



# Magical Hands of a Tribal Farmer Set a Milestone in Finger Millet Cultivation-A Case from Koraput, Odisha, India

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## Abstract

The nutritious millets traditionally occupied substantial part of the diets and cropping systems in tribal areas of Odisha. Millets require less water and are more resilient to climate vulnerability. They can also be cultivated on the undulating terrain. Reduction in millets resulted in nutrition deficiency. In order to address growing crop failures and nutritional issues, millets need to be revived. Majority of the farmers in Koraput district of Odisha are tribal, resources poor and mostly dependent on onset of monsoon for agriculture. The rainfall in this region is erratic and prolonged drought conditions are common occurrences. Numbers of rainy days were decreased over the period of time. Millets being climate resilient crops systems, revival of millets will enhance resilience of the farming systems and household food security against Climate Change. Finger millet is the second staple food after rice. Area under millets is drastically declining resulting in narrowing of the food diversity in consumption at household level. Increasing urban demand, improvements in processing machinery, availability of improved cultivars, better agronomic practices and possibility of accessing support irrigation has increased the potential of realizing higher productivity in millets thereby improving nutrition security, resilience and economic security of tribal households. The farmers were cultivating many traditional varieties in the past, but now have changed to improved varieties because the traditional varieties continuously perform low in terms of productivity due to mixture of seeds, loss of purity and long duration. This paper analyses how a tribal family set a milestone in finger millet by adopting improved agronomic and good agricultural practices (Figure 1).

**Keywords:** Cropping System; Nutrition Deficiency; Climate Resilient Crop; Koraput; Seeds

## Introduction

Odisha is predominantly an agricultural state with a cultivated area of 90.54 lakhs ha and average production of 25.44 million tons. Koraput district comes under Eastern Ghats high land type agro-ecological zone. The district enjoys tropical climate characterized by hot summer (20.5°C to 38°C), cold winters (12 °C to 29 °C and rainy seasons (19 °C to 28 °C). The winter season generally commences from late November and continues up to the end of February. The summer season commences from March and continues till middle of June. It is observed that about 80% of the total annual rainfall takes place due to south-west monsoon between the middle of June and mid-October. The north east monsoon gives erratic and insufficient rainfall. The average annual rainfall varies between 1320-1520mm (Figure 2 & 3). Although the district is having high rainfall, the number of rainy days is restricted to 70-80 days/annum. The district is drought prone because of the erratic and uneven pattern of rainfall. The entire Koraput district has a unique physiographic set up. Except the north western and west-west

central part, the rest of the district is occupied by dense forest with highly rugged mountains, interspersed with intermundane valleys. The total geographical area is 8,807 Sq. Km. The population of Koraput district as per 2011 census 1,379,647 of which male and female were 678,809 and 700,838 respectively with the schedule caste population is 196540 (14.2.%) and schedule tribe population 697583 (50.6%). The literacy percentage of the district is 49.29 as against 72.9 of the state. Population density is 157/km<sup>2</sup>. The proportion of district population to the Odisha state population is 3.29%, Sex Ratio (Per 1000) 1032: 999. The total cropped area is about 3.56 lakh ha out of which 1.53 lakh ha (43.0% of TCA) is irrigated and 2.03 lakh ha (57.0% of TCA) is under rain fed area. The main sources of irrigation are canals, rivers, farm ponds, dug wells to net sown area of the district. Among the different crops, cereals accounts for 54.5% of the irrigated area followed by other crops (34.6%), coarse cereals (4.7%), horticulture & plantation (2.9%), pulses (2.5%) and oil seed crops (0.7%). The primary

source of income is from Agriculture whereas secondary source from agriculture labourer and daily wages. *Kharif* is the major cropping season where farmers cultivate cereals, millets and pulses. In *Rabi* season few pulses crops, oil seed crops and vegetables are being cultivated and majority of the farmers migrated in search of wage labourer both within the district and outside the district. The majority of farmers hold less than one hectare of land in the district and generally practice subsistence farming. Rice is the major crop cultivated in the district in *Kharif* and also in *Rabi* where irrigation

facilities available. Traditional farm practices are followed in upland resulting in low level of production. In the non-agriculture season NTFP like *kendu leaf*, tamarind, *Mohua* and *Sal* seeds are the source of income. Koraput was recognized as a Globally Important Agricultural Heritage Systems (GIAHS) by FAO in 2012 for the efforts of the community in biodiversity conservation, food security, preserving the traditional wisdom and cultural diversity of the region for the benefit of the present and future generations (Figures 4-6).

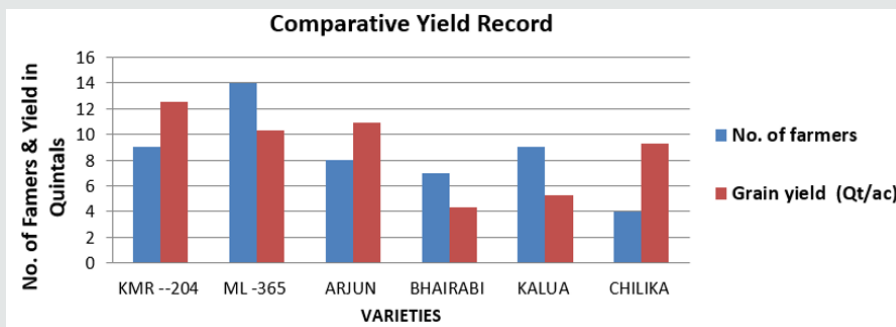


Figure 1: Hari Sukia in his finger millet field of KMR-204.

CROP CUTTING FORMAT FOR FINGER MILLET (SMI) KHARIF-2018								
M. S. SWAMINTAHAN RESEARCH FOUNDATION, BLOCK: KORAPUT								
Date of Crop cutting: 26.11.2018					Date of Nursery sowing: 28.07.2018			
Date of Transplantation: 16.08.2018								
Sl. No.	Name of the Farmer and his wife			Father's Name	Caste	Village	G.P	
	HARI SUKIA GORI SUKIA(Wife)			KAMLU SUKIA	ST(Paroja)	MACHHARA	UMURI	
Khata No.	Plot No.	Variety	Area covered (Acre)	Average tillers/Hill (No.)	No. of fingers/panicle	Green Weight in 25sq meter (Kg.)	Dry weight in 25 Sq. Meter (Kg.)	Yield in quintals/Ha
27	623	KMR-204	0.50	10.4 nos.	9	17.940kg	12.845kg	51.38 quintals/ha
Evaluator-1 <i>[Signature]</i> District Agriculture Officer Koraput			Evaluator-2 <i>[Signature]</i> U. Na. S. P. Evaluator-2, P. S. O.			Evaluator-3		
Remarks and Suggestions if any KMR-204, ragi variety is significantly a promising variety so far agro-climatic conditions of U. Na. S. P. locality is concerned. Hopefully this variety can cover up more area under ragi cultivation as it has more no. of tillers, fingers, better withstand drought situation. Above all its yield potential attracts the farm communities of this area. <i>[Signature]</i>								
Signature of Coordinator Date:								

Figure 2.





“I used to cultivate paddy, ragi, little and foxtail millet, niger in my small patch of land following traditional broadcasting method. I used to apply farm yard manure during intercultural operations and do manual weeding for once. I never follow any other package of practices. The usual yield I get from finger millet is 3 to 4 quintal per acre. When I learnt about transplanting of finger millet, I was bit scared. Finally, I accepted their suggestions and tried in 0.5 acre. I was surprised to see the result. I got more than 10 quintal from this half acre. I and my husband both are very happy to know that we topped in the state in finger millet production. I will collect good quality seeds and follow this practice in coming years and also teach the same technique to other farmers.”

– Hari Sukia, millet farmer

Figure 3.



Figure 4: Transplanting of 15 days seedlings of finger millet in SMI method.



Figure 5: Raised bed Nursery of Finger millet.



**Figure 6:** Use of Cycle Weeder in Finger millet field.

Koraput is a tribal dominated district in Odisha consisting of more than 70% small and marginal farmers and 83% of population live in Below Poverty Line (Anonymous, 2013). The most dominant tribes in this proposed operational area are Bhumia, Gadaba, Paroja and Kandha. Subsistence farming still remains their main source of livelihood, supplemented by forest collection and earning wages [1]. The tribal income is mainly based on agriculture and forest products. The per capita income of the district is Rs 25161/annum (source: Odisha Economic Survey 2014-15). Though the district is rich in biological resources, experienced & hard working farming communities, existence of Women Self Help Groups and the standard of living is quite low due to poor farm productivity, lack of village level small scale industries, low level of technological know-how and lack of market knowledge. Foreseeing the sustainable yield in finger millet, M. S. Swaminathan Research Foundation launched

a project on "Enhancing Production and Productivity of Millets and Pulses in Odisha through an Alternative Seed System Model for Production and Supply of Improved Seed Varieties" with support from Department of Agriculture & Food Production, Govt. of Odisha and Govt. of India under the scheme Rastriya Krishi Vikash Yojana (RKVY) in April 2018. The project was executed in 13 villages of Umuri, Mastiput, Padampur and Lankaput Gram Panchayat in Koraput district involving around 750 farmers. The project introduced new technology like System of Millet Intensification (SMI) and line transplanting. Participatory Varietal Selection was conducted with six traditional varieties and five improved varieties of finger millet. The farmers observed that among all the varieties cultivated, KMR-204 performed better in terms of no. of productive tillers, size of panicle, fingers per panicle, grain filling percentage and grain yield (Figures 7 & 8).



**Figure 7:** IPM training on Finger millet.





Figure 8: Hari Sukia in his finger millet field.

### Materials and Methods

Hari and Gori used to cultivate finger millet in one acre of land following traditional practices. They used to follow broadcasting method. Weeding also was a very tedious task for them. They used to harvest 2.5 to 3.0 quintals from it. During last Kharif MSSRF implemented the seed production programme in the village. They were trained on various improved agronomic practices and System of Millet Intensification (SMI) method of cultivation such as - land preparation, FYM application, seed treatment, raised bed nursery preparation, transplanting in SMI method, organic manure and

bio pesticides preparation and application, use of cycle weeder for weeding etc. Shri and Smt. Sukia were provided with 500 grams of breeder seed of KMR-204 variety to cultivate in half acre land. Initially they were little bit scared [2]. So, they decided to try in half acre and the rest half acre they cultivated their own variety Bati Mandia following traditional method. They followed all the recommended agronomic practices stated above and also followed organic way of cultivation. They also prepared NPM like Amrut jal, jeebamrut, handi kahata etc. and applied in their millet field in every 15 days interval after weeding using cycle weeder which helped in plant growth and controlling pests and diseases (Figures 9 & 10).



Figure 9: Seed Certification Officer is on a field visit to KMR-204





Figure 10: MSSRF Scientists, SCO with Hari and Gori Sukia in their field.

## Study Design

A case study

## Study Location

Machhara village of Koraput block, Koraput District, Odisha, India

## Duration of study

June 2018 to December 2019

## Results and Discussions

Despite the un-conducive weather condition during last kharif season, the crop performed very well. There were productive tillers in a range of 8 to 25 per hill. An average finger per panicle was around

9 which is higher than that of other farmers cultivating same variety (Table 1). Hari and his wife were very happy and surprised to see the crop performance of the new improved variety in comparison to her own traditional variety. They yielded 3.4 quintals/ acre from their own variety of *bati mandia* following traditional practices and 20.55 quintals/ acre from the improved variety i.e. KMR-204 following SMI method and improved cultivation practices (Table 2 & 3). They never dreamt of getting such a bumper yield from the improved variety. Now she is convinced that she will use the seeds of this variety in coming years and also say others to follow the same practice. She sold the foundation seeds of 400 kg @ Rs 40/- per kg and shared around 250 kg to her relatives for seed purpose and remaining grains she kept for own consumption (Figure 11). The cultivation cost was around Rs 6200/- INR for half acre. The net benefit she got after meeting all the cost of cultivation was Rs. 27,400/- INR from the same land of half acre (Table 4-6).



Figure 11: Weighment of finger millet pods during CCE (25 Sq. meter) in presence of District Agriculture Officer, Koraput and staff of MSSRF at Hari and Gori Sukia's field of KMR-204, (Green weight: 17.940KG and Dry weight: 12.845Kg), Yield/ha = 51.38 quintal.

**Table 1:** Comparative statement of biometrical traits of KMR-204.

Sl. No	Traits	Hari Sukia	Average of 10 Farmers
1	45-day Plant height	44.91	51.87
2	Plant height-during harvest	97.32	87.42
3	45-day No of tillers	3.7	3.06
4	No. of tillers during harvest	10.9	7.15
5	Productive tillers	10.4	6.72
6	Non-productive tillers	0.5	0.55
7	No. of finger (per panicle)	9	7.53
8	Finger Length	8.26	8.00
9	Green weight in 25 sqm (Kg)	17.94	10.39
10	Dry weight in 25 sqm (Kg)	12.84	7.31
11	Yield in quintal per Ha	51.38	28.55

I. KMR-204 topped the list by recording the highest yield of 2055 kg/acre and an average yield of 1630 kg/acre in Machhra. This was followed by ML - 365 (1464 kg/acre) and Arjun (1182 kg/acre). The yield of other varieties were low compared to the above varieties namely Chilika recorded 1050 Kg/acre followed by Jam Mandia (985 Kg/acre) and Kalua with 630 Kg/acre.

II. KMR-204 surpassed the state average yield and the previous yield of other varieties. This shows how a combination of pure quality seeds in time and improved technology could bring out a huge impact thus creating a sustainable yield and served as an inspirational variety to the poor tribal community.

**Table 2:** Component-wise cost of cultivation and return from finger millet.

Sl.	Input	Cost (Rs ha <sup>-1</sup> )	
		Demos	Farmers' practice
1	Seeds	87.5	150
2	Fertilizers	7050	3100
3	Plant Protection	500	0
4	Irrigations	0	0
5	Ploughing	6000	6000
6	Human labour	6650	8200
7	Total Cost	20287.5	17450
8	Grain yield (q ha <sup>-1</sup> )	3057	1568
9	Fodder yield (q ha <sup>-1</sup> )	1568	1344
10	Gross return	64282	34048
11	Net return	43995	16598
	Benefit:Cost (B:C) ratio	2.16	0.95

**Table 3:** Operation-wise cost on human labour for finger millet cultivation.

S. No.	Component	Demos	Farmer's practice		
		Rs. / ha	(%)	Rs. /ha	(%)
1	Land preparation	7200	35.49	6000	34.38
2	Sowing / Dibbling	3000	14.79	600	3.44
3	Fertilizer / Manure application	1800	8.87	1500	8.6
4	Weeding	1700	8.38	3700	21.2
5	Insecticide application	500	2.46	0	0
6	Irrigation	0	0	0	0
7	Harvesting, bundling	1800	8.87	1800	10.32
8	Threshing	2287	11.27	2250	12.89

9	Drying	700	3.45	500	2.87
10	Marketing	800	3.94	600	3.44
11	Any other: Refreshment	500	2.46	500	2.87
	Total	20287	100	17450	100

**Table 4:** Results of all the demonstrations.

S. No	Variety	Grain yield (q ha <sup>-1</sup> )	Fodder yield (q ha <sup>-1</sup> )	Cost of cultivation (Rs. ha <sup>-1</sup> )	Gross return (Rs. ha <sup>-1</sup> )	Net return (Rs. ha <sup>-1</sup> )	B:C Ratio
<b>I. Cultivar</b>							
1	GPU-66	26.39	13.51	20800	55482	34682	1.66
2	GPU-28	27.58	14.77	19562	58114	38552	1.97
3	Chilika	30.19	16.95	20980	67160	46180	2.2
4	KMR-204	33.82	25.28	20287	72696	52409	2.58
5	Bati Mandia	20.36	14.66	18796	43652	24856	1.32
6	Jam Mandia	21.89	15.51	19451	46882	27431	1.41
7	Arjun	30.12	14.76	20530	63192	42662	2.02
Farmer's Practice (Local check)		15.68	13.44	17450	34048	16598	0.95

**Table 5:** Nutritional status of millets in comparison to Rice and Wheat.

Crop/Nutrient	Protein(g)	Fiber(g)	Minerals(g)	Iron(mg)	Calcium(mg)
Pearl millet	10.6	1.3	2.3	16.9	38
Finger millet	7.3	3.6	2.7	3.9	344
Foxtail millet	12.3	8	3.3	2.8	31
Proso millet	12.5	2.2	1.9	0.8	14
Kodo millet	8.3	9	2.6	0.5	27
Little millet	7.7	7.6	1.5	9.3	17
Barnyard millet	11.2	10.1	4.4	15.2	11
Rice	6.8	0.2	0.6	0.7	10
Wheat	11.8	1.2	1.5	5.3	41

Source: Nutritive Value of Indian Foods, NIN, Hyderabad, 2007

**Table 6:** Some information on Traditional Varieties of finger millet.

Variety	Duration (Days)	Yield potential/ha (quintal)
Telugu Mandia	135-140	46.90
Chilli Mandia	135-140	45.20
Jam Mandia	140-145	35.30
Lala Mandia	120-125	32.30
Kalia Mandia	130-135	31.60
Bati Mandia	130-135	29.60
Kurkuti Mandia	130-135	28.40
Ladu Mandia	120-125	28.60
Murda Mandia	130-135	25.90
Toya Mandia	130-135	25.40

## Conclusion

The study clearly reveals that millet is not a poor man's crop. If it is cultivated with proper care in up or medium land following improved agronomic practices, it can compete with any other crop and produce good yield with very low input cost of cultivation.

Inclusion and promotion of modern technological intervention like SMI is an advantage to the finger millet. So, it is proved that millet cultivation can be a viable alternative and sustainable option for the rural poor. Moreover, it is eco-friendly and improves food security and enhances economic growth. She is now a role model



who can serve to the community by extending her knowledge and experience to promote millet in the region with a new hope.

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## References

1. Meherda PK (2013) Agricultural Statistics of Odisha.
2. B Dayakar Rao, Vishala AD, Arlene Christina GD, Tonapi VA (2006) Millet Recipes-A Healthy Choice. ICAR-Indian Institute of Millet Research pp. 122.



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