Value Chain Model for Promotion of Spice Farming System in Paderu Tribal Agency Area - Vishakapatanam, Andhra Pradesh









From Farm to Fork

ICAR-Indian Institute of Spices Research
Kozhikode, Kerala-673012

Value Chain Model for Promotion of Spice Farming Systems in Paderu Tribal Agency Area – Vishakapatanam, Andhra Pradesh

Rajeev P
Sivakumar V
Prasath D
Jayashree E
Lijo Thomas

ICAR-Indian Institute of Spices Research
(Indian Council of Agricultural Research)
Marikunnu (P.O), Kozhikode - 673 012
Kerala

VALUE CHAIN MODEL FOR PROMOTION OF SPICE FARMING SYSTEMS IN PADERU TRIBAL AGENCY AREA – VISHAKAPATANAM, ANDHRA PRADESH

Background of the Project for Tribal Livelihood Improvement

Vishakhapatnam is identified by the NITI-AYOG as one of the Aspirational Districts in the state of Andhra Pradesh. Vishakapatnam district has a sizable proportion of tribal population, about 14.5% of the total tribal population in the state. Out of three Divisions, Vishakapatnam, Narasipatnam and Paderu in the district, a major proportion of tribal communities (89.98%) are dwelling in Paderu Tribal Agency area. There are 3,574 Tribal hamlets in Paderu, out of which 1,093 are identified as Primitive Tribal Groups (PTGs). Out of eight tribal groups in the state that are identified as PTGs which require special treatment, three communities are living only in the Paderu agency area. Agriculture followed by collection of non timber forest produce are the major occupation. The basic social indices like literacy, formal education and health are low for these tribal communities.

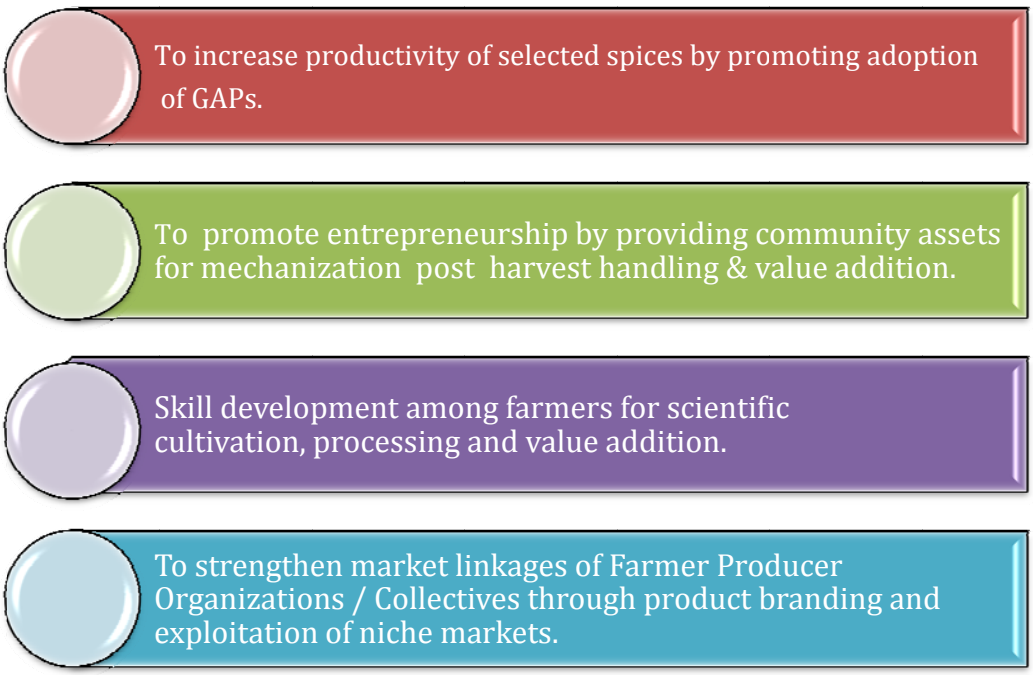
The net income of tribal farmers from agriculture is as low as less than Rs. 10,000/-. The farmers follow traditional and highly conservative agricultural practices bound by age old customs. Besides, access to knowledge and communication resources is also limited. The spice growing areas in the district are identified as habitats with higher biodiversity. Black pepper and turmeric are the two major spices cultivated in Vishakapatanam. Turmeric is the subsistence cash crop cultivated by all communities of tribal farmers. Black pepper was introduced in the latter half of 1970's as an intercrop in the traditional coffee plantation in the hill zones of Paderu.

ICAR Indian Institute of Research has implemented a multi institutional project leveraging several technologies which are already available with the organization for immediate benefit to the tribal community at Paderu. The collaborative institutions were Integrated Tribal Development Agency (ITDA), Paderu; Society for Elimination of Rural Poverty (SERP), Vijayawada; Tata Trust, Vijayawada; and two NGO's in Vishakapatnam District. The first stage of the project initiated in 2011-12 was technology testing or research trials carried out by All India Coordinated Research Project on Spices (AICRPS) located at Horticultural Research Station, YSR Horticultural University,

Chintapalle falling within the target area of the project. Comparative Varietal Yield Trials (CVYT) and Research Station trials of technologies were carried out and eight technologies defined as Good Agricultural Practices (GAP) suitable for this agro ecological zone were selected for upscaling. The selected technologies were improved varieties of turmeric and black pepper, raised bed system, land preparation for turmeric cultivation, organic and micro nutrient formulations developed by ICAR-IISR, intercropping in turmeric, promotion of bio intensive nurseries of black pepper, mechanization of primary processing in turmeric and production of value added products and branding for entrepreneurship development.

Project Objectives

The twin strategies aimed at this location were "Area expansion in black pepper" and "Value adding turmeric". The interventions planned aimed at strengthening already existing network of Farmer Producer Organizations (FPO), through increasing spice crop productivity, increasing bio resource use efficiency and strengthening processing sector. The objectives envisaged were:



Tribal Village/Tribal Farmers Targeted

- Visakhapatnam district is ranked among the bottom 10 of 112 districts in the country as per the Second Delta rankings released by NITI Aayog as part of its Aspirational Districts Programme Deep Dive. In the over-all rankings, Visakhapatnam district was placed at 106th rank of the total districts in the country, while the other two districts, Vizianagaram and Kadapa districts in Andhra Pradesh were ranked 11th and 19th, respectively.

- The Paderu Tribal Agency consists of 11 fully scheduled mandals and 2 partially scheduled mandals of Visakhapatnam district. For administrative convenience, it is divided into three sub-divisions i.e. Paderu, Chintapalle and Araku Valley.

- The Paderu Tribal Agency covers 2,312 revenue villages and 3,574 tribal habitations (1,093 Primitive Tribal Groups (PTGs) and 2,481 Non-PTGs habitations) in 244 Gram Panchayats.

- Hamlets located in interior areas lack minimum need supporting facilities/services. These villages 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.

- The main crop is paddy, followed by other cereals and millets. Barely one-fourth of the cropped area is irrigated. The proportion of marketed surplus has either remained stagnant or become less for most crops. Black pepper and turmeric are the spice crops in the region. Turmeric is an important subsistence crop cultivated by most of the tribal farmers and black pepper is an introduced crop mainly in the coffee plantations in higher elevations that supports a considerable proportion of farm and labour families of the region.

- Turmeric is cultivated in total area of 8,000 ha in Vishakapatnam. Since ages, tribal farmers in this area are cultivating **Chayapasupu** (Chintapalle Local). It is a short duration crop (180-200 days), poor yielder (18-20 t/ha fresh rhizome yield) with 15-16% dry recovery and highly susceptible to turmeric leaf spot and leaf blotch diseases. In this zone, it is a common practice to cultivate this variety in more than one season *i.e* two to three seasons of cultivation in the same piece of land without harvesting. Inspite of the low yield 'Chintappalle local' was reported to have high oil and high curcumin content, which signifies its neutraceutical potential.
- Since 1974, black pepper is grown as perennial intercrop in coffee based cropping system at Visakhapatnam (11 Mandals) in 4,000 ha. The reported yield is very low 1,500 MT. Considering this gap, there is high potential for both area

expansion and productivity enhancement.

- Tribal households in Paderu region earn about half of their incomes from agriculture which is facing a number of challenges like high incidence of land alienation, poor access to institutional credit, lower levels of investment, absence of efficient market environment for competitive price discovery and a lack of an effective extension system.

- A total of 9,459 turmeric farmers from Paderu Tribal Agency area have been organized in to six Farmers Producers Organisations (FPO's) with 767 Farmers Producers Group (FPG's). This turmeric farmer's groups were organized by Society for Elimination of Rural Poverty (SERP) and Tata Trust under the ongoing project 'Reinventing Rural Prosperity through Farmer's Collectives - 2019'.

Tribal Farming Systems Improvement-A Conceptual Framework

- The selected spices namely turmeric and black pepper have higher output value per hectare as compared to other field or other horticultural crops. Because of this they have higher potential of enhancing income and profits. The approach followed for knowledge dissemination, production enhancement and value addition of farm produce was designed to develop a sustainable system that would operate even after the direct interventions are completed. The salient features of approach are as follows:

I. Value chain development

The spices like turmeric and black pepper have higher values of output compared to other field and horticultural crops. The gaps in value chain at all stages starting from seed, production and processing were identified through Participatory Rural Appraisals Surveys (PRA). The tribal community who lived in hamlets or colonies generally used indigenous crop varieties of poor genetic potential, followed conservative agricultural practices defined by tradition and even by myths and social norms. They hardly used any external inputs and farming in general was organic. The major objective of the value chain approach was to infuse technology dimension into existing traditional cultivation practices; improved seed, cultural practices and bio intensive management in the production process and finally hygienic primary processing and value addition in turmeric and black pepper.

II. Inter Institutional Collaboration under Public Private Partnership mode

The net working of various institutions from public private and people's organization was sought to ensure

convergence and sustainability of the project outputs. The involvement of various institutions helped not only to enhance the production of the crops but also to achieve higher objectives of value addition and speciality product development (organic turmeric powder, spice masala blends). The coordination of various organizations and activities was achieved through regular stake holder meetings, exchange and maintenance of reports of all the activities and participatory joint field visits at all stages of project monitoring. The roles of various collaborating organisations are provided in Table 1. Table 2 summarises the identified technologies and methods of testing and dissemination.

Table 1 Collaborative organisations and their roles

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, Chintapalli, Vishakapatnam, Andhra Pradesh	Public	Technology testing and front line extension
3.	Integrated Tribal Development Agency (ITDA), Paderu	Public	Production of planting material, large scale field demonstration.
4.	Society for Elimination of Rural Poverty (SERP), Vijayawada, Andhra Pradesh	Public	Large scale field extension and demonstration services, formation and strengthening of turmeric Farmer Producer Organisation.
5.	Spices Board, Guntur, Andhra Pradesh	Public	Capacity building, Skill development Programme and market promotion.
6.	Giri Chaitanya Farming & Marketing Mutually Aided Cooperative Society, Vishakapatnam, Andhra Pradesh	NGO	Strengthening of farmer collectives, women participation, community assets like processing units and farm machinery, product development
7.	Girjan Vikas Farmer's Society, Vishakapatnam, Andhra Pradesh	NGO	Strengthening of farmer collectives, women participation, community assets like processing units and farm machinery, product development.
8.	Tata Trust, Vijayawada, Andhra Pradesh	NGO	Field extension services, capacity building programmes and strengthening of farmer collectives.

The Work Plan and Interventions

The work plan for the project followed a value chain, multi institutional and multi disciplinary approach, consisting of following research and technology dissemination activities.

- Comparative Varietal Yield Trials (CVYT) and Research Station trials of technologies and Participatory Rural Appraisal for gathering bench mark information
- Establishing demonstration plots of Good Agriculture Practices
- Skill enhancement trainings to promote adoption of standardized Good Agriculture Practices (GAP) in spices cultivation
- Establishing state of the art spice primary processing units (black pepper and turmeric) that are commercially viable for small groups or existing FPOs.
- Quality testing and chemo profiling of spice produce and value added products for branding and commercialization.
- Organizing buyer seller meets and leveraging media for capturing niche markets.

The research method followed was in tune with a 'Value Chain Mode' to enhance the resource use efficiency and productivity across the value chain starting from seed to secondary processing. The different methods adopted were:

- Identification of suitable varieties of turmeric for hill zone (2011-12 to 2014-15).
- Participatory Rural Appraisal for gathering bench mark information and SWOT analysis on turmeric and black pepper cultivation in Paderu Agency area (2016-17).
- Setting up of community nurseries of black pepper and seed villages of turmeric (2016-17).
- Skill development through training and capacity building programmes.
- Demonstration of Good Agricultural Practices (GAP) – improved varieties of turmeric (Roma and IISR- Pragathi), raised bed system of turmeric planting, micro nutrient management, inter cropping in turmeric, serpentine method of nursery raising in black pepper and pro tray method of raising turmeric nursery.
- Introduction of feasible machinery in farm holds especially for primary processing of spices that would enhance quality and reduce drudgery of operators.

- Promoting women initiatives in on-farm processing and value added products for capturing niche markets by establishing pilot processing units in black pepper and turmeric.

- Strengthening group and community action by leadership trainings and formation of Farmer Producer Organisations.

- Promoting media interventions for propaganda and publicity *eg.* social media, news papers, extension literature, TV shows and short video films.

Table 2 Technologies - Methods of testing and dissemination

S. No.	Technologies tested and selected (GAP)	Extension methods
1	Improved varieties of turmeric-Roma and Pragathi.	Comparative Varietal Yield trials through AICRP and demonstration in farmers fields.
2	Eight improved varieties of black pepper released from IISR.	Establishment of Master nursery with nucleus planting materials and further multiplication and distribution for area expansion of pepper in coffee plantations of hill zones.
3	Raised bed system of planting for better soil conservation and optimum plant population in turmeric.	Technology testing at AICRP Centre and filed demonstrations.
4.	Organic farming in turmeric.	Technology back stopping through trainings, literature based on organic package developed for turmeric by IISR and facilitating organic certifications through FPOs.
5.	Micronutrient management and bio fortification using PGPR/AICRPS and trichoderma formulations developed by IISR.	Research Station trials through AICRPS and field demonstrations.
6	Inter cropping in turmeric with maize.	Research trials under AICRPS and demonstrations.
7	Turmeric boiling using steam boiler of 100 kg capacity.	Setting up of 4 pilot demonstration units with FPOs.
8	Polishing of cured and dried turmeric using turmeric polishers.	Setting up of 4 pilot demonstration units with FPOs.

Socio-Economic Profile at the Start of the Work

I. Basic Socio –economic profile of Paderu Region

- Visakhapatnam District is a coastal district with two regions of contrasting ecological and topographic characteristic features, one with the plain landscape extending from the sea coast up to the foot hills of the Eastern Ghats and the other covered by thick forests in the Eastern Ghats with cool temperature and inhabited by the tribal people.

- The entire district is divided into three divisions *viz.* Visakhapatnam, Narsipatnam and Paderu. Visakhapatnam district is having the highest number of Scheduled Tribe villages in Andhra Pradesh.

- Most of the tribal people in the district resort to shifting cultivation and Bagathas community only are settled as agriculturists in this district.

- The spice crops (turmeric and black pepper) are cultivated in the hill zones that cover Paderu Agency area.

Some of the demographic figures pertaining to Vishakapatnam district and Paderu region are provided Tables 3, 4 and 5.

Table 3 District wise predominant tribal groups in Andhra Pradesh

S. No.	Name of the District	Predominant tribal groups	Percentage Of STs to total Population
1	Srikakulam	Savara, Jatapu, Gadaba, Konda Dora	5.38
2	Vizianagaram	Savara, Jatapu, Gadaba, Konda Dora	8.49
3	Visakhapatnam	Bhagata, Gadaba, Kammara, Konda Dora, Kotia, Khond, Mali, Manne Dora, Reddi Dora, Poorja, Valmiki, Goud, Kulia	14.55
4	East Godavari	Koya Konda Reddi, Kammara Konda Dora	3.87
5	West Godavari	Koya Konda Reddi, Yerukula, Yanadi	2.31
6	Khammam	Koya, Konda Reddi, Sugali or Lambada	24.54
7	Warangal	Koya, Lambada	12.72
8	Adilabad	Gond, Kolam, PardhanThoti, Lambada, Naikpod, Andh	16.69
9	Mahboobnagar	Lambada, Chenchu, Yerukula	6.25

Source: ITDA, Paderu, (2018)

Table 4 Basic Profile of ITDA, Paderu

Geographic area of Vishakapatnam District	11,167 Sq. km
Area of I.T.D.A	6,293 Sq. km
% Agency area to the total district area	56.38%
District population	42,90,589
Population of Paderu division	604,047
Population of Scheduled Tribes	547,951
Tribal Households	134,233
% of Agency population to the Dist. population	14.08%
Population density in the District (per Sq. km)	384
Population density in the agency area (per Sq. km)	96
PTGS Tribes	Khond, Gadaba, Poonja
Non-PTGS Tribes	Bhagatha, Valmiki, Kondadora, Kotia, Kammara, Nookadora
No. of Schedule mandal	10 (Full) + 2 Partial
Gram Panchayats	244
No. of revenue villages	2,312
Tribal Habitations	3,574
No. of PTG Habitations	1,093
No. of Non- PTG Habitations	2,481

Source: ITDA, Paderu, (2018)

Table 5 Net annual income of the respondents from different sources

S. No.	Annual Income range Rs.	Respondents				
		Agriculture	Labour Works	Live stock	Minor forest	Other
1	Less than 10,000	84 (38.2)	82 (37.3)	88 (40.0)	08 (03.64)	77 (35.0)
2	10000-20,000	55 (25.0)	47 (21.4)	51 (23.2)	55 (25.00)	51 (23.2)
3	20,000 – 30,000	30 (13.6)	25 (11.4)	27 (12.3)	65 (29.55)	30 (13.6)
4	30,000-40000	12 (5.5)	20 (9.1)	11 (5.0)	29 (13.18)	23 (10.5)
5	40000 – 50000	27 (12.3)	34 (15.5)	31 (14.1)	28 (12.73)	25 (11.4)
6	50000-60000	11 (5.0)	11 (5.0)	09 (4.1)	32 (14.55)	13 (5.9)
7	Greater than 60,000	01 (0.5)	01 (0.5)	03 (1.4)	03 (01.36)	01 (0.5)
Total		220 (100.0)	220 (100.0)	220 (100.0)	220 (100.0)	220 (100.0)

Source: ITDA, Paderu, (2018)

From the above tables, it is inferred that about 14.5% of total population of Vishakapatnam District is constituted by the tribal communities of Paderu Division. Out of 3,574 tribal habitations of Paderu, 1093 are habitations of Primitive Tribal Groups (PTGs) who lead a primitive life style of hunting and fishing. Majority of the three identified PTGs - Khond, Gadaba and Poonja dwell near the forest zones of Paderu Division. The main occupation of all the Tribal communities is agriculture and the net returns of 38.2% of the tribal farmers earn less than Rs. 10,000 per year.

II. Spice cultivation profile of Paderu

- Black pepper and turmeric are the two major spice crops cultivated by tribal communities in Paderu.
- Tree spices like cinnamon are found in wild and used by farmers as non timber forest produce to limited extend.
- Turmeric is one of the main subsistence cash crops for the tribal farmers cultivated in an area of 8,000 ha.
- The farmers cultivate the traditional turmeric cultivar Chintapalle with low yield potential and a low dry recovery of 15-16%. This variety is also mixed up with other local cultivars and related curcuma species.
- The farmers usually follow the flat bed system of planting without any adequate preparation of the land and optimum spacing (Fig. 3).

Fig. 3 Traditional system of flat bed cultivation (mixing of seeds and inadequate plant population)

- They also do not follow any cultural and soil and plant health management practices except weeding operation.
- The farmers practice a conservative method of growing turmeric for 2-3 seasons (up to 18-24 months) without harvesting.

- The post harvest operations – cleaning, curing drying and polishing were carried out by traditional and unhygienic methods (Fig. 4).

Fig. 4 Traditional system cooking turmeric

- Because of all these, the farmers usually get low and uncertain yield. The farmers usually sell their produce in the local market through middle men and get low prices for the low quality.

- The average yield realized by the seven FPO's was 3.5 tonnes / ha which is very low compared to the potential yield of varieties like Roma and IISR- Pragathi to the tune of 8-10 t/ha.

- Black pepper is grown as perennial crop in coffee plantations and it was introduced in 1974 by programmes of Coffee Board, Ministry of Commerce, GOI. The estimated area under black pepper cultivation in Vishakapatnam district was 22,500 ha in 2015.

- 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. The total yield figure reported is only 1,500 MT which is very low in relation to the total area.

Project Outcome

I. Identification of suitable varieties of turmeric for Chintapalli hill zone (2011-12 to 2014-15)

- Thirty eight genotypes of turmeric were extensively studied in Coordinated Varietal Evaluation Trials (CVET) and Genotype x Environment interaction trials.

- Turmeric variety '**Roma**' (released from High Altitude Research Station, Pottangi, Orissa University of Agriculture and Technology) was found suitable for cultivation in tribal area of Andhra Pradesh as it recorded higher fresh yield (33-35 t/ha), dry yield (8-9 t/ha), dry recovery (22-24%)

and high in curcumin (6.3%) and oleoresin (13%) content.

- Moreover, Roma is a medium duration (240 days) variety and yields in single-season unlike the cultivar Chintapalle Local. This quality trait is highly sensitive to environmental micro and macro changes and var. **Roma** yields consistent curcumin over other genotypes specifically in this zone (Fig. 5 and 6).

II. Participatory Rural Appraisal for gathering bench mark information

Surveys were conducted by a multi disciplinary team consisting of representatives from ICAR-IISR, AICRPS Chintapalle, SERP and Tata Trust. The bench mark information pertaining to the formation and composition of turmeric FPO's, existing spice cultivation and yield profile were collected. Based on the data, a SWOT analysis results was carried out and presented in Table 6.

Fig. 5 Rhizome of Chintapalle Local (20 months after sowing)

Fig. 6 Rhizome of Roma (8 months after sowing)

Table 6 SWOT Analysis

SWOT Analysis			
Strength	**Weakness**	**Opportunities**	**Threats**
Fertile soil rich in organic carbon	Low indices of basic socio economic profile like literacy, education and per capital income	Plentiful labour	Remoteness of tribal dwellings
Availability of cultivable land	Poor access to information, knowledge and developmental resources	Agro forestry system expansion	Low nutritional and health standard of tribal population
In favourable climate for spices cultivation promotion	Less farm operational facilities and drinking water	Strengthening genetic bio diversity of spice crops	Adoption of highly conservative and traditional based farming operations
Scope for introduction of new spice crops	Poor logistics road, transport and communication etc	Multiple and intercropping systems	Man-animal conflict and farming

ICAR- AICRP on Spices Centre, HRS, Chintapalle and SERP, Paderu formed 819 farmer producing groups (FPGs) in six farmers producing organizations (FPOs) including 9,806 tribal farmers. The information of the FPOs is given Table 7.

Table 7 Turmeric Farmer Producer Organisations

S.No.	Name of FPO	No. of FPGs	No. of Farmers
1.	Chintapalli	118	1325
2.	Gudem Kotta Veedhi	122	1282
3.	Gangaraju Madugula	130	1735
4.	Paderu	145	1882

III. Setting up of community nurseries of black pepper and seed villages of turmeric (2016-17)

- ICAR-AICRP on Spices Centre, Horticultural Research Station, Chintapalle established a master black pepper nursery in poly house in 2017 with eight varieties of black pepper (Sreekara, Subhakara, Panchami, Pournami, Girimunda, IISR-Sakthi, Malabar Excel and Panniyur-1) at Horticulture Nursery and Training Centre, ITDA, Chintapalle in collaboration with Spice Board, Guntur,

Integrated Tribal Development Authority (ITDA), Paderu and ICAR-IISR, Kozhikode, Kerala.

- Six thousand rooted cuttings of the improved varieties were supplied by ICAR-IISR as nucleus planting materials. About 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 varieties (Konda Miriyam), to gap fill the empty standards and also to establish new black pepper gardens in coffee based cropping system in tribal areas of Visakhapatnam.

- Along with var. Roma ICAR-AICRP on Spices also introduced IISR Pragathi. In 2018, 40 MT of seed materials were distributed with the support of Department of Horticulture.

- For upscaling the spread of improved varieties, financial support was provided by Mission for Integrated Development of Horticulture (MIDH), the details of which are provided in the Table 8.

Table 8 Financial support obtained from MIDH

S. No.	Crop	Budget				
		2012-13	2013-14	2014-15	2015-16	2018-19
1.	Black pepper	30,000	1,20,000	1,20,000	1,20,000	8,00,000
2	Ginger	1,50,000	1,50,000	1,50,000	60,000	60,000
3.	Turmeric	1,25,000	1,87,500	1,50,000	75,000	1,20,000

IV. Demonstration of Good Agricultural Practices (GAP)

(i) Demonstration of improved varieties of turmeric - Roma and IISR-Pragathi

- Roma has been identified as the most suitable variety for the region and ICAR-IISR Pragathi has a unique advantage of short duration of six months, high yield and high quality. The yield obtained from varietal and GxE trials was used as the nucleus seed material of Roma and was distributed to the identified farmers to start up a seed village.
- Further mass multiplication of the seed was carried out with financial assistance received from Mission for Integrated Development of Horticulture (MIDH), sponsored by Directorate of Arecanut and Spice Development (DASD), Kozhikode, Kerala. ICAR-IISR and AICRPS Centre Chintapalle procured 40 tonnes of IISR- Pragathi variety from the ICAR-IISR licensed farmers in Andhra Pradesh and distributed as starting nucleus seed materials to farmers in the

year 2018. Following this, SERP and Tata Trust initiated 31 demonstration plots of IISR–Pragathi and Roma in 2018 with the financial assistance of Andhra Pradesh Rural Growth Inclusive project of the state.

- Front Line Demonstrations were conducted at Chintapalle, Tajangi and Kottavalasa villages to built-up the confidence on the new genotype Roma. At the same time, with the assistance of Agriculture Technology Management Agency (ATMA) number of trainings are given at HRS, Chintapalle and exposure visits organized during various stages of the Roma crop such as seed treatment, bed preparation, sowing, mulching, organic manure preparation & application, harvesting, boiling, drying and polishing. Due to these continuous endless efforts, tribal farmers from Chintapalle and G.K.Veedhi have expressed their interest to cultivate the var. Roma.

Fig. 12 Monitoring of Turmeric var. Roma and IISR Pragathi cultivating fields

(ii) Raised bed system of planting

- Traditionally, tribal farmers cultivate turmeric and ginger on flat bed method by very close planting without following particular spacing between row to row and plant to plant. Due to this practice, rhizome rot incidence is more common during rainy season and also record very lower yields.

- ICAR-AICRP on Spices centre, HRS, Chintapalle in collaboration with Department of Horticulture, KVK Yelamanchili, KVK Kondempudi and other NGOs working in tribal area of Visakhapatnam popularized raised bed cultivation of turmeric and ginger. This practice helped in lowering the rhizome rot incidence, increased yield per unit area and also reduced the labour cost for weeding and harvesting.

- The labour cost for weeding and harvesting (Fig. 13).

Fig. 13 Cultivation of turmeric on raised bed method instead of flat bed method

(iii) Pro tray technology to reduce the seed cost

- ICAR- IISR had developed pro tray technology *i.e.* raise seedlings from single node rhizome cuttings of turmeric to minimise the seed rate and seed cost incurred by the tribal farmers. This technology is suitable for producing quality and disease free planting material in turmeric with less seed material.
- The pro tray technology in turmeric is being popularized by AICRPS, Chintapalle in collaboration with Krishi Vigyan Kendra, Kondempudi, Krishi Vigyan Kendra, Yelamanchili and Society for Elimination of Rural Poverty (SERP) and other NGOs in Vishakaptnam District.

Technology Spread through SERP

Technology Spread through KVK, Kondempudi

Technology Spread through BCT-KVK, Yelamanchili

Technology Spread through KVK, Pandirimamidi

Fig. 14 Popularisation of pro tray technology

(iv) Micro nutrient management

- Since micro nutrient deficiencies are very common in all horticultural crops including spices crops like turmeric, ginger and black pepper in tribal area of Visakhapatnam, ICAR- AICRP on Spices Centre, HRS, Chintapalle conducted experiments on effect of application of crop specific micronutrients on growth and yield of turmeric and ginger under AICRP on Spices research projects and observed 10-15% of yield enhancement by application of crop specific micro nutrient formulations developed by ICAR- IISR, Kozhikode, Kerala.

- The same technology has been popularised among tribal farmers in collaboration with ITDA, Paderu; SERP, Paderu and Department of Horticulture, Andhra Pradesh to reduce the micro nutrient deficiencies and improve yield and quality of the produce.

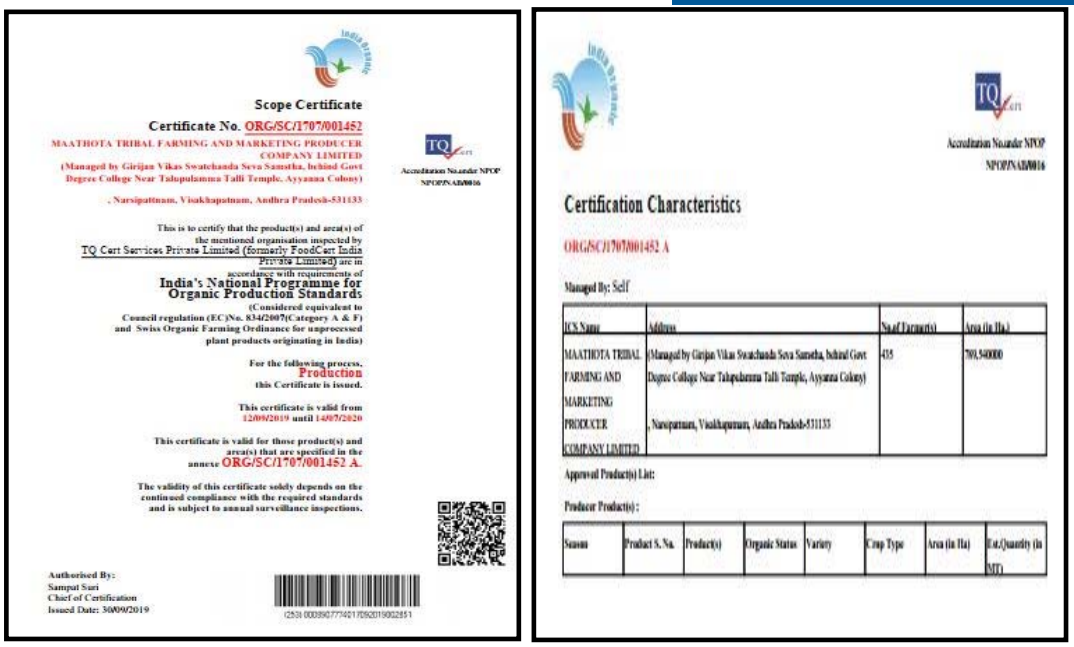
- SERP and Tata Trust carried out demonstration of application of micro nutrients in turmeric in 31 farmers field.

(v) Organic cultivation and certification

- ICAR-AICRP on Spices centre, HRS, Chintapalle supported Maathota Tribal Farming and Marketing Producer Company Limited (FPO) in G. K. Veedhi mandal involving 500 tribal farmers and Andhra Kashmir FPO in Chintapalle with 550 tribal farmers for practising organic farming in turmeric. For this the package of practices developed by ICAR-IISR was used.

- 800 hectares of turmeric area of Maathota FPO, was provided with organic certification by TQ Cert Services Private Limited. This FPO sold 100 T of turmeric under buy back agreement with a Kerala based organic produce company at the rate of Rs. 113/kg.

- 683 ha of turmeric cultivated by Andhra Kashmir FPO, Chintapalle has successfully completed two years of organic cultivation and will get organic certification for the benefit of tribal farmers.



Scope Certificate

Certificate No. ORG/SC/1707/001452

MAATHOTA TRIBAL FARMING AND MARKETING PRODUCER COMPANY LIMITED
(Managed by Girijan Vikas Swatchanda Seva Samstha, behind Govt Degree College Near Talupulamma Talli Temple, Ayyanna Colony)
, Narsipattnam, Visakhapatnam, Andhra Pradesh-531133

This is to certify that the product(s) and area(s) of the mentioned organisation inspected by TQ Cert Services Private Limited (formerly FoodCert India Private Limited) are in accordance with requirements of
India's National Programme for Organic Production Standards
(Considered equivalent to Council regulation (EC) No. 834/2007(Category A & F) and Swiss Organic Farming Ordinance for unprocessed plant products originating in India)

For the following process,
Production
this Certificate is issued.

This certificate is valid from 12/09/2019 until 14/07/2020

This certificate is valid for those product(s) and area(s) that are specified in the annexe ORG/SC/1707/001452 A.

The validity of this certificate solely depends on the continued compliance with the required standards and is subject to annual surveillance inspections.

Authorised By:
Sampat Suri
Chief of Certification
Issued Date: 30/09/2019

Accreditation No.under NPOP
NPOP/NA/0016

Certification Characteristics

ORG/SC/1707/001452 A

Managed By: Self

ICS Name	Address	No.of Farmer(s)	Area (in Ha.)
MAATHOTA TRIBAL FARMING AND MARKETING PRODUCER COMPANY LIMITED	(Managed by Girijan Vikas Swatchanda Seva Samstha, behind Govt Degree College Near Talupulamma Talli Temple, Ayyanna Colony) , Narsipattnam, Visakhapatnam, Andhra Pradesh-531133	435	709.540000

Approved Product(s) List:

Producer Product(s):

Season	Product S. No.	Product(s)	Organic Status	Variety	Crop Type	Area (in Ha)	Est.Quantity (in MT)

Fig. 15 Organic Certification Certificate issued by TQ Cert Services

(vi) Inter cropping of turmeric with maize

- Maize rows are planted on either sides of the raised bed used for turmeric cultivation.
- The introduction of maize in to the system provides additional income and reduces the incidence of the leaf spot disease.

Fig. 16 Inter cropping of turmeric with maize

V. Farm mechanization in Primary Processing–For quality and drudgery reduction

- Tribal farmers do post harvest practices like cooking and drying by manual and traditional methods. These practices are more time and labour intensive and require lot of fire wood. The tribal farmers usually sell their turmeric produce after drying without polishing or partially polished rhizomes done manually by rubbing against hard floor surface. Hence famers get less price losing about Rs. 5-10 / kg.
- ICAR-IISR, Kozhikode, Kerala conducted customised training programmes on post harvest management and processing of spices including turmeric. Following this, 4 units of turmeric boilers and polishers (Fig. 17) were distributed to four tribal Farmers Producer's Organizations (Table 9) for setting up of pilot demonstration units.

Table 9 Details of Farmer Producer Organisations supported by ICAR-IISR

S. No.	Farmer Producer Organisations (FPO'S)	Farmer Producer Groups (FPG's)	No. of farmers
1	The Chintapalle Agriculture & Allied Producers Mutually Aided Co-op Society Ltd., Krishnapuram Village, Chintapalle Mandal	118	1325
2	The G-Mudugula Agriculture & allied Producers Mutually Aided Co-op Society Ltd. Paradesiputtu Village, G Mudugula Mandal	127	1265
3	The Munchingiput Agriculture & Allied Producers Mutually Aided cop-op Society Ltd., Jangamsariya Village, Muchingiputu Mandal	171	2136
4	The Pedabayalu Agriculture & Allied Producers Mutually Aided Co-op Society Ltd., Kimudipalli Village, Pedabayalu Mandal	112	1427

Distribution of turmeric boilers to FPOs

Conducted demonstrations on usage

Distribution of turmeric polishers to FPOs

Conducted demonstrations on usage of turmeric polishers

Usage of turmeric boilers and polishers by tribal farmers

ITDA distributed turmeric polishers and boilers

Fig. 17 turmeric boilers and polishers distributed to FPOs

VI. Skill development through training and capacity building programmes

The content for the courses for Skill Development 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.
- Foliar application of micro nutrient mixture developed by ICAR-IISR for turmeric.
- Drip and micro irrigation technology for water conservation.
- Organic cultivation practices in turmeric and organic certification procedures.
- 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 on farm turmeric curing and polishing.
- Secondary processing for development of value added products turmeric powder, spice powder blends.
- Quality analysis and branding of the produce and finished products. Based on the requirement seven skill development training courses of five days duration each were organized (Table 10).

Table 10 Details of skill development training courses

S.No.	Title of the course	Period	Institution / location	No. of Participants*
1.	Nursery Management, Production and Processing in Turmeric and Black pepper	November 2017	ICAR –IISR at HRS, Chintapalle and Horticulture nursery and training institute under ITDA at Chintapalle	185
2.	Good Agricultural Practices in Production and Processing of Turmeric (at four locations – Chintapalle, Paderu, Araku Valley and Peddabavayalu)	February 2018	ICAR –IISR , SERP and Tata Trust at (at four locations – Chintapalle, Paderu, Araku Valley and Peddabavayalu)	750

3.	Introduction to Tree Spice Cultivation and Good Agricultural Practices for Primary Processing	June 2018	ICAR –IISR at HRS, Chintapalle	250
4.	Mechanization of Primary Processing of turmeric (Field workshop)	March 2019	ICAR –IISR at Chintapalle, GK Veedhi, Paderu and Munchingaputtu	150
5.	Value addition for production of spice powders and spice blends for women (Entrepreneurship Development Programme under Business Planning and Development (BPD) Programme of ICAR	April 2019	ICAR-IISR at Kozhikode	15

* All the participants were office bearers or selected members of the turmeric FPOs

VII. Promoting women initiatives in on farm processing and value added products for capturing niche markets by establishing pilot processing units in black pepper and turmeric

- Promoting women initiatives in on farm processing and value added products for capturing niche markets by establishing pilot processing units in black pepper and turmeric. Efforts were initiated to promote women groups among the FPO's to take up production of value added products like turmeric powder, spice powder blends *etc.* Trainings were provided at ICAR-IISR on use of machinery and production of value added products.

- The NGO's namely Giri Chaitanya Farming & Marketing Mutually Aided Cooperative Society was associated in this venture. Identified women entrepreneurs were provided hands on training for defining the recipes and prototypes of machinery required for production of Spice powders and blends during April 2019.

- ICAR-IISR also assisted in testing the quality of the products. The group has already started producing products like black pepper whole, black pepper powder, dry ginger, ginger powder, turmeric powder etc.

- Another NGO Girijan Vikas farmers society also has a host of Organic products including whole turmeric, whole black pepper, turmeric powder and millet products. The process of these process being labeled, registered and branded is in progress.

Demonstration of mechanical washer cum peeler for ginger

Demonstration and use of cleaner cum grader for black peper

Demonstration of spice roaster

Hands on training on pulverising spices

Use of mechanical sifters

Use of sealing machines

Fig. 18 Training on Production of value added products at ICAR-IISR

Black pepper powder

Turmeric powder

Fig. 19 Value added products by NGO Girijan Vikas Farmers Society

VIII. Strengthening group and community action by leadership trainings and formation of Farmer Producer Organisations (FPO's).

- Trainers from Tata Trust, Vijayawada offered training to the office bearers / leaders of six turmeric FPOs for developing their leadership skill as well as other soft skills like record keeping, use of mobile apps and social media.

- This programme was organized during February 2018.

IX. Promoting media interventions for propaganda for publicity eg. social media, news papers, extension literature, TV shows and short video films.

- Media coverage was given to all activities undertaken in the project like training programmes, field days joint field visits, harvest festival etc. (Fig. 20).

- Society for Elimination of Rural Poverty produced a full length video film highlighting the success and feed back of farmers on all the technological demonstrations carried out.

Fig. 20 Media coverage of various activities

Project Impact

Impact pathways are tracked as knowledge and technology dissemination, skill enhancement, technology adoption, cost and return analysis.

I. Technology dissemination and adoption.

(i). Turmeric

- The major impact is attributed to the adoption of Roma ant IISR Pragathi variety to partially replace the existing local varieties with low genetic potential.

- The impact of cultivation of turmeric var. Roma after two years of adoption was clearly evident in improvement of the economic returns of tribal farmers. The farmers who cultivated turmeric cultivar Chintapalle Local realized a net profit only Rs. 1,65,000/- per hectare, whereas the tribal farmers got net profit Rs. 4,20,000/- by cultivating turmeric variety Roma (Table 11).

- The increase in productivity is also attributed to the adoption of scientific practices such as seed treatment, bed preparation, sowing, mulching, organic manure preparation & application, harvesting, boiling, drying and polishing.

- Along with var. Roma, ICAR- AICRP on Spices centre, HRS, Chintapalle was also introduced turmeric var. IISR-Pragathi and distributed 40 tonnes (45 acres) with the Department of Horticulture, Andhra Pradesh replace the local cultivar for the aim of uplift the economic growth of tribal farming community.

- Following the successful performance and acceptability of both these varieties ITDA Paderu has initiated steps to procure 300 tonnes of Pragathi from the licensed seed producers from Telengana under the Business Planning Development Scheme of ICAR-IISR during 2020 planting season.

- The agency also proposed to procure 200 tonnes of Roma from local growers and High Altitude Research Station, Pottangi, OUAT.

Table 11 Characteristics of Turmeric local to the improved variety

Characteristics	Chintapalle Local (ha)	Roma (ha)
Fresh Rhizome Yield/ha (t) (2 seasons)	15	40
Dry rhizome yield (t) (2 seasons)	3	8
Prize of dry rhizome/t	80,000	70,000
Total returns (Rs.)	2,40,000	5,60,000
Total cost of cultivation (Rs.)	75,000	1,40,000
Net Returns (Rs.)	**1,65,000**	**4,20,000**

(ii). Black pepper

- Over 1,40,000/- rooted cuttings of eight improved varieties of black pepper were distributed to 1500 farmers during last two seasons. Since these new planted pepper is still in pre bearing stage the direct yield benefit cannot be measured.
- However, a field survey conducted revealed that there was an increase from 10,000 to 12,000 acres since the year 2015. The trends in area expansion is provided in Fig. 21 and the envisaged area expansion programme in black pepper in given in Table 12.

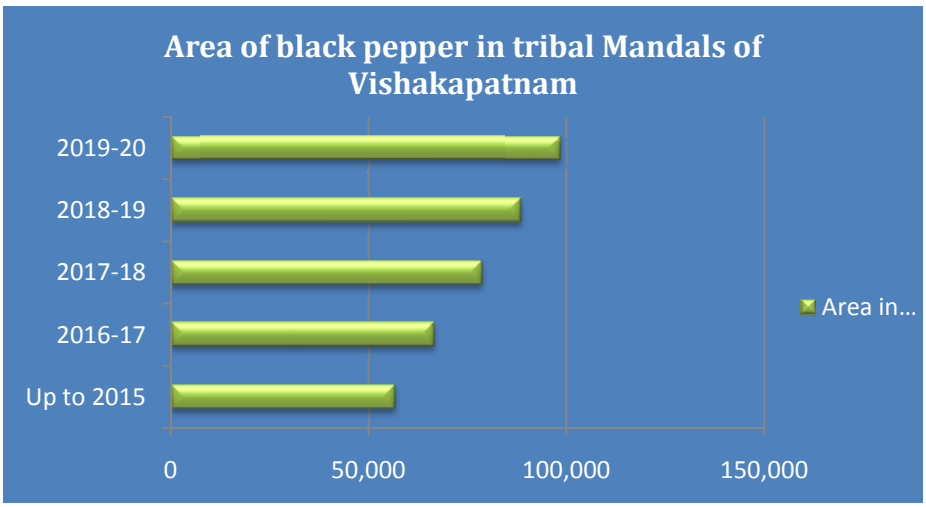


Fig. 21 Trend in area expansion of black pepper

Table 12 Envisaged area expansion programme in black pepper

Sl.No.	Year	Extent (acres)	No. of farmers	No. of plants proposed to be planted (Lakhs)
1.	2020-21	12,000	11,500	12,000
2.	2021-22	12,000	11,000	12,000
3.	2022-23	12,000	11,000	12,000
4.	2023-24	12,000	11,000	12,000
5.	2024-25	10,000	9,000	10,000
	Total	**58,000**	**53,500 No.s**	**58,000**

II. Productivity enhancement

- The survey conducted during two seasons indicated that average yield for local cultivars were 3 Tonnes of dry turmeric and 8 Tonnes for Roma variety (Table 11).

- The dry recovery of Roma was also higher (22-24 %) compared to local cultivars (15-16% dry).

- Among the local cultivars, Chintapalle local with lower yield was found to have distinct advances in terms of quality oil and oleoresin content. It is rare that the traits of oil and high oleoresin combine in cultivars – either local or improved. Hence, the nutraceutical value of Chintapalle local turmeric is superior which makes the variety more suitable for emerging plant based pharmaceutical application. The quality analysis of turmeric of Chintapalle region is given in the Table 13.

Table13 Quality Analysis of turmeric of Chintapalle Region

S.No.	Turmeric	Essential Oil, %	Oleoresin, %	Curcumin, %
1.	Chinthapalle local (Finger rhizomes, 1 year crop)	9.6	13.83	5.82
2.	Chinthapalle local (Finger rhizomes, 2 year crop)	8.0	16.84	6.74
3	Chinthapalle local (Mother rhizomes, 2 year crop)	10.4	16.44	6.49
4.	IISR, Pragathi (1year crop)	6.0	11.10	5.93

- Based on these finding ICAR-IISR carried out quality analysis and chemoprofiling studies of samples of Chintapalle local variety collected from different locations and found that the intrinsic quality of essential oil and oleoresin were high in the local variety.

III. Income enhancement

- Due to the adoption of the improved varieties and a host of scientific cultivation practices there is a significant increase in total and net income of farmers.

- The cost of cultivation of improved varieties was estimated to be higher at Rs. 1,40,000 / ha compared to Rs. 75,000/ha for local cultivars.

- However, the net returns registered almost a threefold increase – Rs. 4,20,000/- for improved varieties and Rs. 1,65,000/-.

- This increase in profit can only be attributed to the adoption of genetically improved varieties, identified good agricultural practices and consistent quality of the produce.

IV. Nutritional improvement

- General nutritional and health status of tribal farm families are low due to dwellings in unhygienic conditions, and poor access to health and nutritional services. Hence there are always threats of inadequate food security resulting in poor health and malnutrition.

- Many post harvest aspects operations of curing and drying of turmeric and pepper are carried out by traditional or manual methods. This resulted in poor quality and contamination of the produce.

- The introduction of simple operated farm machinery for turmeric boiling and polishing helped to improve the standards of on farm primary processing operations.

- The establishment of four units for turmeric processing gained wide acceptance among the target tribal communities. The reported advantages were:

  - Easiness of operation.
  - Reduction in drudgery.
  - Improved quality of the produce and the value added products to ensure food safety and nutritional security.

  Following the successful adoption of the mechanised processing technologies ITDA, Paderu has initiated programme for setting up community processing infrastructure for upscaling the spread of mechanized on-farm tribal population.

V. Socio-economic profile of tribals after the work.

- The tribal population in Visakhapatnam District comes to 14.33% out of the total population in the state of Andhra Pradesh.

- The highest tribal population per centage of 89.98 relates to Paderu division compared to Vishakapattanam and Narsipattanam revenue divisions of the district.

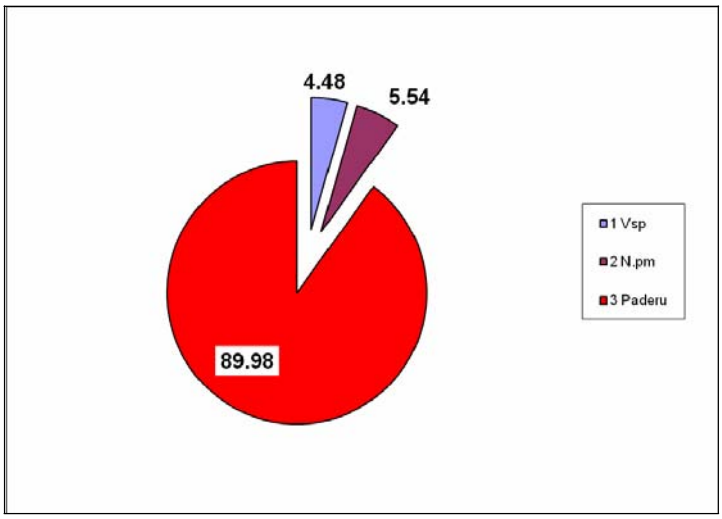


Fig. 22 Distribution of tribal population in Vishakapatnam District

- The basic social and economic indices of the tribal population are low. The total tribal literacy rate is 18.06% in Paderu division and 45.91% are under graduates. In the category of undergraduates, most of them were just literates stopping education in elementary stage and a very few have completed secondary education. There are 3.64% of technically qualified people to take up formal occupations.

- The annual income of tribal population engaged in agriculture, the main occupation source (followed by minor forest produce) is very low. The farmers follow technologies governed by tradition and social beliefs that lead to low land and capital resource use efficiency. The constraints are poor access to knowledge resources, development services and communication services. About 38% of the tribal population in Paderu Agency Area earn only an yearly net income of less than Rs.10,000/- from agriculture and 25% earn a net income between Rs. 10,000 and Rs. 20,000/- per year.

- The major spices cultivated in the region are turmeric and black pepper where in turmeric is a subsistence income generating crop among all tribal communities. Black pepper is an introduced crop in the traditional coffee plantations confined to hill zones like Araku valley.

- Since the estimated value of unit output from turmeric (Rs. 2,55,229/ha) and black pepper (Rs. 1,43,458/ha) is as compared to other main crops of the region, the potential of these crops for enhancing farm income is very high. The

FLDs and interventions carried out helped in increasing the area under improved varieties of turmeric to 1,300 ha out of the reported 8,000 ha in the district. The productivity has increased form 3-4 t/ha dry turmeric to 9 t/ha.

- The estimated cost benefit ratio before and after the interventions and follow up in turmeric were 1:2.2 and 1:3 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- 56,378 ha in 2015 to 98,378 ha in 2019.

Implications and Way Forward

- The significant innovative outcomes of the project can be summarized as introduction of improved varieties in turmeric – Roma and IISR-Pragathi, replacement of age old traditional practice of 2-3 seasons turmeric cultivation in the same land with one season cultivation and adoption of farm machinery for primary processing in turmeric.

- The immediate outcomes were increase in productivity of turmeric, income enhancement of small farmers and quality enhancement of the produce as a result of introduction of easy to use turmeric boilers and polishers.

- The area expansion in black pepper in traditional coffee based agro forestry system not only enhanced the income of farmers but also broadened the scope of carbon sequestration for ecological sustainability.

- Based on the findings of the project, the Integrated Tribal Development Agency (ITDA), Paderu has envisaged futuristic schemes for large scale supply of seeds/planting material of turmeric and black pepper.

- The agency also proposes to promote mechanization of primary processing and establishment of community secondary processing units.

- The project also enhanced the scope of organic cultivation, development of organic and branded value added products in turmeric.

Spicing up the nation's progress

For details contact:

The Director
ICAR - Indian Institute of Spices Research
Marikunnu P.O
Kozhikode 673 012
Kerala

Ph: 0495-2731410
E-mail: director.spices@icar.gov.in