



Spicing up Tribal's Welfare

भाकृअनुप-अखिल भारतीय समन्वित मसाला अनुसंधान परियोजना ए आई सी आर पी एस
ICAR-All India Coordinated Research Project on Spices
ICAR-Indian Institute of Spices Research
Kozhikode - 673012, Kerala, India

SPICING UP TRIBAL'S WELFARE



**ICAR-All India Coordinated Research
Project on Spices (ICAR-AICRPS)
ICAR Indian Institute of Spices Reserach
Kozhikode, Kerala**



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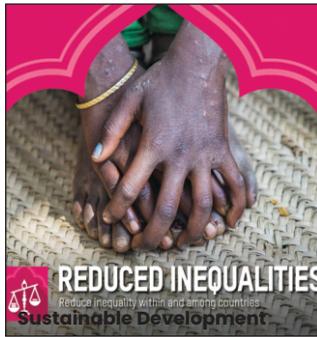
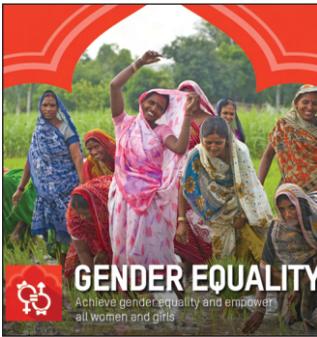
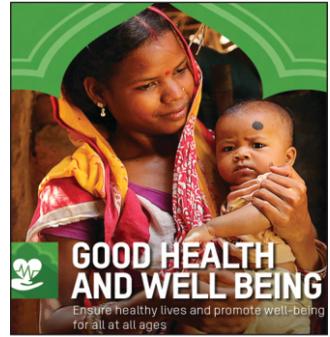
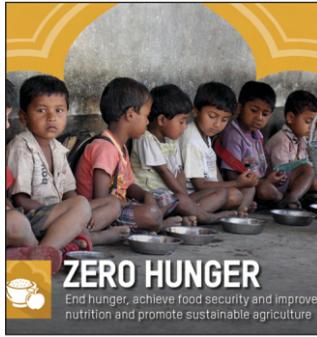
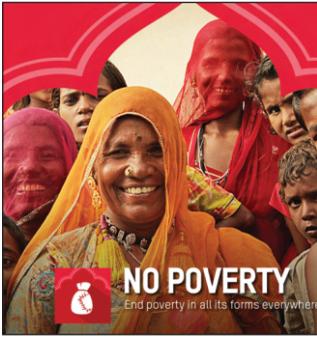
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SPICES FOR TRIBAL WELFARE

Genesis

The ICAR–All India Coordinated Research Project on Spices (ICAR-AICRPS) has been implementing a project under the Tribal Sub Plan Component in Koraput district of Odisha since 2015 through its AICRPS centre at HARS, Odisha University of Agriculture & Technology, Pottangi. The project aimed at empowering the tribal people by improving the economic and social wellbeing through a well conceived extension programme using a set of technologies developed by ICAR-AICRPS in major spice crops *viz.*, turmeric, ginger, blackpepper and coriander.

Odisha has the third largest concentration of tribal population in the country. Koraput is a part of the tribal belt in southern Odisha and has one of the highest tribal populations in Odisha and is a Scheduled District under the Constitution of India. As many as 51 different tribes have been noted in the undivided district - each with its own language and culture. Koraput district is ranked fifth among the top 5 ranking of aspirational districts as per Delta rankings released by Niti Ayog in 2020 while Gajapati district of Odisha has topped the list.



KORAPUT DISTRICT



Intervention Objectives

Area expansion of spices with increased productivity

Sustainable spices production by adoption of GAPs

Strengthening of market linkages of Farmer Producer Organizations

Skill development of tribals for scientific cultivation, processing and value addition

Spices are high value and low volume commodities of commerce in the world market and hence have great potential in increasing the farmers' income substantially. The research efforts of ICAR-AICRPS have resulted in the generation of location specific technologies that could substantially create employment opportunities, women empowerment and upliftment of tribals. These technologies have been effectively disseminated to stakeholders by the transfer of technology network of the State Agricultural Universities like OUAT, Pottangi, State Departments of Horticulture and Agriculture and ICAR-Indian Institute of Spices Research, Kozhikode.

Spice cultivation Profile of Koraput

The farmers usually follow the flat bed system of planting without any adequate preparation of the land and optimum spacing. They also do not follow any cultural and soil and plant health management practices except weeding operation. No improved technologies or scientific cultivation practices were followed. Improved varieties were never known to farmers. The post harvest operations – cleaning, curing, drying and polishing were carried out by traditional and unhygienic methods.

Ginger and turmeric were the two major spice crops cultivated by all tribal communities in Koraput. Mostly local cultivars like Pottangi local, Sargiguda local, Kakrigumma local, Brahmanigaon local, Bansal local and



Fig 1: Traditional system of flat bed cultivation of turmeric

Nabrangapur local were grown with low yield potential and a low dry recovery.

Turmeric is one of the main subsistence cash crops for the tribal farmers, cultivated in an area of 20000 ha (2011-12). The turmeric cultivars grown include Padua local, Keskeri Laxmipur local, Kandhamala local, Kashipur local and Lamataput local.

Due to the adoption of conventional method of cultivation, the farmers usually get a low and uncertain yield. The farmers usually sell their produce in the local market through middle men and get low prices owing to inferior quality.

Black pepper is grown as perennial crop and was introduced in 1979-80 as a part of Machhakunda watershed project. The estimated area under black pepper cultivation in Odisha was 650 ha in 2011-12. The average yield obtained per vine is very low (< 1 kg per vine) because of poor management of the crop in the field as in the case of turmeric.

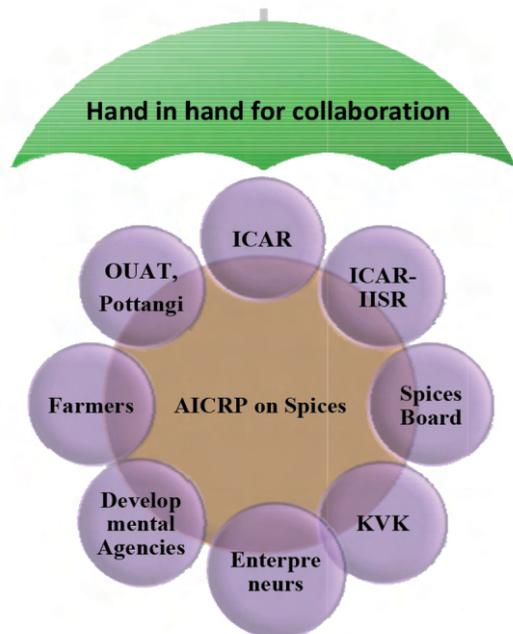


Fig 2: Various collaborative agencies

Technologies for sustainable livelihood

Towards achieving the goal of “no poverty”, improving agricultural productivity is crucial while ensuring the farming activities adopted are sustainable and environmental friendly. ICAR- AICRPS has developed crop wise technologies for varietal improvement, nutrient availability and plant health management in various spice crops. The objective was to provide easily adoptable, locally available, sustainable and low input technologies aimed at upliftment of socio economic well being of tribal farmers of the region. Some of the interventions were,

A. Identification of suitable varieties of spices for Koraput

Multi location testing of varieties is one of the mandate of AICRPS which has centres in 24 agro climatic regions of the country. By testing in such centres, the suitability of each variety across the country can be mapped and thus aid

in identification of varieties with high yield and high quality varieties suitable for cultivation in different geographic regions of the country.

I. Development of curcumin rich varieties of turmeric

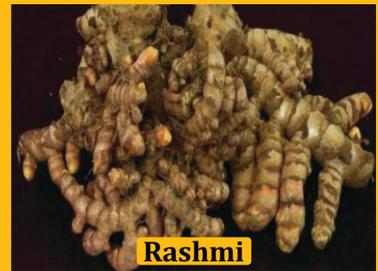
Initial Evaluation trials (1992-95), coordinated varietal trials and multi location testing of turmeric genotypes resulted in the development of varieties suitable for Eastern Ghat region of India. High Altitude Research Station (HARS) of OUAT, Pottangi under ICAR-AICRPS developed high yielding, curcumin rich (6.1- 6.4 %) varieties of turmeric viz., Roma (1988), Suroma (1989) and Rashmi (1992). These varieties find place in pharmaceutical industry owing to their high curcumin content. Among the varieties, Roma is more popular among the tribal farmers and occupy a sizeable area. This is cultivated organically also.



Roma



Surama

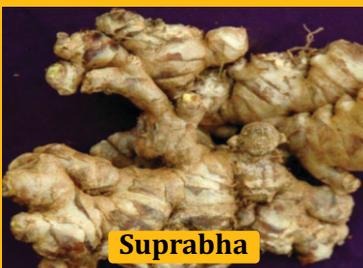


Rashmi

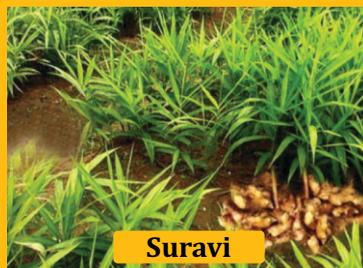
II. Development of high yielding and high quality ginger varieties

HARS, OUAT, Pottangi under ICAR-AICRPS has developed high yielding varieties of ginger viz., Suprabha (high yielding with less fibre), Suravi

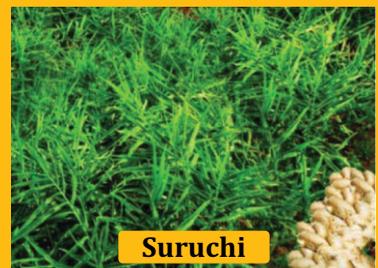
(Suruchi (high yielding and high oil), Suruchi (less fibre) and Sourabh (disease tolerant). Among the varieties, Suprabha is more popular among the tribal farmers due to its high yielding potential.



Suprabha



Suravi



Suruchi

III. Introduction of suitable varieties of turmeric and ginger

G x E trials of turmeric assessed the suitability of turmeric varieties at Pottangi and found that the turmeric varieties like IISR Prathibha, Lakadong and Rajendra Sonia as superior in yield and quality characters. Similarly, IISR

developed ginger varieties like IISR Varada (low fibre), IISR Rejatha (high oil) and IISR Mahima (nematode tolerant) were introduced to the Koraput region of Odisha. Due to their high yielding ability and better quality, income of farmers can be enhanced by adopting these varieties.



Rajendra Sonia



IISR Prathibha



Megha Turmeric 1



IISR Varada



IISR Rejatha



IISR Mahima

IV. Introduction of suitable varieties of black pepper

Panniyur 1, the first hybrid of black pepper dominated Koraput region of Odisha since 1985. This variety has high yielding ability and is medium in quality, and is highly adaptable. Other varieties like Panniyur 2 (shade tolerant), Panniyur 6 (drought tolerant), IISR Thevam (field tolerance to *Phytophthora* and drought), IISR Gimunda (suitable for high altitude regions) and IISR Shakthi (high dry recovery and tolerant to foot rot) were also introduced to

increase the productivity of black pepper as these varieties perform better under stress conditions, which is prevalent in Koraput.



Panniyur 1



Panniyur 2



Panniyur 6



IISR Thevam



IISR Shakthi



IISR Gimunda



Fig 3: Farmer's plot before adoption of technology

B. Organic nutrient management- for food safe spice production

Organic agriculture is a holistic food production management system which promotes and enhances healthy agro ecosystem. The main objective is to maximize the use of on farm resources, and minimize off farm resources. The tribal farmers were educated on organic nutrient management practices through various training programmes and demonstrations at field levels. Organic management practices for general health of plants and management practices to contain diseases and pests were taught to them in spices such as ginger, turmeric, black pepper and coriander.



Fig 4: Dissemination of organic farming technology of ginger & turmeric at Koraput

C. Rapid multiplication of planting materials-*for minimal expenditure*

Single bud protray method of propagation in ginger and turmeric- Rhizome bits of 5-6 g with a bud planted in protray requires only 1/4th of planting material compared to

conventional propagation method. It saves 60% cost of seed rhizome and ensures 98-100% field establishment with disease free planting materials. It is suitable for both early as well as delayed planting.



Protray technology in turmeric



Protray technology in ginger

Need for single bud rhizome method

Characters	Direct planting method	Transplanting method
Propagation through	Whole rhizome	Rhizome single bud
Seed rate	2500 kg/ha	750 kg/ha
Cost of planting material	Rs. 30,000	Rs. 9,000
Crop establishment	75 - 80%	95 -100 %
Rhizome development	Starts from 5 MAP	Starts from 2 MAP
Productivity	30-32 tonnes/ha	40-42 tonnes/ha

A) Cost of seedling production (1500 protrays/ha)	Cost (Rs.) per ha
1. Protray (Rs.4/No.)	6,000.00
2. Cost of growing media	2,500.00
3. Cost of rhizome (750 kg @ Rs.10/kg)	7,500.00
4. Labour charge	2,500.00
Total	18,500.00
B) Cost of seed rhizome (2500 kg/ha)	25,000.00
Benefit from transplant production	6,500.00
Benefit cost ratio	1.35



Tribal women preparing protrays



Crop in farmer's field

This technology was popularised among the tribals of Odisha creating employment opportunities for tribal women (for cutting the rhizomes and transplanting the plants in the field, women labour is preferred).

D. Raised bed system of planting- for maximising yield.

Traditionally, tribal farmers cultivate turmeric and ginger on flat beds with very close planting. Row to row and plant to plant spacing is seldom followed. Due to this practice, rhizome rot disease incidence is more common during rainy season resulting in very low yields. ICAR-AICRPS centre, OUAT, Pottangi in collaboration with Department of Horticulture, KVK, Koraput, and other NGOs working in tribal area

of Koraput popularized raised bed cultivation of turmeric and ginger. Raised bed of 1 m width and 15 cm height with 40-50 cm channel within beds was advocated with an optimum spacing of 30 cm x 25 cm for planting turmeric and ginger. This practice helped in maintaining optimum plant population, low rhizome rot incidence, increased yield per unit area and also reduced the labour cost for weeding and harvesting.

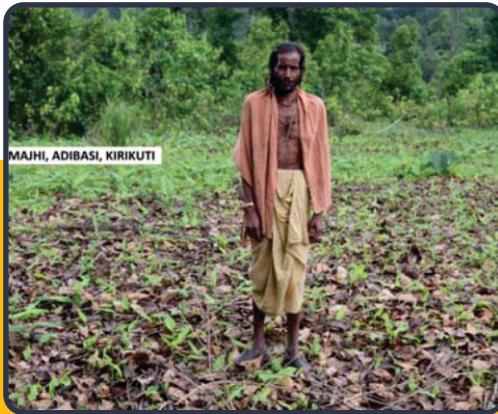


Fig 5: Conventional and improved methods of cultivation of turmeric

E. Farm mechanization- to reduce drudgery of tribals

Tribal farmers perform post harvest practices like cooking and drying of turmeric rhizomes by manual and traditional methods. These practices are more time consuming, labour intensive and require lot of fire wood. The tribal farmers usually sell their turmeric produce after drying without polishing or sell partially polished rhizomes, done manually by rubbing against hard surface. Hence farmers get less price losing about Rs. 5-10 / kg as it does not result in desired appearance.

Hence, to create awareness among the tribals on improved processing methods, HARS, OUAT, Pottangi conducted customised training programmes on post harvest management and processing of spices including ginger and turmeric. Following this, 14 units of turmeric boilers developed by a Farmer Producer Organisation- KASAM (Kandhamal Apex Spices Association for Marketing) were distributed to 14 self help groups of Kandhamal. This helped the tribal farmers to process their turmeric in improved boilers, thus reducing the drudgery of tribal farmers as well as resulted in better quality product.

Table 1: Details of Farmer Producer Organisations supported by ICAR-AICRPS centre at OUAT, Pottangi

Sl. No.	Farmer Producer Organisations (FPO'S)	Crops	No. of farmers
1.	Padua Nanda Producer Company, Padua Nandapur, Koraput	ginger, turmeric, black pepper	158
2.	Alekhmahima Producer Company, Padua Nandapur, Koraput	ginger, turmeric, black pepper	175
3.	Jayadurga FPO, Gelaguda, Kunduli Semiliguda, Koraput	Ginger burfee, candy & flakes	126

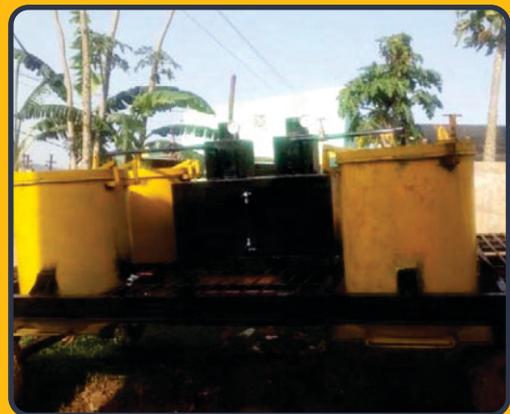
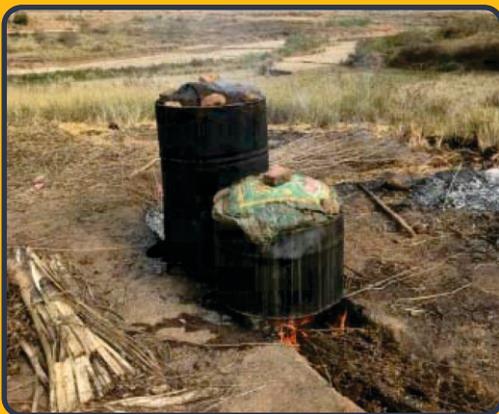
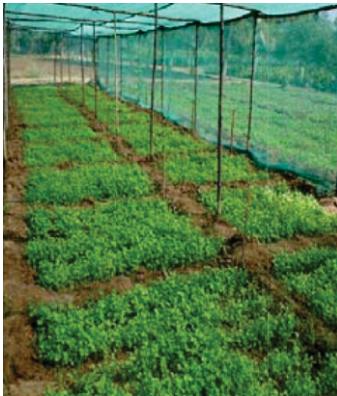


Fig 6: Conventional and improved methods of curing of turmeric

F. Off season leafy coriander - a way for profit generation

The off season production of coriander under shade net, a technology developed by AICRP on spices is a boon for tribals as it generates additional income and overcomes the problem of low germination percentage under field conditions during March to April. Application of NPK @ 30:40:20 kg per ha along with spraying of GA @ 15 ppm at 20 DAS produces maximum leaf yield of coriander with yield increase of 25% over control. The crop can be harvested

45th day after sowing. Cultivation of off season coriander helps farmers to earn profit in a very short time as the crop can be harvested just 45 days after sowing and as it is off season crop, it fetches more income. Tribal farmers were trained on coriander cultivation, demonstrations were held and coriander seeds of multi cut varieties were distributed by AICRPS centre at Pottangi. Introduction of multi cut varieties further enhanced prospects of tribal farmers by generating additional income from the net sown area.



Off season coriander production under shade net

80% germination success under shade net condition during off season production



Fig 7: Training on coriander cultivation & distribution of seeds at Sagar Village & Asha kiran Society, Lamtaput

Availability of quality, disease free planting material is one of the major bottlenecks to obtain quality produce and also to enhance productivity. To supply disease free quality planting material of spices, community nurseries of black pepper and seed villages of turmeric were established during 2014-15 for sustainable spice production. ICAR-AICRPS centre at Pottangi established a master black pepper nursery in poly house in 2017 with nine varieties of black pepper (Sreekara, Subhakara, Panchami, Pournami, Girimunda, IISR Thevam, IISR Shakthi, IISR Malabar Excel and Panniyur-1) in collaboration with DASD, Kozhikode and ICAR- IISR, Kozhikode, Kerala.

The nucleus planting materials of the improved varieties were procured from ICAR-IISR and PRS, Panniyur. About 2000 rooted cuttings in 2017, 45,000 rooted cuttings in 2018 and 1,00,000 cuttings in 2019 were distributed to the tribal farmers. These cuttings were planted to replace the unproductive local black pepper vines, to gap fill the empty standards and also to establish new black pepper gardens in coffee

based cropping system in tribal area of Koraput. Also, commercial cultivation of black pepper was taken up in large scale at Koraput, Kandhamal and Gajapati districts in 334 ha. 115,000 black pepper seedlings were raised to plant in the forest land of Kandhamala district of Odisha as a demonstration through watershed project, G.Udayagiri, Kandhamala. Pottangi station also produced 3000 seedlings of cinnamon and small cardamom during 2017-20 and distributed to tribals to promote cinnamon and small cardamom cultivation in the tribal belt.

Seed materials of improved varieties of ginger (Suprabha) and turmeric (Roma) were multiplied and distributed to the tribals. OUAT Pottangi in collaboration with ICAR-AICRPS and DASD, Kozhikode has produced 20 tonnes of nucleus seed materials of ginger variety Suprabha and 24 tonnes turmeric variety Roma during 2017-20 and supplied to the farmers, mostly tribals to bring more area under spices cultivation.



Fig 8: Accredited black pepper nursery at Pottangi



Ginger seed production at Pottangi



Turmeric seed production at Pottangi



Tree spices & black pepper production at Pottangi

Fig 9: Quality seed material production of Spices

The ICAR-AICRPS through its network across the country has developed several improved varieties and sustainable technologies which have been demonstrated in famers' plots and have become popular among the farmers. Scientists from AICRPS centre at OUAT, Pottangi have been actively involved in popularization of the latest technologies to create awareness among farmers especially tribals about scientific cultivation practices and sustainable spice production which in turn improves the standard of living of tribals.

Front line demonstrations were undertaken in the districts like Koraput (Pottangi, Semiliguda, Nandapur, Lamataput, Dasamantapur), Kandhamal (Daringibadi, Phulbani, Baliguda, G. Udayagiri) and Gajapati (R. Udayagiri, Ramagiri, Nuagada, Lobasing, Raising, Jirang etc.) districts of Odisha Major tribes in Koraput district are Gadaba, Jhadia Paraja and Parenga. The tribals after getting convinced through demonstrations and trainings started cultivating spices like ginger, turmeric, black pepper and leafy coriander on commercial scale by adopting good agricultural practices which rewarded them with huge income.

Some of the technologies demonstrated by AICRPS are as follows:

- Demonstration of high yielding turmeric variety Roma.
- Demonstration of high yielding ginger variety Suprabha.
- Demonstration of 15 varieties of black pepper.
- Demonstration of black pepper cultivation: 5.0 ha in Gajapati and 21.0 ha in Lamataput district of Odisha.
- Demonstration of the performance of protray produced ginger and turmeric plants.
- Protray cultivation technique for quality seed production of ginger & turmeric.
- Organic farming in ginger and turmeric.

Apart from the above field level demonstrations, the scientists popularised technologies by conducting virtual trainings and attending as resource persons in virtual trainings and seminars and also through various media (newspaper, radio talks and TV programmes).



Turmeric variety Roma



Single budded transplant of ginger

Fig 10: Demonstrations of turmeric variety Roma & single budded transplant of ginger

Skill development- for educating tribals

Skill development programme was conducted through training and capacity building programmes oriented for the overall development of tribals.

The content for the courses for skill development programme was developed based on the following technologies:

- Systems of planting of turmeric – raised bed system, ridges and furrows
- Seed rate and spacing in turmeric to maintain optimum plant population
- Protray method for rapid multiplication of planting materials of ginger and turmeric
- Organic cultivation practices in turmeric and organic certification procedures
- Foliar application of micronutrient mixture developed by ICAR-IISR for turmeric
- Drip and micro irrigation technology for water conservation
- Soil solarization of planting beds for disease management in ginger
- Method of seed rhizome storage under pit-system
- Introduction of multiple cropping systems in ginger (ginger+ maize, french bean+ arhar + colocasia)
- Off season cultivation of leafy coriander and adoption of multi cut techniques in coriander
- Serpentine method of black pepper nursery raising
- Bio intensive management of black pepper nursery to produce disease free quality planting materials using *Trichoderma* and PGPR formulations designed by ICAR-IISR
- Use of small scale machines for onfarm turmeric curing and polishing
- Secondary processing for development of value added products viz., ginger and turmeric powder, ginger candy and ginger burfee
- Quality planting material production of spices and their distribution

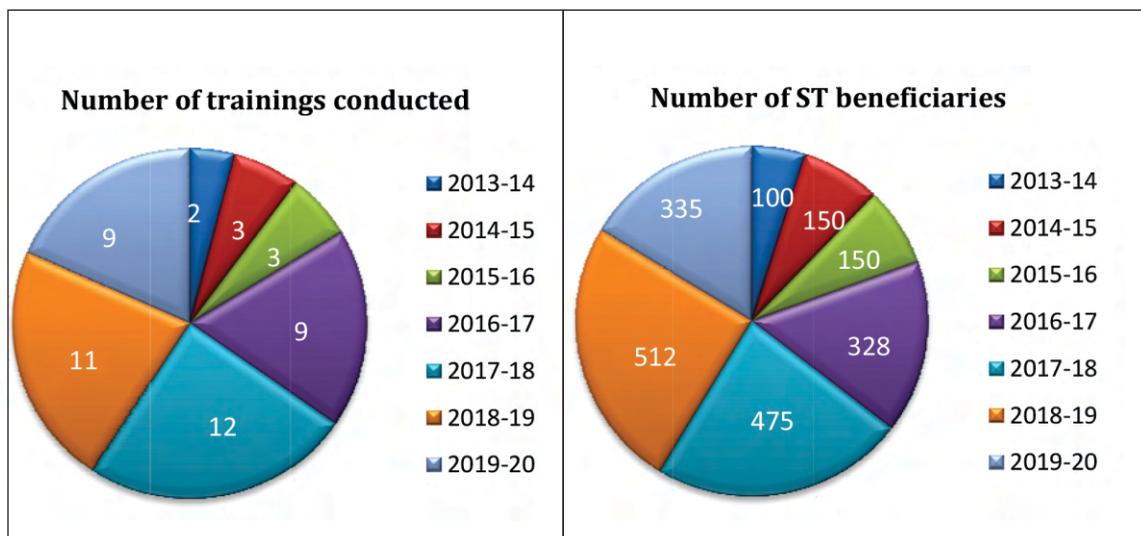


Fig 11: Number of trainings conducted by AICRPS centre at OUAT Pottangi during 2013-20

Women empowerment- for strengthening tribals

In line with the words of Mahatma Gandhi “If you educate a woman, you educate entire family”. AICRPS centre at OUAT, Pottangi started imparting training and skill development to tribal women in order to uplift each tribal family and to ensure that none of the family members are involved in any of the extremist activities.

Tribal women of Koraput and Kandhamal are actively involved in the cultivation of high

yielding ginger variety, Suprabha, high yielding and high quality turmeric variety Roma and pro tray method of rapid multiplication of planting materials of ginger and turmeric. In Kandhamal, 14 self help groups were formed who are dynamically involved in the curing of turmeric, drying and selling the end product. The NGO's namely KASAM and Asha Kiran Society were associated in this venture.



Training for tribal women



Successful black pepper cultivation by Women



Woman relishing ginger cultivation

Fig 12: Tribal women empowerment activities by AICRPS centre at OUAT Pottangi

Impact of AICRPS technologies on tribal welfare

The impact of AICRPS technologies in Koraput district of Odisha is tracked through knowledge and technology dissemination, skill enhancement, technology adoption, cost and return analysis.

I. Technology dissemination and adoption

A. Improved varieties of ginger & turmeric

(-) The major impact is attributed to the adoption of the improved varieties of ginger (Suprabha) and turmeric (Roma) developed by ICAR-AICRPS centre at OUAT, Pottangi. These varieties have replaced the existing low yielding local varieties. Improved varieties have high yield and high dry recovery compared to local varieties.

(-) The increase in productivity is also attributed to the adoption of scientific cultivation practices such as seed treatment, raised bed preparation, recommended spacing between plants and rows, mulching, organic nutrient management, and improved processing methods.

(-) Following the successful performance and acceptability of both these varieties, KASAM and other NGOs like PRADAN, Asha Kiran Society and RASS started promoting cultivation of Suprabha (ginger) and Roma (turmeric) on large scale.

(-) These agencies could produce 400 tonnes of Roma from five villages during 2019-20.

Table 2: Characteristics of the improved varieties of ginger and turmeric with that of local varieties

Characteristics	Turmeric		Ginger	
	Local	Roma	Local	Roma
Fresh rhizome yield/ha (t)	15	22	12	16.6
Dry rhizome yield (t)	3	6	2.4	3.8
Price of dry rhizome/t (Rs.)	75000	90000	130000	140000
Total returns (Rs.)	225000	540000	312000	532000
Total cost of cultivation (Rs.)	200000	350000	250000	380000
Net Returns (Rs.)	25000	190000	62000	152000

B. Area expansion in black pepper and coriander

(-) Over 3,00,000 rooted cuttings of improved varieties of black pepper were distributed to 500 farmers during 2016-20. Since these new planted pepper is still in pre bearing stage the direct yield benefit cannot be measured at present. It takes 6-7 years for yield stabilization in black pepper.

(-) Commercial plantation of pepper was taken up in Koraput, Kandhamal and Gajapati district in 334 ha.

(-) According to Dept. of Horticulture, Govt. of Odisha there is an increase of 500 hectares since the year 2011. The envisaged area expansion programme in black pepper is about 2000 ha by 2024-25. For this purpose, the seedlings will be produced by HARS, OUAT,

Pottangi, NGOs, Department of Horticulture, Department of Watershed and soil conservation unit, Odisha.

(-) During the year 2011-12, the area under coriander cultivation was 12910 ha which has increased to 20222 ha owing to the adoption of multi cut technology and off season cultivation.

II. Productivity enhancement

By adopting the improved methods of cultivation in ginger and turmeric like raised bed system of cultivation, optimum seed rate, spacing, pro tray method for rapid multiplication of planting materials, organic

cultivation practices, foliar application of micronutrient mixtures, fertigation, solarization, introduction of intercropping in ginger, offseason cultivation of leafy coriander, adoption of multi cut techniques in leafy coriander, bio intensive management of black pepper nursery to produce disease free quality planting materials using *Trichoderma* and PGPR formulations and quality planting material production of spices and their distribution, the area, production and productivity of spice crops like ginger, turmeric, black pepper and coriander in the state of Odisha has increased considerably (Table 3).



Organic ginger farming



Organic turmeric farming



Processing in turmeric



Leafy coriander in Pottangi

Fig 13: Adoption of ICAR-AICRPS technologies at Koraput

Table 3: Trends in area, production & productivity of spices in Odisha

Crop	Odisha					
	2011-2012			2019-2020		
	Area (ha)	Production (tons)	Productivity (t/ha)	Area (ha)	Production (tons)	Productivity (t/ha)
Coriander	12910	6146	0.48	20222 (56%)	11066 (80%)	0.55 (15%)
Ginger	17120	126530	7.39	16965 (no change)	133680 (5.6%)	7.88 (6.66%)
Turmeric	26830	202920	7.56	28137 (4.8%)	221702 (9.2%)	7.88 (4.2%)
Pepper	650	975	1.5	1175 (78%)	1298 (33%)	1.7 (13%)
Total	132069	474128	3.59	135920 (2.9%)	568145 (19.8%)	4.18 (16.4%)

III. Income enhancement

- Due to the adoption of the improved varieties and scientific cultivation practices there is a significant increase in total and net income of farmers.
- The cost of cultivation of improved varieties of ginger and turmeric was estimated to be higher at Rs. 3,50,000 ha and Rs. 220000 per ha as compared to Rs. 100,000 per ha for local cultivars.
- On the other hand the net returns registered for ginger variety Suprabha accounts to Rs. 2,25,000 per ha and for turmeric variety Roma accounts to Rs. 1,00,000 per ha as compared to local cultivars with Rs. 60,000 per ha.

IV. Nutritional improvement

- Geographical isolation, primitive agricultural practices, sociocultural taboos, lack of formal education, poor infrastructure facilities, improper health

seeking behaviour, poverty etc. has always lead to the development of various morbidities and under-nutrition among the tribals.

- As each tribal population has its own unique food habits and taboos, general awareness creation on importance of food and nutrition could only change their mind set. Introduction of spices cultivation compared to the cultivation of traditional crops in the tribal dominated Koraput district has improved the financial status of these tribals. Because of our continuous efforts, with increase in financial status, they slowly started taking care of basic food and nutrition requirements.
- Introduction of spices such as turmeric, ginger and black pepper in tribal belt and their subsequent daily consumption in various forms such as in tribal dishes and in the form of extracts lead to overall health improvement including their immunity to various ailments.

- Continuous awareness creation on good agricultural practices among tribals resulted in the acceptance of these practices by them. This led to the production and consumption of hygienic and quality spices, thereby improving their nutritional status. Production of hygienic spices resulted in increased market price for their produce. The market demand for their product also increased as the products are purely organic.

V. Upliftment of socio-economic profile of tribal farmers

Odisha has the third largest concentration of tribal population in the country. ST constitute 22.89% of the total population of the state as per 2011 census. Koraput is a part of the tribal belt in southern Odisha and has one of the highest tribal populations in Odisha and is a Scheduled District under the Constitution of India. The Koraput district has 14 Blocks/Tahsils

in under two sub-divisions (Koraput and Jeypore). Hamlets located in interior areas lack minimum need supporting facilities/services. These villagers lack access to basic health and drinking water. About 70 to 80 per cent of the tribal farm holdings in these villages fall in the categories of small and marginal holdings, the average farm size being about two thirds of an acre.

Agriculture is the main source of income for the tribal population but the farming practices are archaic and primitive resulting in very little yield. Koraput district has a total cultivable area of 301.50 sq.km in which paddy occupies the major area (99000 ha). Other crops grown are wheat, sugarcane, pulses and vegetables. The district overall has a warm and humid type of climate, though significantly more pleasant than the rest of Odisha. In Kandhamal and Koraput districts, ginger and turmeric were cultivated in large scale using local varieties and conventional

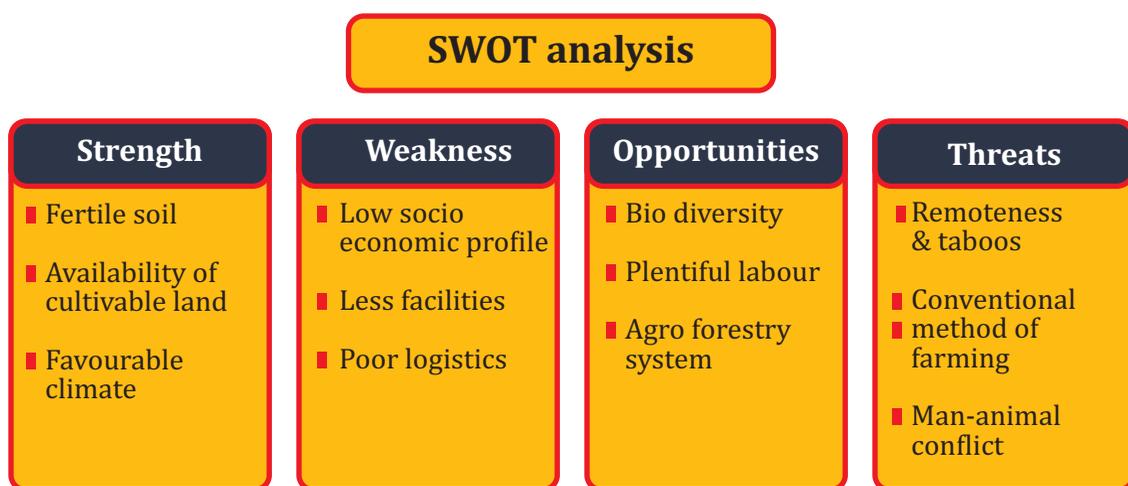


Fig 14: SWOT analysis at the onset of the project

Owing to the developmental activities undertaken by ICAR-AICRPS centre at OUAT, Pottangi there was a substantial increment in the income of farmers mainly due to the adoption of scientific cultivation practices and improved varieties of ginger and turmeric.

Since the estimated value of unit output for turmeric (Rs. 500000 per ha) and ginger (Rs. 1190000 per ha) are high, the potential of these crops for enhancing farm income is very high. The FLDs, training programmes and interventions carried out by OUAT, Pottangi, State Agriculture and Horticulture departments and other agencies such as KASAM, PRADAN, Asha Kiran etc. helped in increasing the area under improved varieties of ginger (16695 ha) and turmeric (28137ha) with increased production (133680 t and 221702 t) and productivity (both 7.88 t/ha) of ginger and turmeric respectively.

The estimated cost benefit ratio after the interventions in ginger and turmeric were 1:3.5 and 1:2.2 respectively. This estimate was worked out taking in to account the cost of cultivation and net returns.

The area under black pepper showed an increasing trend from 650 ha in 2011-12 to 1175 ha in 2019. Planting of black pepper cuttings has been undertaken in large scale but as these newly planted pepper is still in pre bearing stage the direct economic gains cannot be measured immediately.

The area under coriander cultivation has also increased from 12910 to 20222 ha during the last 7 years due to the adoption of multi cut technology and off season cultivation.

By following scientific cultivation and the good agricultural practices (GAP), there was a significant increase (almost the double) in the income of tribal farmers which helped them to construct Pucca houses and afford two wheelers such as motor bikes, which earlier were very rarely seen in these tribal villages.

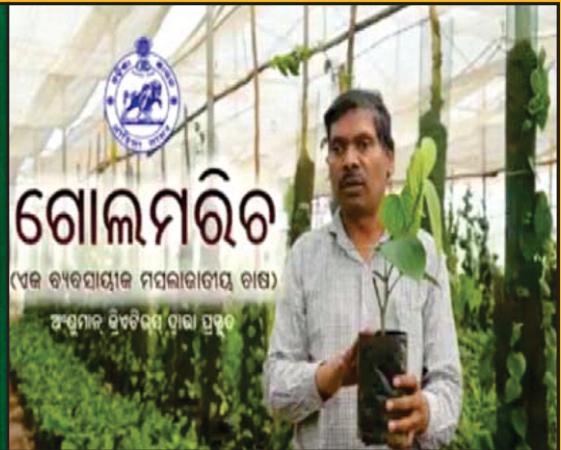
VI. Success stories documented

The success stories on the cultivation of improved varieties of ginger and turmeric, organic farming, primary processing, cultivation of leafy coriander and area expansion programme of black pepper etc were documented through, articles, booklets, pamphlets and videos.

- Success story on organic farming in turmeric in tribal area of Koraput
- Success of adoption of primary processing in turmeric - Pamphlet published by KASAM
- Development of organic products of ginger and turmeric - Pamphlet published by KASAM
- Success story on off season cultivation of coriander
- Video on area expansion programme of black pepper in Odisha.



Pamphlet of KASAM on organic products of turmeric



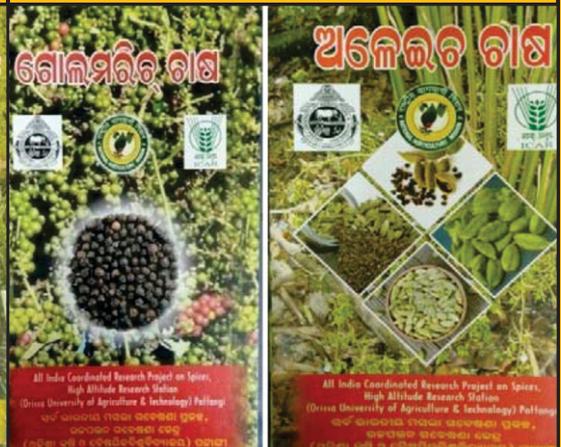
Video on area expansion in black pepper



Uploaded You tube video on value addition of ginger



News paper coverage



Booklets published on improved technologies

Fig 15: Documentation of success story of the project

Tribal welfare through sustainable development

Owing to the developmental activities undertaken by ICAR-AICRPS centre at OUAT, Pottangi there was a substantial increment in the income of farmers mainly due to the adoption of scientific cultivation practices and improved varieties of ginger and turmeric.

Since the estimated value of unit output for turmeric (Rs. 500000 per ha) and ginger (Rs. 1190000 per ha) are high, the potential of these crops for enhancing farm income is very high. The FLDs, training programmes and interventions carried out by OUAT, Pottangi, State Agriculture and Horticulture departments and other agencies such as KASAM, PRADAN, Asha Kiran etc. helped in increasing the area under improved varieties of ginger (16695

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Table 4 : Percentage of adoption of technologies in Odisha

Sl. No.	Technology	Percentage of adoption of technologies (%)
1.	Use of high yielding varieties	15-20
2.	Timely planting	60
3.	Raised method of planting	45
4.	Inter cropping and mixed cropping	30
5.	Crop rotation (2 years gap)	40
6.	Application of biofertilizers	15
7.	Organic farming	20
8.	Seed treatment	50
9.	Application of mulching (dry straw)	50
10.	Maintenance of spacing	40
11.	Timely plant protection measures	40
12.	Storage methodology	35
13.	Application of foliar micronutrients	40
14.	Value addition	20

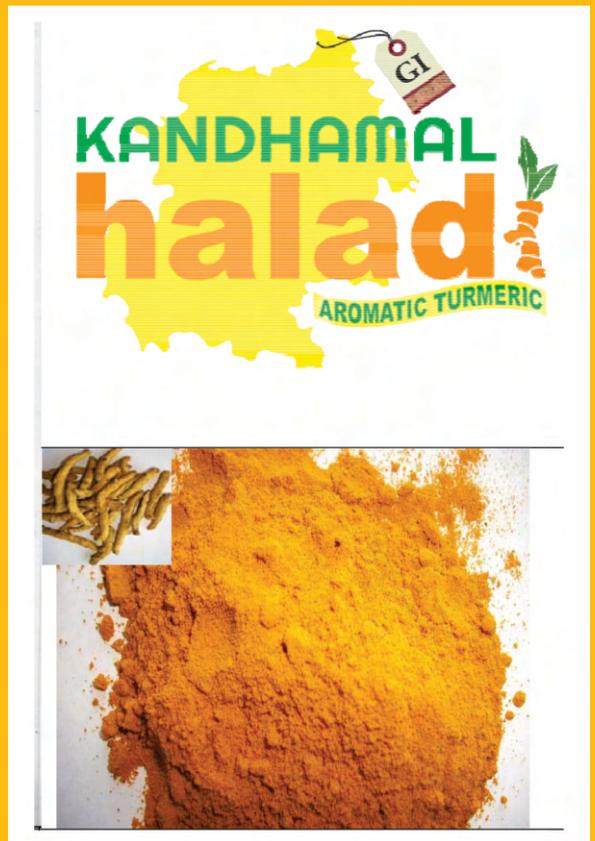


Fig 16: GI certificate, GI tag & powder of Kandhamal Haladi

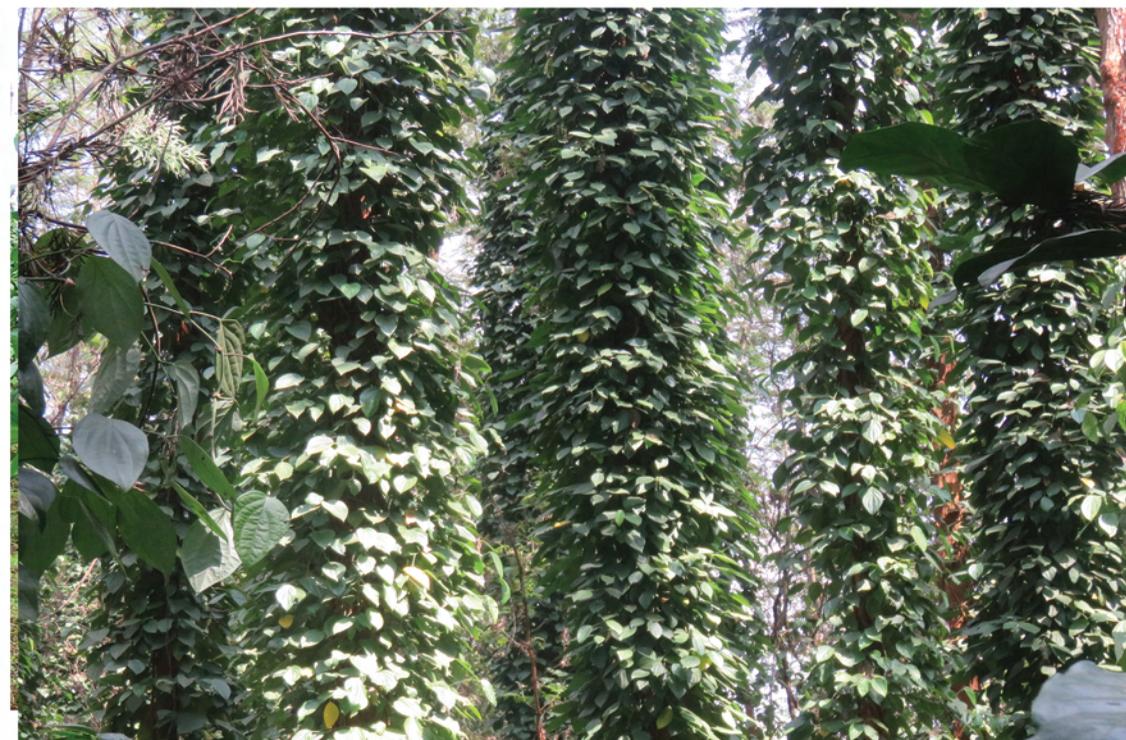
Partners for Tribal Welfare at Koraput

Table 5: Roles of various collaborating institutions for upliftment of tribals in Koraput

S. No.	Name of the Organisation	Category	Role or Activity
1.	ICAR- Indian Institute of Spices Research, Kozhikode, Kerala	Public	Technology generation, testing and front line extension
2.	AICRP on Spices centre, HARS, OUAT, Pottangi, Odisha	Public	Technology testing and front line extension
3.	Spices Board, Koraput, Odisha	Public	Capacity Building, Skill development Programme and market promotion.
4.	Krishi Vigyan Kendra, Koraput, Odisha	Public	Imparting training, FLDs and OFTs in spices
5.	Kandhamal Apex Spices Association for Marketing (KASAM), Kandhamal, Odisha	Public	Imparting training, FLDs and OFTs in spices
6.	Professional Assistance for Development Action (PRADAN), Koraput, Odisha	NGO	Production of planting material, large scale field demonstration. Promotion of organic ginger & turmeric cultivation in Koraput
7.	Asha Kiran Society, Lamtaput, Odisha	NGO	Strengthening of farmer collective, women participation, collective farming of ginger, turmeric, black pepper and small cardamom in tribal belts of Lamataput & Nandapur blocks of Koraput
8.	Rashtriya Seva Samithi (RASS), Koraput, Odisha	NGO	Formed two FPOs in Padua named Padua Nanda Producer Company and Alekhamahima Producer company for promoting ginger, turmeric (especially Roma variety in large scale) and black pepper cultivation and value addition

Timeline of the project at Koraput

1979-80	Introduction of black pepper as a part of watershed project
1985-86	Introduction of black pepper variety Panniyur 1
1988-92	Development of improved varieties of ginger and turmeric by AICRPS centre at OUAT, Pottangi
1994-95	Raised bed method of cultivation of ginger and turmeric
1998-2000	Introduction of improved varieties of ginger (IISR Varada) and turmeric (IISR Prathibha)
2000	Introduction of small cardamom varieties Mudigere 1, PV1 & Njallani Green gold
2000	Introduction of cinnamon variety Konkan Tej
2001-02	Introduction of improved varieties of coriander & large scale cultivation of leafy coriander
2006-10	Introduction of improved varieties of ginger and turmeric
2009-10	Machineries for processing of ginger and turmeric
2013-14	Introduction of improved varieties of black pepper
2014-15	Pro tray method of rapid multiplication in ginger and turmeric
2014-15	Establishment of nurseries for quality planting material production
2015-17	Organic farming in ginger and turmeric
2017-18	Formation of FPOs and development of value added products of ginger and turmeric
2018-19	Introduction of small cardamom variety Appangala 1



**ICAR-All India Coordinated Research Project
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