



Adoption and Practice of Integrated Farming System -Way to Overcome Barriers of Dry Land Farming for the Small and Marginal Farmers

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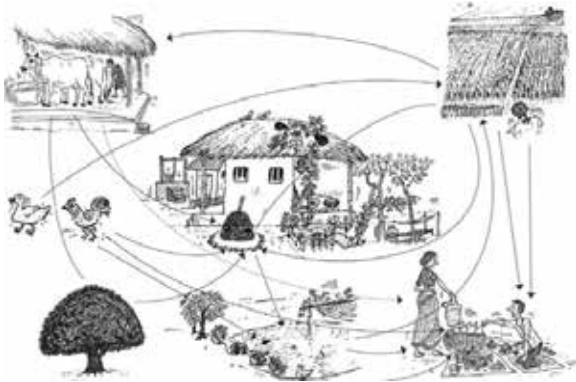
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ABSTRACT

Santal Parganas of Jharkhand is already far below in Agricultural productivity due to low soil fertility & water holding capacity, low rainfall. These lands are originally covered with dry deciduous forests and scrublands/grasslands. Food crops are cultivated in small patches mainly during the rainy season. Usually farming of maize, sorghum, pulses, paddy, small-scale animal husbandry and seasonal migration etc are the main sources of livelihood.

KEYWORDS



This semi arid areas where average annual precipitation is about 1000 ~1200 mm / year, length of rainy season is less than 90-100 days – but the soil water conservation actions are very poor that leads to high amount of top soil loss. Agricultural productions in these areas have remained stagnant or have declined, soils have become degraded, and many streams have dried up. Majority of the people, who are living in dry lands are undernourished, unemployed, or under-employed and food insecure. Beside that due to impact of climate change since last few years, rain fall is erratic and decreasing day by day.

Since mid 60s, input intensive agriculture was introduced in India, which has reasonably failed in ecologically stressed region like Santal Parganas. The general condition of the people living here have not improved much even now, due to a combination of several factors-

Natural forests have decreased; partly due to mining development projects; partly due to replacement by short or long term mono-species plantations and partly due to over harvesting. This clubbed with restrictions on collection and use of forest resources has affected the living condition of the landless poor. Deforestation has also resulted in flash floods, accelerated soil erosion and consequent silting of dams & rivers as well as decline in soil productivity.

The HYV based GR package developed for well to do farmers and well of regions have failed to perform in drought prone areas; and lack of support for millet-pulse based cropping

system has made many communities food insecure. Introduction of rice-wheat through PDS has resulted in change of food habits and most of the local food processing technologies, and recipes have been largely forgotten.

Rope making, soap making, basket weaving, palm sugar making, mat making and hundreds of other small crafts based on agro waste or forest produces, have gradually disappeared as sources of livelihood; due to : either negligence / lack of support, exploitative monopoly, lack of appropriate technology or a combination of all these.

Though there is number development projects undertaken for this region, the basic needs of the local communities grossly neglected; food culture ignored and the indigenous crops, breeds, survival strategies were seldom studied seriously. Now, when the GR model is failing miserably as a strategy reduce hunger even in resource-endowed regions; causing wide soil & water degradation & pollution and decline in ground-water level as well as in biodiversity, we need to search for another path of development, based on ecological science and sustainable natural resource management combined with participatory action research & experiential learning approaches based on our strategies on conservation ethics; where indigenous resources & knowledge-base are used as foundation of development while strengthening of the weak links is given priority.

PRAVAH has implemented Sustainable Integrated Farming System (SIFS) Project, supported by Welthungerhilfe & BMZ in 50 villages of Sonaraythadi block, Dist- Deoghar of Santal Parganas to reduce poverty and improve food and nutrition security of the most vulnerable sections of society. With the support of the organization, present researchers have carried out the research by utilizing the *SIFS approach* to integrate crops, horticulture, agro-forestry and livestock into an interactive relationship where the wastes from one operation or sub-system are used as inputs for other subsystems. The objective of the research is to reduce risks and external inputs, improve soil fertility & productivity, as well as to enhance household nutrition, availability of fuel and fodder and facilitate market participation. Location specific models of SIFS are developed by the community in collaboration with experts. The integration include a) a horizontal element –complementarities with interlinked production systems and improved management practices and b) a vertical element -value addition and marketing, while addressing the economic and social dimensions of technology transfer and adoption.



Three years journey towards sustainable integrated farming of a migrated wage labor -

Nandalal Singh is a marginal farmer living at Jhanji, Jarka-I G.P. of Sonayarathadi Block under Deoghar district with 5 family members. Till 2011 he used to practice chemical intensive traditional monoculture of paddy, maize in rainy season and wheat and potato in winter season on his 2.50 acre of land.

Most of the upland remained fallow. Practicing the mono cropping in the same section of land throughout the year was resulting in degradation of soil health, productivity of farm product and increased in pest attack and diseases. On other side, over the last ten years, fluctuating market price and increasing market rate of fertilizer, seed and pesticide was directly effecting on his cost of production.

In the year of 2012, his situation was worsened to give dowries to his daughter's wedding, Nandalal had to mortgage his 1 acre land and at the same time (**Government of India certainly reduced the subsidy on chemical fertilizer**) cost of fertilizers increased. He did not have the capacity to buy optimal amount of fertilizers. That time his livelihood was totally insecure and created severe food shortage for his family. In the same year, Nandalal has left Jhanji and migrated to Chennai to work in a factory as wage labor.

When he has returned in puja vacation 2012, he came to know about the concept of Sustainable Integrated Farming by attending a farmers' meeting at the village. He has decided to adopt and practice integrated farming system in his farm.

IFS intervention-

Sl.No	Components	Details		
1	Farm Size	2.5 acre or 1 ha		
	Skill	Master trainer of IFS. Can provide training on improved package of practices of crop, different technique preparation of composting, bio pesticides.		
2	Membership in Farmers Club	Sahyog Kishan Club (Jhanji)		
3	Support From Project	Capacity building training, Farm Pond, Duck, Bio- Gas, Zero energy Chamber, Pucca NADEP		
4	Intervention			
4.a	Main field	2012	2013	2014
		Intervention	Intervention	Intervention
	Summer	NA	Introduction of Dhaincha (Sesbania) for use as green manure on paddy field	Introduction of Dhaincha (Sesbania) for use as green manure on paddy field
	Rainy	Kharif Paddy Stabilization Line sowing of finger millet Inter cropping of maize + cow pea + pigeon pea Mixed cropping of maize + pigeon pea	Kharif Paddy Stabilization System of Rice Intensification Mixed cropping of maize + cow pea +kurdum (Due to non grazing plant kurdum used as living fence to protect the main crops and get some additional return) Line sowing of finger millet	Kharif Paddy Stabilization + Azola Inter cropping of maize + cow pea and kurdum (live fencing) Mixed cropping of finger millet + perl millet + sorghum + kodo millet + pigeon pea + cow pea + kurdum Line showing of brinjal and introduction of IPM (pheromen trap, marry gold showing)
	Winter	System Wheat Intensification Line sowing of Chickpea	Mixed cropping of wheat + mustard Intercropping of chick pea + oil seed Inter cropping of potato + methi + french bean	Mixed cropping of wheat + mustard Intercropping of chick pea + oil seed Inter cropping of potato + methi + french bean Line showing of chilly
	4.b	Home stead Nutrition garden	2012	2013
Intervention			Intervention	Intervention
Summer		1 st time introduced summer crop with pitcher irrigation and mulching. Bottle gourd, Ridge gourd in 5 decimal land.	Bottle gourd, Ridge gourd, Cucumber in 10 decimal land	Bottle gourd, Ridge gourd, Cucumber in 20 decimal land Onion in 2 decimal land
Rainy		Introduction of homestead nutrition garden concept on 1.5 decimal land with 3 types of vegetable crops.		
Winter	Nutrition garden		Inter cropping of potato, methi and French bean in 5 decimal land Cultivated fodder crop bar seem on 10 decimal land	

4.c	Waste land	2012	2013	2014
		Intervention	Intervention	Intervention
		Intercropping of Maize Pigeon pea	In Kharif season 1 acre of waste land converted into crop land by cultivating maize and pigeon pea, kundrum and finger millet In winter season by the help of LIS and farm pond supported from SIFS, he cultivated mixed cropping of wheat and mustard and intercropping of chickpea and oilseed.	On same land cultivated finger millet, pearl millet, sutra, sorghum and pigeon pea.
4.d	Livestock	2012	2013	2014
		Intervention	Intervention	Intervention
		NA	Vaccination (Understood importance of vaccination and started to work on cowshed management for health care of livestock) Started to collect beats of pigeon (Started to use it in preparation of compost) Supported 10 ducks from SIFS	Cowshed construction (Collecting easily cow dung for bio gas and 4-5 liters cow urine per day and using it to prepare bio fertilizer and bio pesticide) Established one azola producing unit (Using it feed for duck and livestock)
4.e	Aqua culture	2012	2013 to 2014	
		Intervention	Intervention	
		NA	Excavated farm pond (Irrigation facility increased by 6 acres land of farmers for cultivating winter crops in jhanji village.) Fishery with Duck and food forest concept introduced. Producing seasonal vegetable for home consumption on the bunds of pond. Planted subabul as fodder plant on the bund of pond, after 2-3 years he will use leaf as fodder.	
4.f	Recycling of wastage of any subsystem	2012	2013	2014
		Intervention	Intervention	Intervention
		One vermin compost unit (5*3*3) ft One pit compost unit (5*3*3) ft	One vermin compost unit (10*3*3) ft One pit compost unit (10*3*3) feet. One bio dung unit	Bio gas (Cooking every 2 time every day, helps to reduce fuel cost as well as slury of bio gas using in vermin compost) 2 vermin compost unit (10*3*3) ft One bio dung unit One Pucca NADEP compost unit Cow urine 4-5 liter/day
5	Impact on food security			
	From own source	2012	2013	2014
		Consumed carbohydrate rich food for 7-8 months. Vegetable 2-3 times in a week for 3-4 months.	Consumed carbohydrate rich food for 7-8 months. 1-2 kinds of vegetable 2-3 times in a week, throughout the year.	Consumed carbohydrate rich food throughout the year. 2-3 kinds of vegetable in every day throughout the year. Animal product like fish, eggs 1-2 time in a week.

Cost Benefit Analysis:

Year	Subsystem	Crop Season	Input, Techniques, Design adopted	Types or breeds or Crops	Area or Amount (Acre)	Number of outside Labour Days	INR (Input from market)	Input from market in Kg. or Ltr	Input from own source in Kg or Ltr	Main Product	Production (kg)	Local Market Rate of Produce 1	Bi-Product	Produce 2 in Kg	Local Market Rate of Produce 2
2012	Main Field	Summer	NA												
	Homestead		Mixed	Bottle gourd, Ridge gourd	.05	0	250	DAP-1 kg Urea-5 kg Pesticide-150 INR Irrigation (Diesel)	50 FYM (farm yard manure)	Bottle gourd Ridge Gourd	50 30	5 5	NA		
	Main Field	Kharif	KPS	Paddy	0.25	17	3115	DAP-40 kg Urea-50 kg Pesticide-100 INR	1000 kg FYM	Paddy	1000	10	Straw	550	2
			Traditional	Paddy	0.8										
			Intercropping	Pigeon pea	0.20	4	1085	DAP-15 kg Urea 20 kg		Pigeon Pea	30	30	Stem	50	.5
				Maize						Maize	35	10			

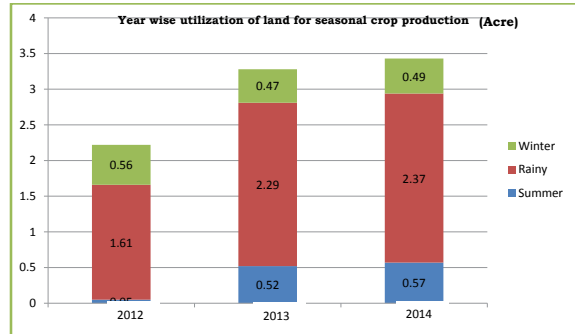
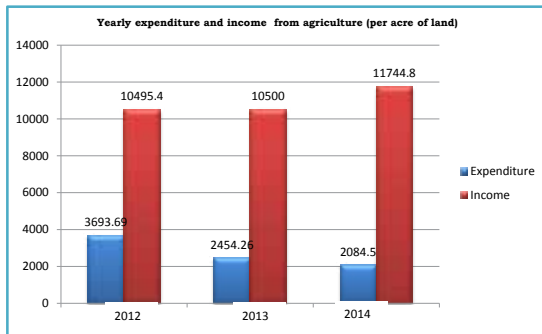
			Mixed cropping	Cow pea						cow pea	40	25					
				Maize	.30					Maize	65	10					
				Pigeon pea						Pigeon pea	50	30					
			Line sowing	Finger millet	.05			0	100 kg FYM	Finger millet	15	15					
Home Stead (Nutritio n garden)			Mixed	Brinjal	.015	0	150	Seed-150 INR	50 kg FYM	Brinjal	20	8	NA				
				Bottle gourd							Bottle gourd	15	5				
				Amaranths								Amaranths	2	3			
				Ladies finger								Ladies finger	12	7			
Main field	Rabi	SWI	Traditional	Wheat	0.1	5	1700	DAP-25 kg Urea 30 kg	300 kg compost	Wheat	100	13	Straw	20	2		
				Wheat	0.2												
		Line sowing	Traditional	Chickpea	0.10	3	600	DAP-3kg		Chickpea	45	30	Stem		3		
				Mustard	0.1	0	200			Oil	10	70	oil cake	15	25		
				Potato	0.05	3	900	Seed-10 kg DAP-15 kg Urea -12 kg	100 kg compost	Potato	200	6	Stem	NA			
Homeste ad	Mixed		Beet	.01	0		200	30 kg compost	Beet	15	25						
			Muttar							Muttar	Lost						
			Kohra							Kohra	Lost						
			Spinach							Spinach	15	5					
Tree	Year 2012	Home stead		Tomato						Tomato	35	5					
				Chilli						Chilli	10	40					
				Mango	2	0	0	0	0	0	Fruit	70	4	Wood	NA		
				Jack fruit	3						Fruit	100	3				
				Sesem	3						Leaf	5000	NA				
				Gambar	4												
				Sagwan	3												
Livestoc k	Year 2012	Shed		Goat	5		11000	Feed-900 kg	Fodder 30000 kg	Meat	30	300					
				Cow	6						Milk	300	25	Dung	10000		
2013	Main Field	Summer	Traditional	Dhaincha	.40	0	0	0	0	Leaf + Stem	Used as green Manure						
				Home stead	Traditional	Amaranths	.07	0	750	Seed-150 INR DAP 1 kg Diesel for irrigati on 6 litres	100 kg compost	Amaranths	15	10			
						Bottle Gourd						Bottle Gourd	80	5			
						Ridge Gourd						Ridge Gourd	50	5			
						Bitter Gourd						Bitter Gourd	40	5			
						Maize	0.03					Maize	30	12	Stem	fodder	
						Onion	0.02					Onion	120	10			
	Main Field	Kharif	K.P.S.	Paddy	1.00	21	2800	25 kg DAP, 30 kg- Urea	2500 kg. compost	Paddy	1600	10.5	Straw	800	2		
					S.R.I.	.10				500 kg. compost							
			Mixed cropping	Cow pea	1.00	4	800	Seed , DAP-15 kg	Vermi compost 500 kg	Cow pea	60	20	Stem	100 kg used for compost			
					Kudrum (Local)						Kudrum (Local)	15	30				
					Pigeon pea						Pigeon pea	70	30				
	Maize						Maize	80	12								
	Line sowing	Finger millet	0.10	0	0	0	100 kg. compost	Finger millet	30	20	Straw	NA					
	Homeste ad	Mixed	Brinjal	0.09	0	100	seed	50 kg. compost	Brinjal	35	10	Stem	NA				
Okra									Okra	15	15						
Kachu									Kachu	10	15						
Ridge gourd									Ridge gourd	30	5						
Sesem									Sesem	30	5						
Ridge gourd									Ridge gourd	10	10						
Bottle gourd									Bottle gourd	30	10						
Okra									Okra	10	15						
Main field	Rabi	Mixed	Wheat	.30	5	2000	Seed-20 kg DAP-10 kg Urea 15 kg	200 kg compost	Wheat	100	12	straw	50	1			
			Mustard						oil	8	70	Oil cake	12	25			
		Inter cropping	Chick Pea	0.05		600	DAP-2 kg	100 kg compost	Chick Pea	25	30						

Home stead	Year 2013	Home stead	Inter cropping	Oil seed	0.1	3	900	Seed-20 kg DAP-5 kg Urea 6 jg	100 kg compost	Oil	2	35						
				Potato							Potato	250	7					
				Methi							Methi	4	5					
			French Bean								French Bean	30	35					
			Mixed	Spinach	0.02			100			50 kg compost	Spinach	10	5				
				Tomato								Tomato	25	8				
				Dhaniya								Dhaniya	2	5				
				Carrot								Carrot	15	35				
				Radish								Radish	10	6				
			Tree	Year 2013	Home stead	Mango	2		300			50 kg compost	Mango	80	5			
						Jack fruit	3						Jack fruit	80	5	leaf	600 kg fodder	
						Sesem	3						Leaf	2000 kg fodder				
						Gamhar	4											
						Subabul	8											
			Livestock	Year 2013	Shed	Goat	15	0	14000	Feed-900 kg	Fodder 30000 kg	Meat	50	300				
Cow	6									Milk	750	20	dung	10500 kg as compost				
Bird	Year 2013	Caze	Pigeon	20		1000	Feed-200 kg	Feed 1000 kg	Pigeon	10	50							
			Duck	6						Egg	150	8						
Pond	Year 2013	Aquaculture	Fish fingerlings			3000	Fish feed	Compost 50 kg	Fish	Yet to harvest								
			Bottle gourd					Fish feed 100 kg	Bottle gourd	40	4							
		Ridge gourd						Ridge gourd	40	5								
		Okra						Okra	35	5								
2014	Main Field	Summer	Traditional	Dhaincha	.5	0	0	0	0	Leaf + Stem	Used as green Manure							
			Home stead	Traditional	Cucumber	.07	0	650	Seed-Diesel for irrigati on 7 litres	300 kg vermin compost	Cucumb er	40	10	Stem used as compost				
				Line sowing	Bottle Gourd						Bottle Gourd	100	5					
				Line sowing	Ridge Gourd						Ridge Gourd	50	5					
				Line sowing	Bitter Gourd						Bitter Gourd	40	5					
	Line sowing	Onion	0.04						Onion	150	10							
	Main Field	Kharif	K.P.S.	Paddy	1.00	22	1900	15 kg. DAP.	2500 kg. compost	Paddy	1700	11	Straw	850 kg as fodder				
			Azola	Azola					500 kg. compost	Azola	80 kg used as poultry feed							
			Inter cropping fencing with Kundrum	Cow pea	30	4	700	Seed , DAP-5 kg	Vermi compost 500 kg	Cow pea	35	25	Stem used as compost					
				Kudrum (Local)						Kudrum (Local)	10	32						
				Maize						Maize	60	12						
			Mixed cropping	Finger millet	1.00	4	1000	Seed	1000 kg. compost	Finger millet	50	20	Straw used as compost					
				Perl Millet						Perl Millet	45	12						
	Sarghum							Sarghum	35	10								
	Pigeon Pea							Pigeon Pea	60	35								
Cow pea							Cow pea	50	25									
Kodo Millet						Kodo Millet	20	10										
Kundrum						Kundrum	20	30										
Homestead	Year 2013	Line sowing with IPM	Brinjal	0.05	0	100	seed	200 kg. compost	Brinjal	125	15							
		Mixed	Okra	.02	0	100	Seed		Okra	20	15							
Main field	Rabi	Mixed	Ridge gourd					75 kg compost	Ridge gourd	25	5							
			Tomato							Tomato	30	10						
			Spinach							Spinach	10	5						
			Corriender							Corriender	4	10						
			Wheat	.35	4	1500	Seed-20 kg DAP-15 kg Urea 15 kg	400 kg compost	Wheat	110	12	straw						
			oil						oil	10	70	Oil cake						
			Mixed cropping	Chick Pea	0.05		400	Diesel for irrigati on	100 kg compost	Chick Pea	25	30						
				Oil seed						Oil	2	35						
			Inter cropping	Potato	0.05	2	400	Seed-20 kg DAP-2 kg	100 kg compost	Potato	150	10						
				Methi						Methi	4	5						
				French Bean						French Bean	20	35						
			Line sowing	Chilly	.02		300	DAP-1kg. Diesel	200 kg compost	Chilly	80	35						
			Home stead	Year 2014	Home stead	Mixed	Spinach	0.02		100		70 kg compost	Spinach	5	5			
						Tomato						Tomato	30	20				
						Carrot						Carrot	10	6				
Radish									Radish	15	5							
Tree	Year 2014	Home stead	Mango	2		0		0	Mango	0	5	2000 kg used for fodder						
			Jack fruit	3					Jack fruit	100	5							
			Sesem	3					Leaf	2000								

																	kg fodder	
			Gamhar	4													leaf	6000 kg as fodder
Livestock	Year 2014	Shed	Goat	20	0	20000	Feed-1200 kg	Fodder 30000 kg	Meat	60	300	dung	11000 kg for compost					
			Cow	6	Milk				800	22								
Bird	Year 2014	Caze	Pigeon	50		1600	Feed-200 kg	Feed 1000 kg	Pigeon	50	70							
			Duck	12					Egg	300	8							
Pond	Year 2014	Aquaculture	Fish fingerlings	pond		6000	Fish feed	Compost 50 kg Fish feed 100 kg	Fish	200	100							
			Pond Bund	Bottle gourd					Bund	0	0			100 kg Compost	Bottle gourd	70	4	
		Ridge gourd					Ridge gourd	40	5									
		Okra					Okra	20	15									
Vermi compost unit	Year 2014	2 unit vermi compost unit 2										Vermi compost	25 Quintal vermi compost					

Consolidated Chart:

Year	2012			2013			2014		
	Subsystem	Expenditure	Income	Net Profit	Expenditure	Income	Net Profit	Expenditure	Income
Agriculture	8200	23300	15100	8050	34440	26390	7150	40285	33135
Livestock	11000	16500	5500	14000	27000	13000	20000	35600	15600
Bird	0	0	0	1000	1700	700	1600	5900	4300
Pond	0	0	0	3000	535	-2465	6000	20780	14780
Tree	0	580	580	300	800	500	0	500	500
Vermi Compost	0	0	0	0	0	0	0	0	0
Total	19200	40380	21180	26350	64475	38125	34750	103065	68315



Introduction local seed, NADEP compost, vermin compost, azola, Dhalncha as green manure, Bio gas (by utilizing organic waste like cow dung, cow urine, duck and pigeon manure, biogas slurry, agricultural waste) of any subsystem's help to reduce the agricultural external input cost like HYV/HV seed, chemical fertilizer and pesticide and as well as introduction of improved package of practice of crops, utilization of waste land by cultivating low water requirement crops that enhance the productivity and diversity of his farm.

Established model of Integrated Farming System by Nandalal Singh has not only provided productive employment to all the members of the family throughout the year but also has ensured food and nutrition security for the family. By practicing integrated farming, he has found out solution of problems like negative return of his investment on agriculture through recycling waste of any subsystem and resource management. This result has increased production diversity, productivity and sustainability. This also enables him to think scientifically about farm planning. Introduction of kitchen garden helps him to reduce the annual expenditure on green vegetables. Now he is utilizing each and every inches of land for raising suitable field crops, vegetables. He is recycling all farm wastes and crop residues within the system. The practice of integrated farming has given his family food secured and the considerable extent of integration has done in his farm that reduced the dependence on market. Establishment of Village level seed bank, preservation and treatment of quality traditional seed, preparation of different compost, bio-fertilizer and practice of IPM make him self sufficient regarding supply of seeds, fertilizer, pesticides and production. Importantly, now he is realizing the benefits of farming according to laws of nature.

Now a day, Nandalal Singh is a model farmer for the youth and others, who are migrating in the cities for searching of jobs, instead of generating employment from their potential lands. Nandalal has shown that the Agriculture is a profitable venture if it has taken on the basis of proper farm planning. Other farmers are visiting him frequently to adopt his way of success.

He has decided to convert himself as an organic farmer within next three years. Increase of income has also changed his personality and mind set-up. Few years back he was thinking about only food security of his family due to less income and confidence. But, now a days, determination and confidence is being reflected in his voice: 'I have determined, I have to graduate my younger daughter. Now she is now in class VII and I want to see my son as a progressive Farmer instead of Government service holder after completion of his bachelor degree. I want to develop an agro horticultural model on near about 6 acre of waste land in our village with my other colleagues of Sahyaog Kishan Club and want to do voluntary service for scaling up IFS concept by providing capacity building training to other farmers of my area.' -Nandalal Singh

Photographs of his Farm-



