capacity 250 kg per batch) was installed under CSIR-Aroma Mission. Now, the planting material is being multiplied by farmers, and distillation is being carried out on a small scale. It is hoped that the area under Geranium and Peppermint cultivation will expand to 100 acres soon.

Benefits accrued to tribals

Geranium is a high-value crop; the essential oil of this crop is still imported. Geranium requires cool temperatures as the majority of the plants will die during hot and humid climates, generally prevailing in the plains during the monsoon. The successful interventions made through the introduction of a high-yielding variety of Geranium (var. Bio 171) has started giving them higher returns; coupled with the installation of an improved distillation unit, the yields of Geranium oil are exceptionally high, which has started providing them higher returns. With the introduction of Geranium, the income of the farmers has increased at least three-fold. Similarly, Peppermint is growing very well, and farmers have started distilling the crop. Looking at the success of these crops, many farmers have started demanding the planting material, which has opened up another area of entrepreneurship. Many other crops like Lemongrass, Rosemary, *Salvia*, etc. were also introduced, which are also growing very well under those conditions. Lemongrass, a hardy crop grown on hilly slopes, protects against landslides or erosion. Some of the farmers are directly selling essential oils in small bottles to the tourists visiting this place. It is hoped that a large area would be brought under Geranium cultivation, which would significantly reduce the imports, and this area may become the hub of this important essential oil and help as an import substitution.

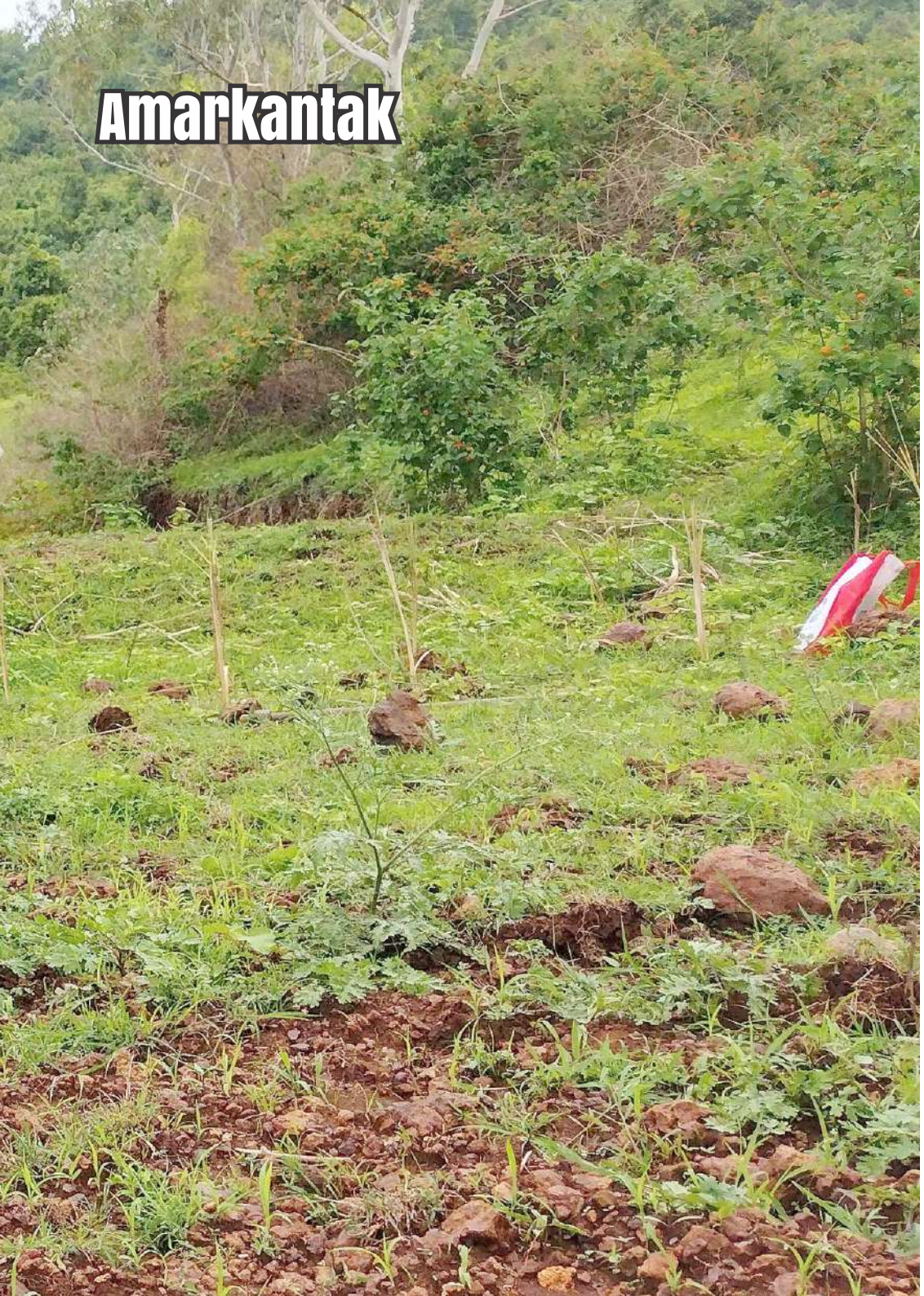
From the farmer(s).....

I started cultivating aromatic plants in 2020 after getting training at Nongstoin.

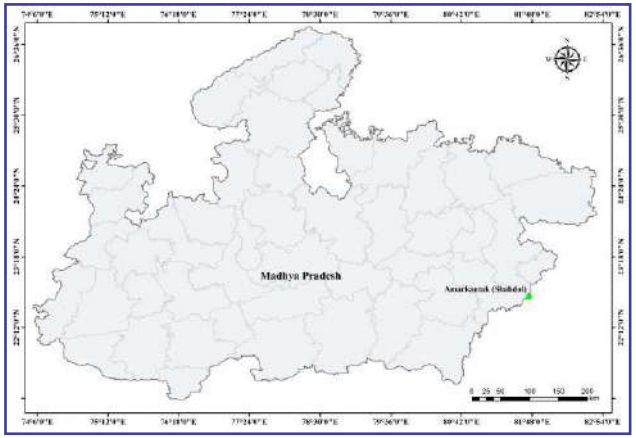
1. **Geranium**: I got 80 Numbers of saplings and multiplied it under the supervision of Dr. Bansal.
   a) In a poly house: till now I have 1200 numbers of Geranium plants.
   b) In the field: in the year 2021 cultivated 13,600 saplings.
   In this year 2022, cultivated in another field 10,000 saplings.
2. ***Mentha piperita***: I started with around one acre and got 5 litres of oil.
3. **Citronella**: In 2021 August, I started Citronella cultivation in around 1 acre. This is very simple and easy to cultivate.
   Note: I got one distillation unit from CSIR-CIMAP and earned Rs. 96,000/- in the year, 2021 by multiplying and selling geranium saplings.

Shri. Kitbok Lang Marwein
Umkrem Mawthad Sashan Block, West Khasi Hills, Meghalaya

New initiatives



Tribal cluster habitat details



Amarkantak, a nagar panchayat, is located in Anuppur, district of Madhya Pradesh, and located at a latitude 22.670N and longitude 81.750E. Most tribal families live in this forest area, with a constant threat from wild animals with minimal basic facilities related to health, education, etc. It has an average elevation of 1,048 m (3,438 ft). It is known for its beautiful forests with tribal colonies, also called the state's cultural capital. Amarkantak is a Hindu Tirtha place, a site where three rivers including the Narmada Johila and Son Rivers. Amarkantak is mainly dominated by the tribes Baiga, Gond Bharia, bhils, Kol, Muria, and Pradhan. It has beautiful forests with Maikal mountains adjoining Kanha Tiger Reserve.

Status before interventions of CSIR-CIMAP

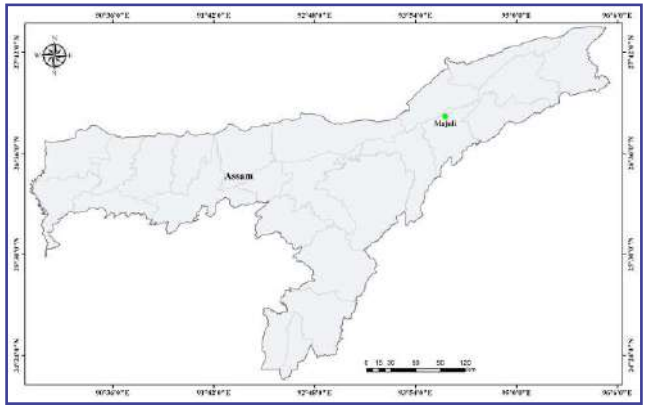
The majority of the population in this area are tribal communities. The main crop of this region is paddy during the kharif season. The crop is cultivated with minimal agri-inputs; most of the farm area is rain-fed there is minimal use of chemical fertilizers. The houses of the tribal families are made from wood rather than bricks. In agriculture, there is more use of bullocks rather than tractors; most of agriculture and transportation are bullock-dependent. The use of traditional farm implements has affected productivity and has reduced agricultural production considerably. Other Kharif crops grown in this region are maize, jowar and small millets, as rainfed crop. Tribal farmers of this region were desperately looking for high-income generating crops that could be grown as rainfed crops with minimal threat from wild animals.

Technological Interventions by CSIR-CIMAP

Two training programmes were organized at Indira Gandhi National Tribal University (IGNTU), Amarkantak, Madhya Pradesh, by CSIR-CIMAP, Lucknow, in collaboration with IGNTU, Amarkantak and District Administration, Anuppur, Madhya Pradesh. In these programmes more than 500 farmers, including a large no of women, participated. CSIR-CIMAP trained the farmers in cultivation and distillation of aromatic crops, including lemongrass, palmarosa, tulsi etc., suitable for the region. More than 5 lakhs of lemongrass slips of Krishna variety and 20 kg seeds of palmarosa, and 5 kg tulsi seeds were distributed to the farmers, and the crops were demonstrated on more than 65 farmers fields. Apart from this, one user aroma industry also supplied lemongrass slips to tribal farmers under the CSIR Aroma mission. Now about a total of 70 acres has been brought under cultivation by aromatic crops in the district in 15 villages with the help of the local district administration, Anuppur, and IGNTU, Amarkantak. All the crops are growing well, and the first harvest of these is expected by November 2022. Before that, it is expected that two distillation units, one by CSIR-CIMAP and another by the Industry would be installed there.

Majuli

Tribal cluster habitat details



Majuli is a famous island in the River Brahmaputra, flowing in the state of Assam. Majuli is the largest inhabited riverine island in the world and is quite close to Jorhat. In 2016, it became the first island to be made a district in India. It had an area of 880 square kilometers (340 sq mi) at the beginning of the 20th century, but having lost significantly erosion its area is decreasing day by day. Majuli has shrunk as the river surrounding it has grown. The Brahmaputra River forms the island in the south and the Kharkutta Xuti, a branch of the Brahmaputra, joined by the Subansiri River in the north. Majuli Island is accessible only by ferries from the city of Jorhat. The island is about 300–400 kilometers east of the state's largest city Guwahati. It was formed due to course changes by the river Brahmaputra and its tributaries, mainly the Lohit. Majuli is the abode of the Assamese neo-Vaishnavite culture. The tribal communities include the Misings, the Deoris and the Sonowal Kacharis.

Status before interventions of CSIR-CIMAP

Most of the tribal communities and their livelihood through cultivation of some traditional crops. They produce rice, mustard, pulses, and some vegetables. Rice is the primary food for the people. They have sufficient agricultural land, but the fields remain fallow after paddy. Before the intervention of the Aroma Mission in this area, tribal communities used to cultivate some traditional crops like paddy mustard, potato and some kind of vegetables, etc. The economic condition of these tribals is very poor, and these people maintain their families by doing other petty jobs like labour, driving, cloth weaving, and making attractive pots using bamboo and wood. Because of the limited land available for cultivation, Most of the tribal farmers are able to manage to produce food grain just sufficient for them.

Technological Interventions by CSIR-CIMAP

CSIR-CIMAP initially conducted two one-day awareness programmes in the Majuli to make the farmers aware of the aromatic crops suitable for the region. Two crops, Lemongrass and Vetiver, were initially shortlisted on the basis of our initial studies and considering the environmental conditions and soil types. CSIR-CIMAP introduced Lemongrass and Vetiver crops in Village - Jengraichapari, Post-Jengraimukh, District-Majuli, Assam, Blocks of the District. About 105 Misings tribal farmers attended these training programmes. During these programmes, lemongrass slips of Krishna variety (containing higher oil content of about 0.8-1.0%) slips of vetiver (CIM Vridhi) were distributed, and the benefits of lemongrass cultivation like low water requirements, no damage from wild and domestic animals, etc., were explained. Farmers were also made aware of the benefits of vetiver as this crop can tolerate floods/water logging for quite some time and therefore could be a crop of choice for low land areas frequently affected by floods. The training-cum-demonstrations programme for operation and maintenance of the field distillation unit was also organized on the tribal farmers' fields. Around one lakh thirty thousand lemongrass slips (Krishna variety) and one lakh twenty-five Thousand Vetiver slips (variety CIM- Vridhi) were provided to the tribal community in selected areas. One distillation unit (capacity 500 Kg per batch) has been installed at Village Jengrai Chapori, under CSIR- Aroma Mission in 2022 to facilitate farmers in processing their farm produce.

After the unit was established, farmers have started distilling the crop produce and selling the same in the local market. They have appreciated the economics of lemongrass in comparison with other existing crops like paddy mustard and other traditional crops. Encouraged with the initial results, the farmers of the clusters are now planning to extend the area to 30 acres with vetiver and lemongrass. CSIR-CIMAP now plans to organize training cum field demonstration for further extension of the area so that most of Mising tribes get benefitted through CSIR- Aroma mission activities.

Tribal farmers of Bishunpur and Malgaon

Tribal farmers of Nabarangpur celebrating harvest of lemongrass

Tribal farmers of Bishunpur

Tribal farmers of Bishunpur

Tribal farmers of Chandankiyari

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