

AARDO e-Lecture

Role of Agroforestry in Poverty Reduction

Tuesday 8th August 2022 : 4.00 PM IST

Enabling Small Holders in Odisha to Produce and Consume more Nutritious Food through Agroforestry Systems

Govt of Odisha

Directorate Soil Conservation & Watershed Development
Directorate of Agriculture, Directorate of Horticulture, Odisha Livelihood Mission
Forest Department , Labour Department , Odisha Bamboo Development Agency
OUAT, Bhubaneswar

ICAR

ICAR-CAFRI, Jhansi
ICAR-NRRI, Cuttack
ICAR-CAZRI, Jodhpur
World Agroforestry (ICRAF)



**World
Agroforestry**

Transforming Lives and Landscapes with Trees



Study area & Objectives (Balangir & Nuapada)

- Create awareness about benefits of consuming diversified nutritious farm produce, including, fruits, vegetables, and other tree-based produce, such as flowers, pods, leaves, etc.
- Introduce and accelerate adoption of suitable agroforestry systems to enhance availability of nutritive food
- Generate employment and income to support the efforts of Odisha Government to reduce in-country migration
- Assess the impact of introduced interventions on availability of nutritive food to support better decision making for scaling up and scaling out
- Build capacity of all stakeholders and strengthen existing/ create structures to sustain the activities and impact of the project



- Typical Rainfed Mono Crop Area
- Poor crop productivity, lack of awareness and practices
- **Food nutrition & livelihood Insecurity**
- **Tribal area & Stressed migration**
- Target districts prioritized by Niti Aayog & ICAR

Interventions in target villages

- Paddy based AF system
- Non – paddy (Pulses, oilseed, cotton) based AF system
- Backyard AF System
(Vegetables + fruit MPTs plants)
- Boundary Plantation
- Nutritional garden & nursery
- AF based NRM approach

Interventions	Achievements
Crop demonstration intercropped with fruit trees (Ha)	7751
First time 2 nd crop cultivation in Rice Fallow (Ha)	3070
Boundary Plantation with fruit/MPT (Ha)	4534
Block Based QPM Nursery	2 No.
Women Empowerment: village based Nursery with WSHG	36 No.
Backyard Plantation with fruit plants & vegetables	13400 HH
Nutrition Garden for School Children in their Schools	15 No.
Development of Phone Based App	1 No.
Agroforestry based Water Infiltration NRM work on Pilot basis	250 Acres
Capacity Development (Trainers & Farmers)	KVM 58 Farmers 18542



Paddy & non-paddy (legumes) based AF System



Backyard Plantation: Nutritious food for families



Nutrition Garden (15) : Nourishing younger generation



Plantation Progress



Women SHGs

Training, tech-support, inputs, small equipment for nursery; Buy Back guarantee at market rate

36 Women Self Help Group (WSHG)

Buy back guarantee and market linkage for sustainability



Breaking the myth of long gestation period of agroforestry



Innovations: New Approaches/differently done

- Agroforestry in System Mode : **To reduce gestation period**
- Biofortified protein rich rice **CR Dhan 310 & 311 (10.3 % protein & 15-20 ppm zinc)**
- **Short & long duration , drought resistant, high yielding** rice var. CR Dhan 101 (Ankit) & CR Dhan 307 (Maudamani)
- High yielding drought resistant grass-pea (**non-toxic**) in **fallow area**
- Hydrogel & Sub-surface irrigation system (**saving on irrigation water & mitigating dry spell**)
- Agroforestry based NRM approach (**Water infiltration, ground water recharge, reduction in run-off & soil erosion**)

FPOs on Biofortified Paddy 310/311

Getting Seed of Biofortified varieties is a challenge.

CR Dhan 310 & 311 (10.3 % protein & 15-20 ppm zinc)

4 FPO of 53 farmers produced 64.3 Ton CR Dhan 310 certified seed

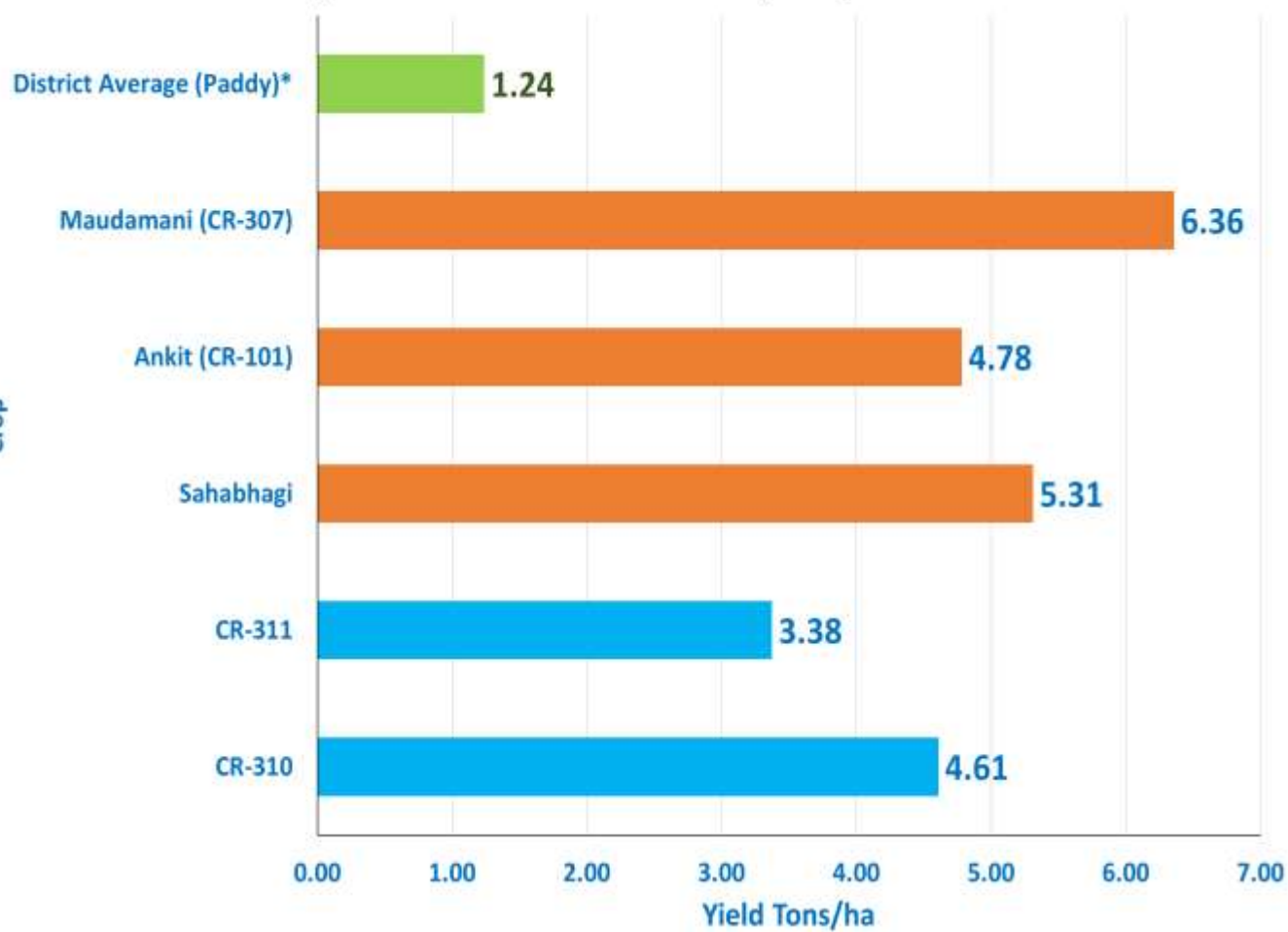
Project Team has aligned with OSSC and Dept. of Agriculture to introduce this in seed chain and direct purchase form these farmers.

Farmers will be now registered growers



Crop Yield Dynamics

Average Yield Data of Different Paddy Crops of 2019-20



Average Yield Data of Different Non-Paddy Crops of 2019-20



Additional income to participatory Farmers over District Average (Paddy)on MSP (2018-19)& Rice-Fallow cultivation.

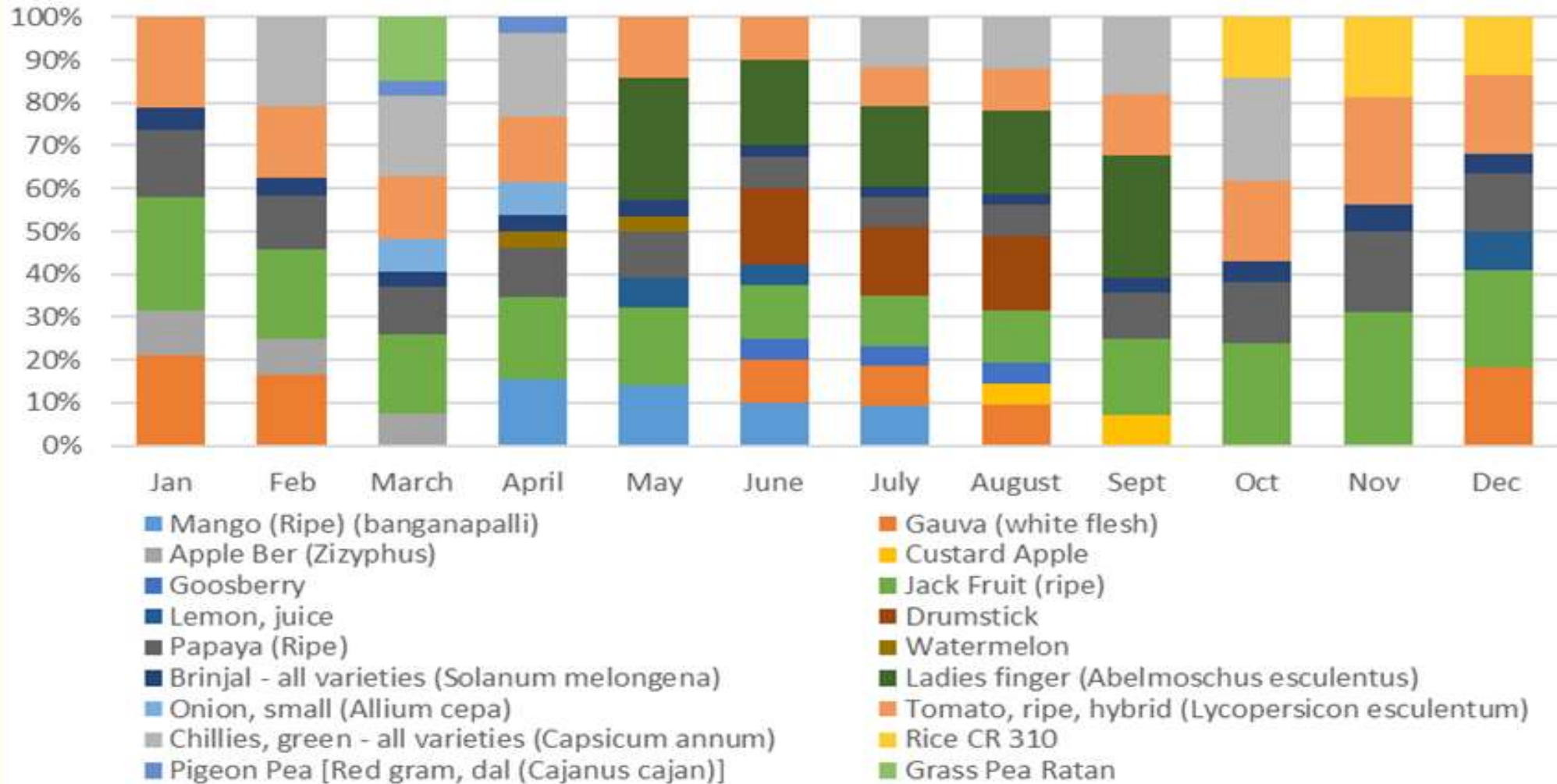
Block	Crop	2018-19 in INR	2019-20 in INR	2020-21 in INR	2021-22 in INR	Total in INR
Belpada	Paddy	9749	18547	14054	4183	46533
Belpada	Grasspea	7200	6800	8000	8384	30384
	Total	16949	25347	22054	12567	76917
Nuapada	Paddy	10449	13550	11275	7812	43086
Nuapada	Grasspea	7300	7552	5440	8000	28292
	Total	17749	21102	16715	15812	71378

Addition of Nutrient through crop introduction (2018-22)

Crop	Nutrient	Quantity
Bio-fortified Rice: CR 310/311	Protein	515 Qt.
	Zinc	150g
	Iron	150g
Grasspea in Rice Fallow	Protein	4475 Qt.
	Zinc	49.95 Kg
	Calcium	14.43Qt
	Magnesium	19.92Qt
	Phosphorus	48.65Qt

Round the Year Availability of Nutritious Food

Agroforestry Nutrient Profile



Income from 70% Backyard produce sale by each Household (13400HH)

Particular	2018-19	2019-20	2020-21	2021-22
	INR	INR	INR	INR
Vegetable	2998	4149	4533	4450
Fruits	-	464	673	1113
Total	2998	4613	5206	5563



World Agroforestry

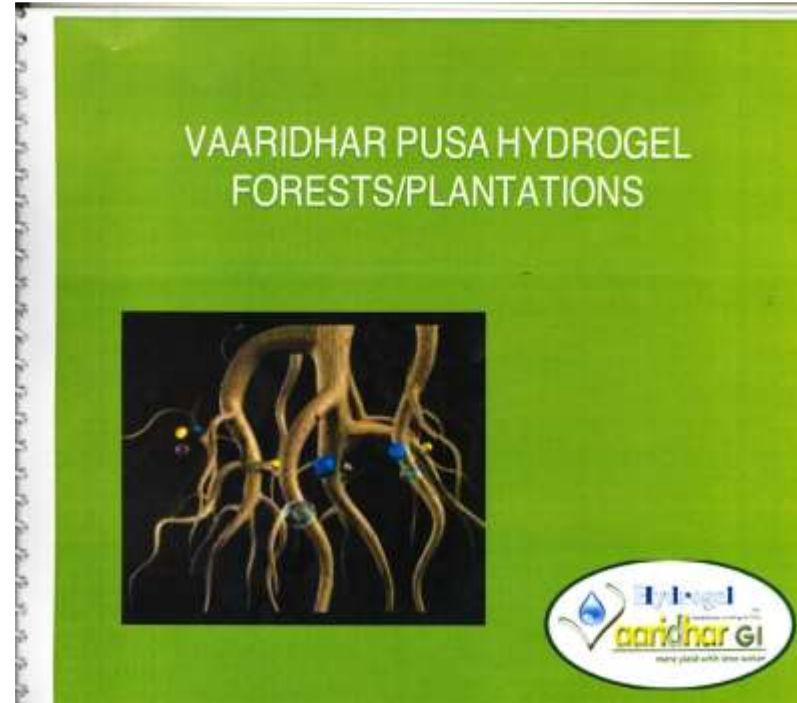
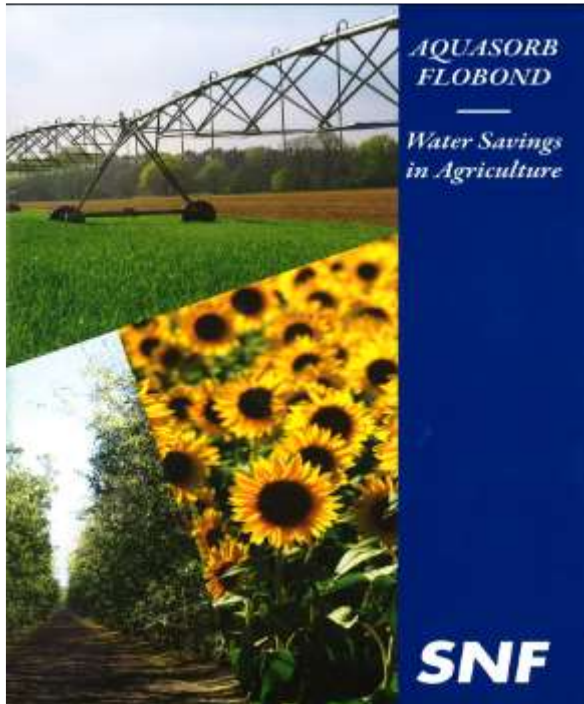
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Nutrients availability to each Household(2018-22)

S. No.	Vitamins & Minerals	Unit	Total from 30% produce consumption (Vegetables+ Fruits)in Backyards
	Vitamins		
1	Fiber	gm	13069.59
2	Folate	mcg	84068.43
3	Niacin	mg	1270.87
4	Pantothenalic Acid	mg	381.99
5	Riboflavin	mg	78.62
6	Thiamin	mg	2514
7	Vit A	IU	1394719
8	Vit. C	mg	124084
	Minerals		
1	Ca	mg	55712.65
2	Fe	mg	936.48
3	Zn	mg	463.73

Reducing irrigation frequency & drudgery, mitigating drought : Hydrogel

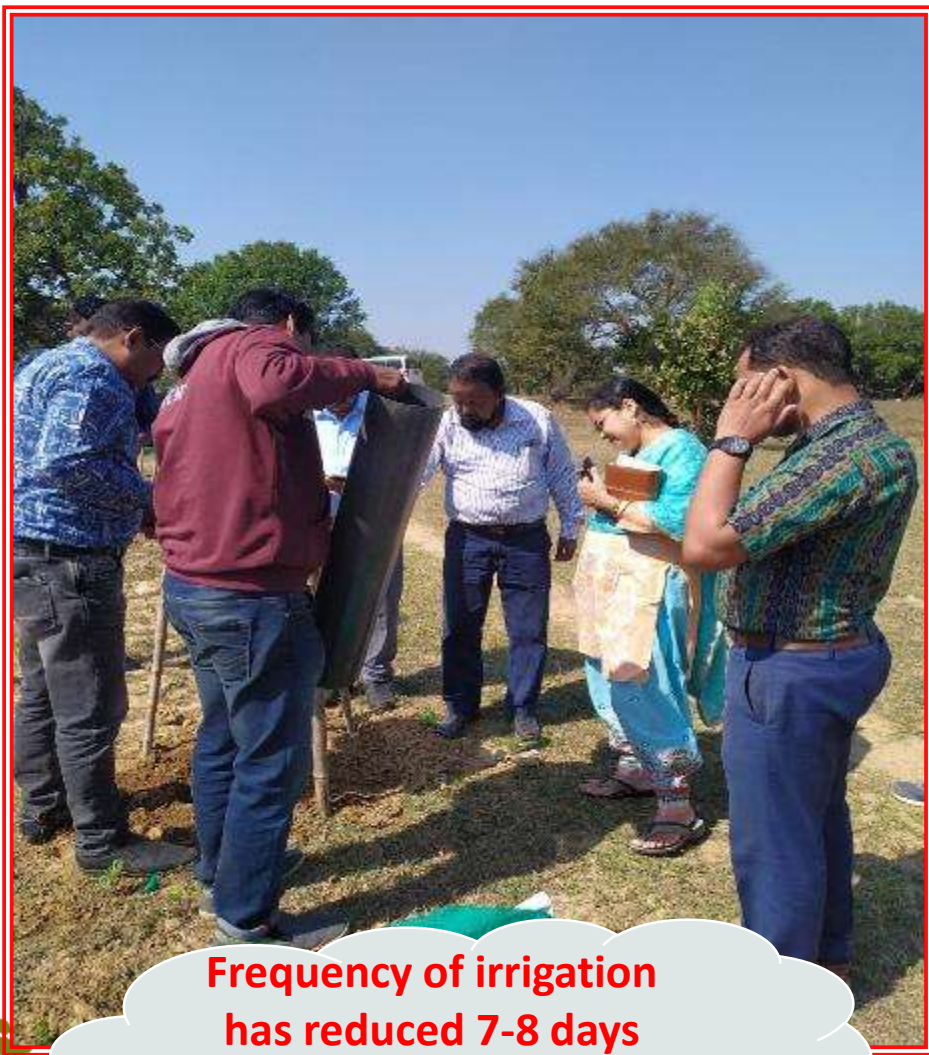


Pilot testing:

During Dry Spell, wilting of treated plants was recorded **4-5 days** late than untreated plants. Number of irrigation reduced. In Paddy (Ankit), yield increase of **13.92%** recorded



Sub-surface Irrigation: Reducing challenge of water scarcity and drudgery



**Frequency of irrigation
has reduced 7-8 days
/plant during peak
summer season**



Latitude: 20.664694
Longitude: 82.978107
Elevation: 297.58 m
Accuracy: 3.8 m
Time: 07-28-2020 11:29
Note: Plantation

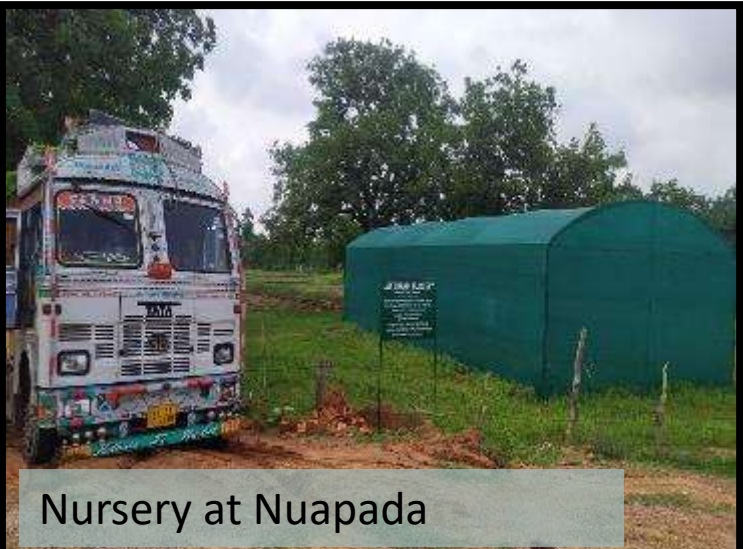
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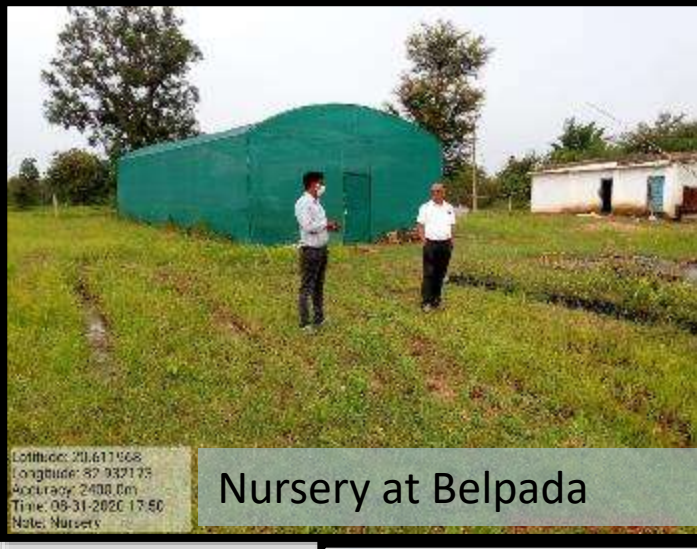
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Note: Plantation

06/28/2020 11:29 AM

Block Level Nurseries



Nursery at Nuapada



Latitude: 20.611568
Longitude: 87.932113
Altitude: 2408.0m
Time: 06-31-2020 17:50
Note: Nursery


Nursery at Belpada




Plants stored in Nursery before distribution




Rodomil Spraying in Nursery



କୃଷି ବ୍ୟାପକତା ଯାକ୍ ଉପଯୁକ୍ତ ମୂର୍ଦ୍ଧରା ପରିଚାଳନା (Nursery Management)





ଶ୍ରୀମତୀ ସସ୍ମିତା ବେହେରା, ଦୃଃ ସୁବାସ ଚନ୍ଦ୍ର ମହାପାତ୍ର,
ଶ୍ରୀଯୁକ୍ତ ବିଜୁ ପ୍ରସାଦ ମିଶ୍ର, ଦୃଃ ସ୍ଵାଗତିକା ଶ୍ରୀରତନ ଏବଂ
ଦୃଃ ମୋହାଣ ମୋହାକ ହୋସେନ୍

ବୈଷୟିକ, ସର୍ବ ଭାରତୀୟ କୃଷି ବ୍ୟାପକତା ପ୍ରଦାନ, ଚୈତ୍ୟ କୃଷି ଓ ବୈଷୟିକ ବିଶ୍ଵବିଦ୍ୟାଳୟ, ଭୁବନେଶ୍ଵର
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ଦକ୍ଷିଣ ଏସିଆ ଆଞ୍ଚଳିକ କାର୍ଯ୍ୟାଳୟ
ପ୍ରଥମ ଚଳ, ସି ଦୁଇ, ଏଚ.ଏ.ଏସ୍.ସି. ଜଗନ୍ନାଥ, ପୁଷ୍ପା ବ୍ୟାପକତା
ଚେକ ପ୍ରକାଶ ଶାଖା ମାଗି, କୁଆଡ଼ିଲା-୧୧୦୦୧୨
ଦୂରଭାଷ: +୯୧ ୧୧ ୨୫୮୪ ୭୮୮୫/୮୬,
ଇମେଲ : worldagroforestry@cgiar.org
ୱେବସାଇଟ: www.worldagroforestry.org

QPM Guideline for Farmers

Enhancing suitable land and Water Infiltration through Agro-bio-physical interventions (NRM based AF)



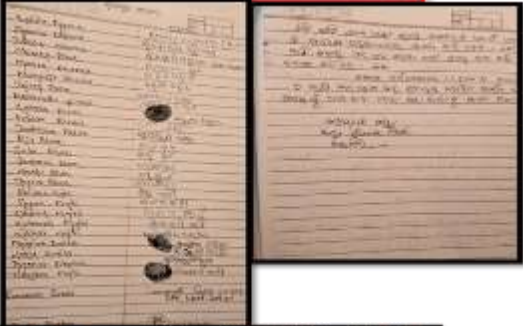
Enhancing land use efficiency

- **NRM activities with agroforestry for enhancing ground water recharge, reduce erosion, and supporting physical structures Enhance soil carbon and fertility**

- **Trees to improve microclimate, front line defense**

- **Round the year employment and additional income for reducing migration**

- **Improvement in soil and climatic condition**



Area dominated by single crop because of limitation of prevailing soil, moisture and climatic conditions

Annual rainfall over 1200 mm

High runoff and poor infiltration & recharge

Poor ground/ surface water availability

Low soil organic carbon, soil nutrient status and high level of erosion



Enhancing water infiltration through bunding



Approx. 1.5 Km road

Benefit to approx. 210 acre

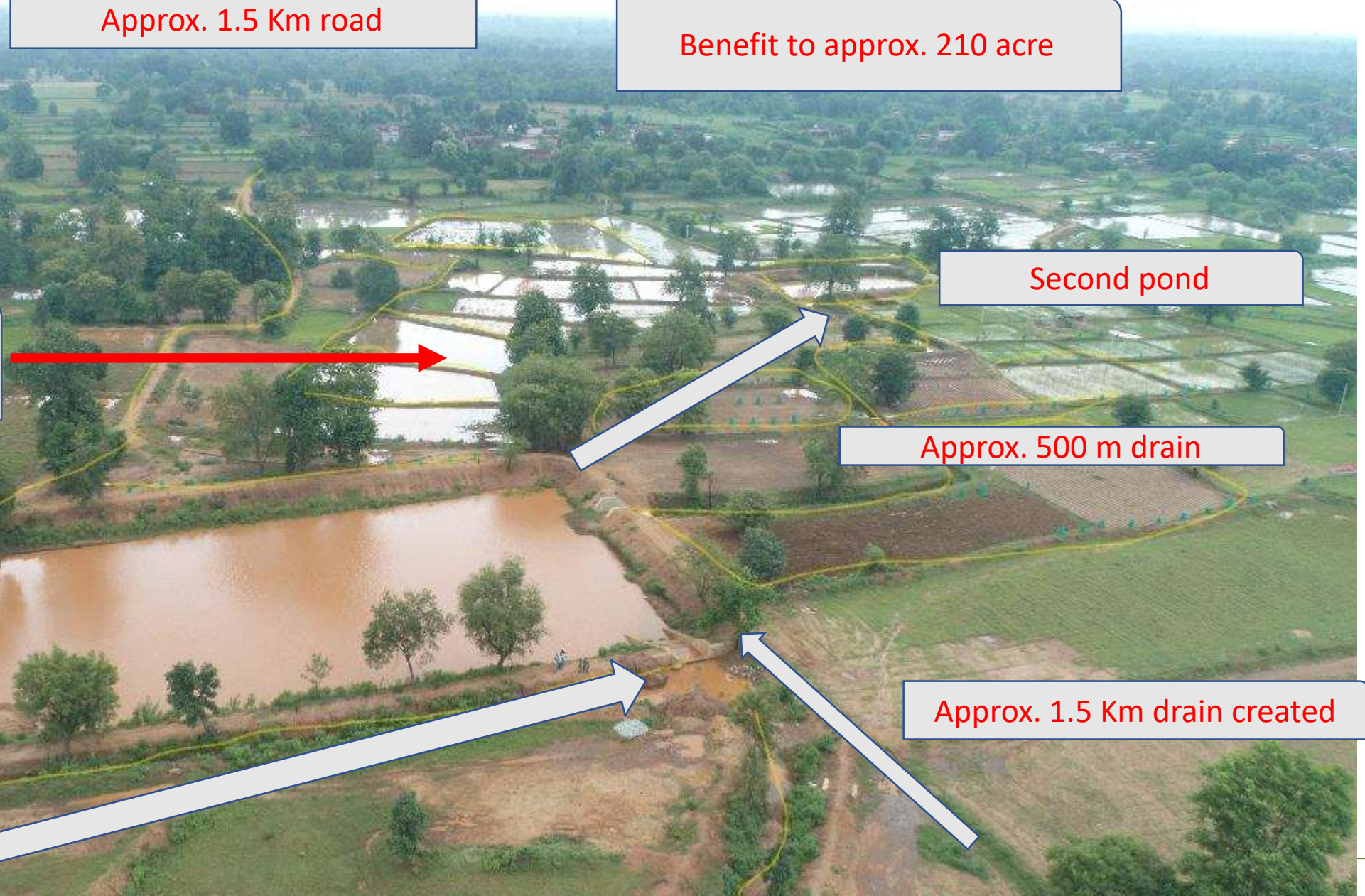
Employment generation for migratory farmers



Second pond

Approx. 500 m drain

Approx. 1.5 Km drain created



Water Resources and Soil & Water conservation activities

Water storage and distribution ponds excavated and developed

Capacity of ponds is 16,000 Cubic meter, 54,00 cubic meters & 2100 cubic meter

- ❖ Ponds harvested : 70,500 cubic meter
- ❖ 21,000 used for irrigation
- ❖ 49,500 for ground recharge
- ❖ 1.25 lakh cum water infiltrated to ground
- ❖ Bunding reduced soil erosion 60 to 75% of 12 to 15 ton soil/ha. In turn it saved 8.4 ton of soil/ha from erosion. Total soil saved from erosion: 714 ton

Bunding done in 85 ha, facilitated rainwater harvesting: 85,000 cum equivalent to 106 mm in a year

All bunds covered by Teak, Mango, bamboo; and Napier grass to reduce soil erosion and source of fodder

Divers and rain gauge (manual & automatic) installed

Evidence based Interventions



Migratory Farmers: Success Story

Mr Tirtha Bariaha, Belapda- Migratory farmer was migrating on regular basis

Installed 5 KWatts Agri-voltaic system and generating 1250 KW electricity/ per month for Rs 3488/ month

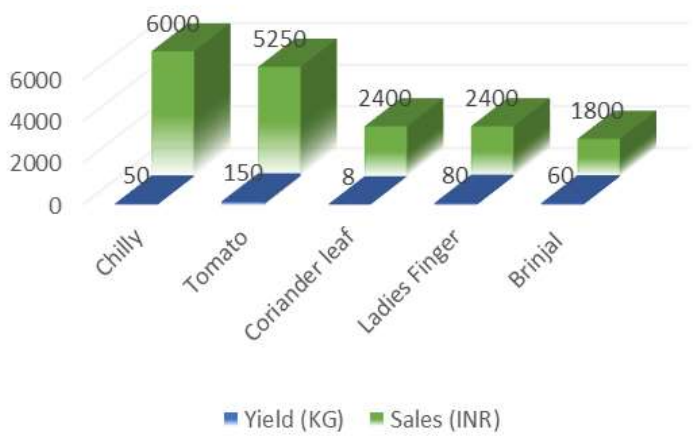
Total Income: Rs 85, 077



Figure 1: Fruit trees (covered in tree guard) planted in rows in the field and at boundary



Tiratha's Vegetable Yields and Income from its Sale



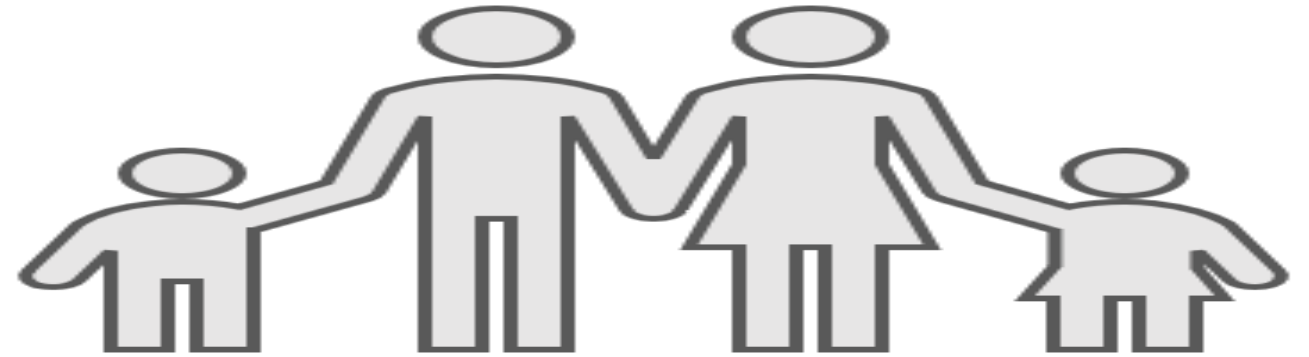


Migratory Farmer: Success Story

- Mr Blabhadra Malik, regular migrating from 2012
- Attended project training and came forward to adopt horticulturally based AF
- Fruit trees planted and adopted all technologies
- Successful model of subsurface irrigation at his farm
- CR Dhan provided income of Rs. 39,785 from 0.41 ha land
- Watermelon planted as intercrop in 0.6 acre with trees, produced 8 Ton and earned Rs 45,000
- **Total income : Rs 84,585**
- **Income from migration : Rs 60,000**



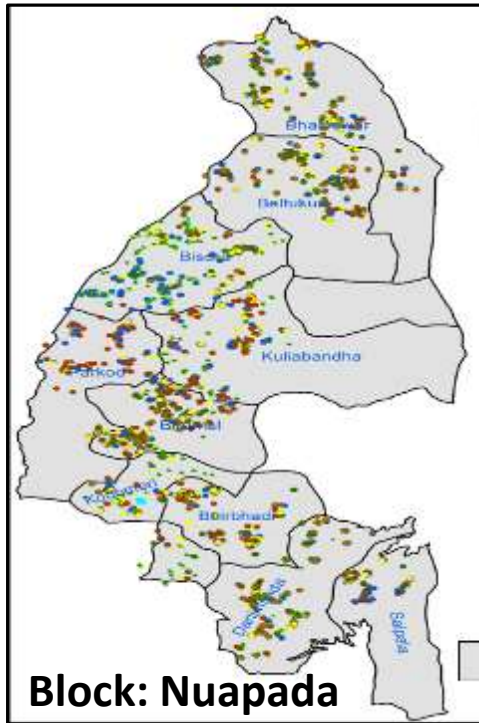
Aligning Project activities during COVID-19 : Contingency Plan



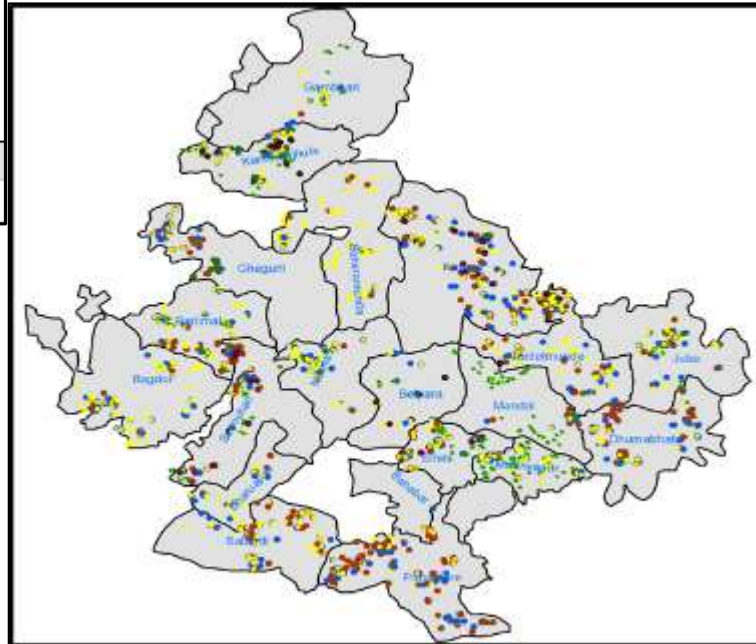
- Developed Guideline- Odisha & ICRAF
- Helped migratory worker
- Opportunity to sustain



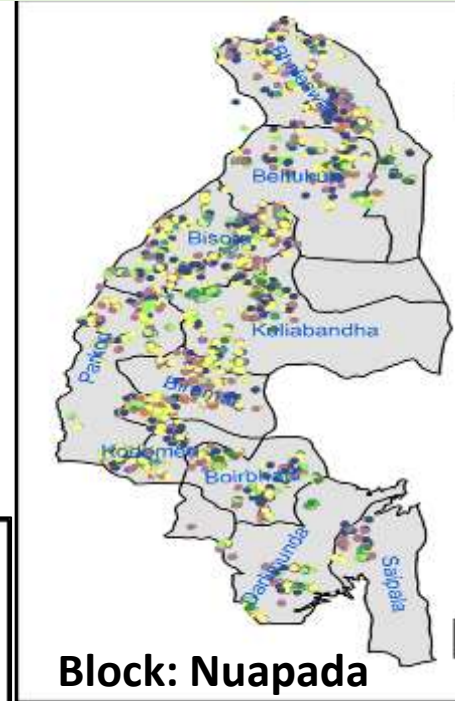
Spatial distribution of Agroforestry interventions



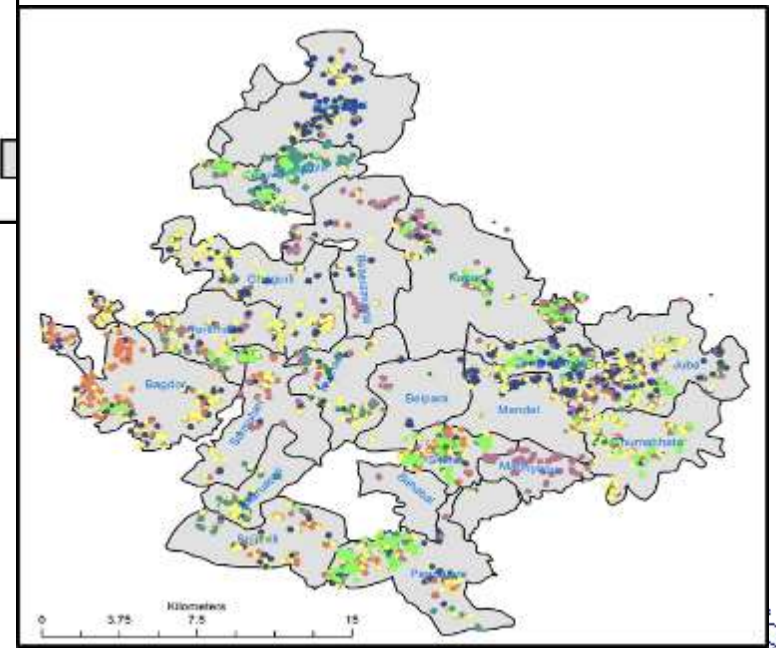
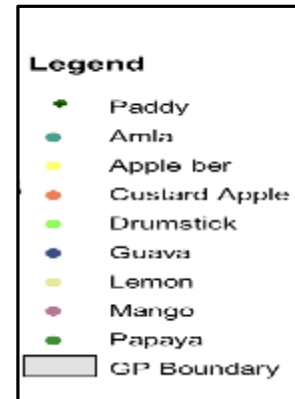
Block: Nuapada



Block: Belpada



Block: Nuapada

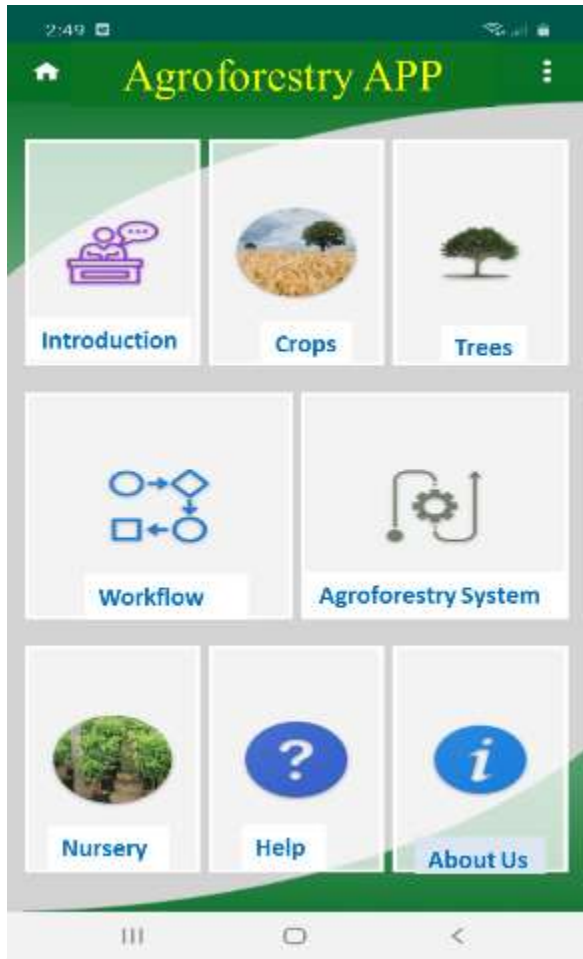


Block: Belpada

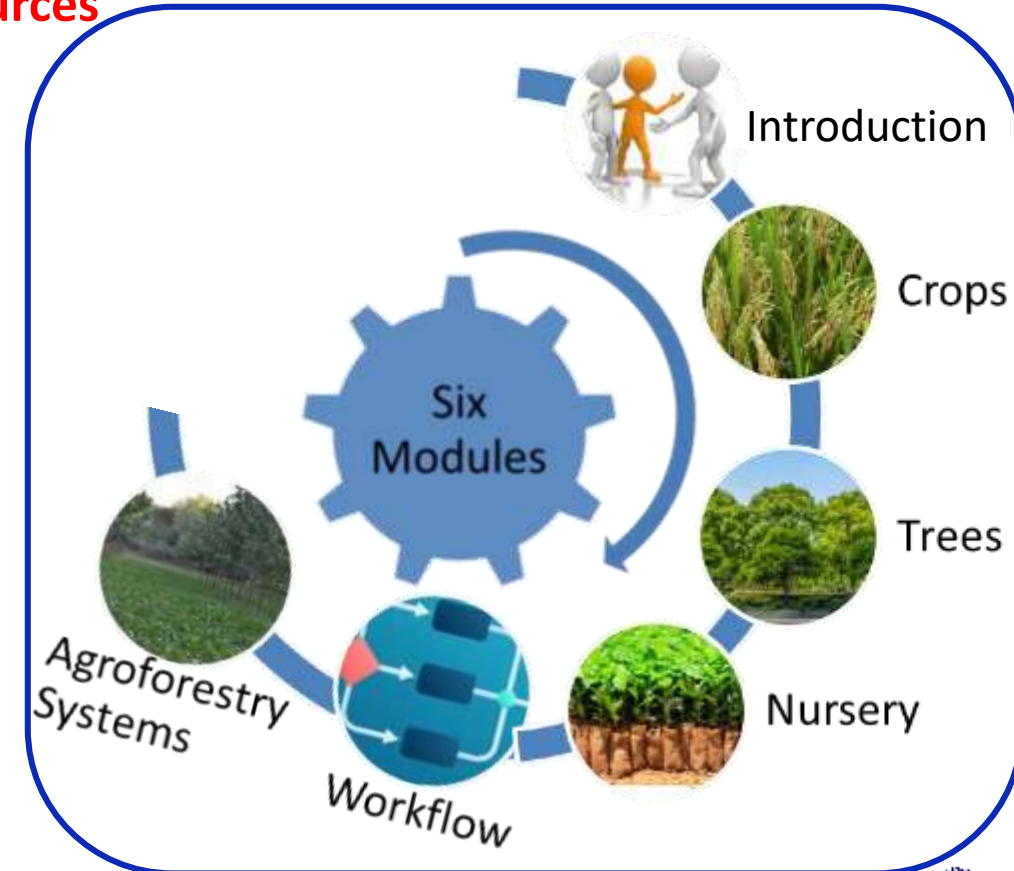


Odisha Agroforestry Assistant (OAFA) : Mobile Based Application

भारत
ICAR



System approach : crop & plants
Best practices
Quality Planting material sources



Data dissemination tool



Gender balanced capacity development of extension workers, farmers and policymakers

KVM: Krishi Vaniki Mitra

Educated and with access to smart phone

One KVM per two villages from same community : 58

Trained in Project intervention

Local knowledge resource

Extended hand holding for communities at village level & exit strategy

**Total Trainers
trained: 1618**



**Total farmers
trained: 18,542**



Initial Impacts.....



- **Income from fruits**

- ✓ Average **per plant estimated income** : Rs750 from fourth year (Total plants : 199, 000)



- **Income from Backyard**

- ✓ Seasonal Vegetables like, okra, brinjal, chilli, cowpea, tomato etc.
- ✓ Average income from backyards from first year : **5,500** per HH (Total Households: 13400)



- **Nutritional Profile of introduced AF System**

- ✓ **Biofortified rice** has increased availability of 515 Qt of protein, 150 gm zinc, 150 gm iron
- ✓ Introduction of 2nd crop (Grasspea) in Rice-Fallow for the 1st time added 4475 Q protein, 49.95 Kg Zinc, 14.43 Qt calcium, 19.92 Qt. Magnesium and 48.65 Qt. Phosphorus



- **Extra Crop in Fallow**

- ✓ Introduced Grasspea, covering 3070 ha, providing 400-500 kg per ha yield , income of Rs 18,750 per ha in rabi season



- **NRM based AF**

- ✓ 85 ha bunding; Rainwater harvesting = 85,000 cum
- ✓ Water harvesting from ponds : 70,500 cubic meters. ; 21,000 cum water used for rabi irrigation
- ✓ 1.25 Lakh Cum water infiltrated into ground
- ✓ 8.4 ton/ha soil was saved from erosion; total soil saved: 714 ton

Thank You : Stay Safe



For any queries Please contact:
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