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Enhancement of Finger Millet Production for Food and Nutrition Security of the Tribal Community in Koraput District of Odisha





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Koraput district at a glance:

- Geographical area : 8807 sq km and constitutes 30.6% of geographical area of the state.
- o **Population : 1,379,467**
 - Male : 49%, Female : 51%,
 - Rural: 84%, Urban: 16%
 - Schedule caste : 14%, Schedule tribe : 51%
- **Population density : 157/sq km**
- o Literacy : 50% [Male:61%, Female;39%]
- 23 ethnic tribal groups constituting 51% of population.
- o 9 major tribes (Ethnic groups)
- 83% population are living below poverty line as compared to state average 47%.







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Undulating hilly terrain of Koraput:

9 major tribes:











Koraput district at a glance continued....

- More than 70% of the farmers are small & marginal landholders with an average landholding of 1.63 hectare and operational holdings of 0.6 hectare.
- Agriculture is the mainstay of the economy and around 83% depends on it.
- Drought prone because of the erratic and uneven pattern of rainfall.
- Only 8-9% land are irrigated & rest are rain fed.
- Rice is the main staple food followed by millets.
- o Incidences of endemic hunger & malnutrition
- District ranked 541 among the 599 districts in India on the District Development Index.







MSSI

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Temperature and Rainfall:









Nutrition status of the district:

SI. No	Indicator	%
1	Underweight among children under 5 years	53
2	Stunting among children under 5 years	58
3	Wasting among children under 5 years	21
4	Anaemia among children under 5 years	57
5	Low birth weight children	33
6	Women with chronic energy deficiency	44

Source: District Nutrition Profile of Koraput, POSHAN(2016)









Under-nutrition status of the study villages:



Source : MSSRF, Baseline Survey 2014







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Micronutrient deficiency:



Source : MSSRF, Baseline Survey 2014









Food Consumption Pattern:



Source : MSSRF, Baseline Survey 2014









Why Finger Millet?

- Finger Millet is the staple food for the tribal community of the district.
- Ancient crop
- Wide adaptability and assured yields
- Regional food and nutritional security
- Climate change resilient and ideal for contingency planning
- Highly nutritious
- Many value added nutritious product are made from Finger millet.









Nutritive value of Finger millet in comparison to other cereals (All values are per 100gms of edible portion)

Food stuff	Protein (g)	Minerals (g)	Crude Fibre (g)	Energy (Kcal)	Calcium (mg)	Phosphorus (mg)	Iron (mg)	Niacin (mg)	Total Folic acid (µg)
Finger millet	7.3	2.7	3.6	328	344	283	3.9	1.1	18.3
Rice raw (milled)	6.8	0.6	0.2	345	10	160	0.7	1.9	8.0
Maize (dry)	11.1	1.5	2.7	342	10	348	2.3	1.8	20.0
Pearl millets	11.6	2.3	1.2	361	42	296	8.0	2.3	45.5
Italian millet	12.3	3.3	8.0	331	31	290	2.8	3.2	15.0
Sorghum	10.4	1.6	1.6	349	25	222	4.1	3.1	20.0
Wheat whole	11.8	1.5	1.2	346	41	306	5.3	5.5	36.6

Source: Nutritive value of Indian Foods, ICMR-2012









Current status of Finger Millet Cultivation:

- Area under Finger millet accounts only 16% of the total gross cropped area and 28% of the total area under cereals crops cultivation.
- The area under Finger millet has declined by 55% over 33 year from 144,480 ha in 1980 to 65,160 ha in 2013.
- o Local landraces using traditional agronomic practices.
- Improper soil fertility management, imbalanced use of chemical fertilizer, poor quality seeds.
- o Limited access to knowledge about improved agronomic practices
- **o** Yield as low as 4 quintal/ha under broadcasting.
- o 9 quintal /ha under traditional transplanting.
- Everybody consumed finger millet daily and it is largely source from market (78%).









- $\circ~$ Clearly there is a demand –supply gap to be addressed .
- These issues are being addressed under a study to demonstrate feasibility of a Farming System for Nutrition (FSN) approach to address nutrition deficiencies under an international research program on 'Leveraging Agriculture for Nutrition in South Asia (LANSA)'.
- The attempt is to enhance finger millet cultivation and yield in selected project villages in Boipariguda block of Koraput district, to promote consumption of the nutrient-dense crop.
- This is being done through introduction of improved variety of seed along with improved agronomic practices to increase the production and productivity of finger millet.









Leveraging Agriculture for Nutrition in South Asia (LANSA)

LANSA is a multi-country multi-institutional six year (2013-2018) research programme for improving nutrition through agriculture, supported by UK Department for International Development (DFID).

This research programme led by MSSRF and the other partners are:

BRAC, Bangladesh
Collective for Social Science Research (CSSR), Pakistan
Institute of Development Studies (IDS), UK
International Food Policy Research Institute (IFPRI), USA
Leverhulme Centre for Integrative Research on Agriculture and Health (LCIRAH), UK.

Countries: Afghanistan, Bangladesh, India, Pakistan

Core question: How can South Asian agriculture and related food policies and interventions be designed and implemented to improve their impacts on nutrition?









The Demonstration:

- Demonstration of finger millet cultivation with improved variety of seed and agronomic practices was conducted in four villages in *Kharif* 2015 (June to October 2015).
- A total area of 0.52 hectare on 7 farmers' fields characterized by sandy loam soil was covered.
- The demonstration was in rainfed condition, with 1687 mm rainfall over 60 rainy days.
- The temperature ranged from 17°C to 35°C during the study period.
- The farmers selected improved variety GPU-67, a high yielding variety was taken along with farmer's variety of finger millet.
- The demonstration was designed to enable farmers to compare the difference in yield parameters under line transplanting in research plot and traditional practice plot by the communities









Rainfall status of the study area (May-December 2015)

Month	Normal rainfall	Actual rainfall	No. of rainy day	% of Excess / Less rainfall	
May	81.9 mm	93.0 mm	6	13.6% excess	
June	206.8 mm	559.0 mm 15		170.3% excess	
July	375.6 mm	111.0 mm	10	70.5% less	
August	393.6 mm	382.0 mm	21	3% less	
September	256.3 mm	632.0 mm	13	147% excess	
October	126.1 mm	3.0 mm	1	97.6% less	
November	32.6 mm	16.0 mm	2	51% less	
December	6.5 mm	2.0 mm	1	69% less	









Package of practices followed:

	Improved Agronomic Practice		Farmers' Practice
0	Seed treatment	0	No seed treatment
0	Line transplanting with recommended	0	Random transplanting with variable
	spacing (20cm x 10cm)		spacing
0	Weeding through hand weeder	0	Manual weeding
0	Regular monitoring of intercultural	0	Irregular monitoring of intercultural
	operation		operation

Note: The areas under each treatment plots were same in size. Recommended fertilizer application; date of nursery and date of transplanting were same for both the practices and varieties for each farmer.

Each farmers' plot was divided in to 4 treatment areas of equal size. Treatment :

T1: Improved variety (GPU-67) with improved agronomic practice.

- **T2:** Farmers variety with improved agronomic practice.
- T3: Improved variety (GPU-67) with farmer practice
- T4: Farmers variety with farmers practice.









- Seeds were treated with Carbendazim 50
 WP @ 2g/kg seed 24 hours before nursery raising.
- Seedlings were grown in raised bed @
 2.5 kg/ha.
- 21-25 days seedlings were transplanted in each case with one to two seedlings per hill.
- Recommended fertilizer dose 40:20:20 (N: P: K kg/ha) was applied in each treatment plot.
- 50% of the nitrogen and the total
 Phosphorus and Potash were applied
 over the main field before the last
 ploughing.
- The remaining 50% of the nitrogen was applied 25 days after transplanting.













- As blast is the common disease and stem-borer is the common pest that attacks finger millet, Carbendazim 50 WP @
 1g/litre and Chloropyriphos 20 EC @ 2000ml/ha was applied
 45 days after transplanting, as a precautionary measure.
- Detailed information on date of nursery, date of transplanting, date of intercultural operation and harvesting were recorded.









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Yield data (kg/ha)



*Mean value reported









Result and Discussion:

- Yield of improved variety (GPU-67) with improved agronomic practice (Treatment 1) was 13% higher than the yield of farmer's variety with similar practice (Treatment 2).
- The performance of the improved variety (GPU-67) under both the practices showed that the yield with improved agronomic practice was 19% higher than farmer's practice.
- The yield of improved variety (GPU-67) using improved agronomic practice was 31% higher than the yield under farmer's variety with farmer's practice.











- In sum, GPU- 67 gave additional 488.5 kg more yield per hectare, as compared to yield from farmer's variety with farmers' practice.
- Taking into consideration the nutritive value of finger millet , the following additional nutrients harvested per hectare

Additional nutrient harvested/ha

(All values are per 488.5 kg of edible portion)

Protein	Minerals	Crude	Energy	Calcium	Phosphorus	Iron	Niacin	Total Folic
(g)	(g)	Fibre (g)	(Kcal)	(mg)	(mg)	(mg)	(mg)	acid (μg)
35660.5	13189.5	17586	1602280	1680440	1382455	19051.5	5373.5	89395.5

- The performance of improved variety (GPU-67) under improved agronomic practices was superior to the other three treatments consistently across the demonstrations in the given soil and weather condition.
- By just changing the variety, the yield increased by 10% and by changing both the variety and practice the yield increased by 31%, i.e. 488.5 kg more yield.
- By converting the additional yield into nutrients, on an average additional 36 kg protein, 13 kg minerals, 16,02,280 Kcal energy, 1.7 kg calcium, 1.4 kg phosphorus were harvested from one hectare of land by cultivating GPU-67 variety of finger millet using improved agronomic practices.









Conclusion:

- The study revealed that the yield from improved practices was consistently and significantly higher than that from the farmer's practice of cultivation across the seven demonstrations.
- The most importance factor contributing to the production enhancement was the technology innovation rather than variety replacement.
- However replacing the local landraces with improved variety also contributed to the production enhancement by another 10 %.
- Keeping this in mind, if the area under finger millet is increased through technology innovation and improved seed variety i.e. improved cultivation practices with better high yielding variety, definitely more nutrients viz. protein, minerals, calcium and phosphorus can be harvested.









- As finger millet is a staple food of the tribal community, they will retain it for their own consumption.
- This will help address protein and micronutrient deficiencies in the population.
- Therefore increasing the area and production of this nutrient dense crop will increase the availability of macro and micronutrients.
- This programme can also be leveraged to serve as a delivery platform for nutrition-specific interventions by increasing their effectiveness through bio-fortified variety if available, coverage and scale and thus help accelerate progress towards improving the nutrition of the community.

Finger millet should be included in PDS











Way forward:

- Replacement of local landraces with improved variety along with improved agronomic practices supported the higher production of finger millet; the surplus created demand among farmers through barter/exchange system as well as provided for giving to relatives when they came as guests of the farmers.
- Ultimately this can create the channel for spreading to nearby villages and untouched areas through the daily and weekly local markets.
- As an impact of the demonstration with 7 farmers from four villages in *Kharif* 2015 generating demand from 312 farmers from 21 neighboring villages for improved variety of finger millet seed for *Kharif* 2016.

Increasing the area also requires establishment of sustainable seed systems to ensure regular supply of the improved seeds. Community seed bank at village level can be a seed enterprise model. Work in this direction is also set to start from this year.







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Beginnings made, still a long way to go... Thank you



