An impact assessment study of

“SRTT-CInI Project”

Enhancing livelihoods of tribal peoples in Jharkhand through agricultural land and water management

A collaboration project between

Sir Ratan Tata Trust (SRTT)

and

Central India Initiative (CInI)

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I. Introduction

This report attempts to assess the impact of Mission Hariyali, a collaboration project between the Sir Ratan Tata Trust (SRTT) and the Central India Initiative (CInI), with the aim of improving tribal livelihoods in the Saraikela-Kharsawan District of Jharkhand in India.

II. Methodology

II.A. Sampling method

To conduct the assessment, a stratified random sampling method was used at two levels: first, in determining the villages to be surveyed; and second, in determining the households to be sampled for questionnaire-based data collection.

(1) Village sample

Sample size: The project Focus Area comprises 16 villages. From this range, a target sample was set at 31.25% (5 villages). However, given the time constraints, substantial *quantitative* data was collected from a 25% sample (4 villages) only.

Sampling method: Villages were stratified according to two criteria:

1. **Demographic composition** – measured in terms of *ratio of tribal/non-tribal population*.
2. **Degree of SRTT-CInI intervention** – measured in terms of the *number of water structures installed in each village per household*. (This was the only quantifiably variable factor, since most interventions (such as paddy stabilization, agricultural training sessions, capacity building) were constant across villages.)

Once all 16 villages were stratified, 1 village was chosen from each of the 5 strata by an independent person. The selected villages are presented in bold in the following table.

Table 1 Village sample stratification, with selected villages in bold

	Tribal (SC/ST) population >50%	Tribal (SC/ST) population <50%
No of water structures per household	Jojo **Saharbeda** Sidmakudar	Bitapur Dasiadih **Sarmali**
	Mosodih Golpapur Rakakocha	Koira-Begnadih **Kendua** Baksahi
	Kadambera Kalyandih-Parganathdih **Lakhodih** Sokhandih-Sildrungi	

(2) Household sample

Sample size: For the purposes of questionnaire-based data collection, a target sample was set at 20% of households per village. However, given the time constraints, substantial *quantitative* data from questionnaires was collected from a sample of approximately 18% of households. This is shown in Table 2.

Sampling method: Households were stratified according to economic status on a peer basis amongst villagers.

Table 2 Target and actual household sample sizes for each of the sample villages

Stratum	Village	Target sample (approx 20%)	Actual sample of quantitative data collected (approx 18%)
1	Saharbeda	6	2
2	Mosodih	11	8
3	Lakhodih	11	8
4	Sarmali	20	20
5	Kendua	22	18

II.B. Data collection method

The primary method of data collection was via questionnaires with individual householders. The questionnaires contained open and closed questions intended to obtain both quantitative and qualitative data from villagers. A sample questionnaire is included in the Appendices.

The questionnaires were supported and triangulated by focus group discussions (FGDs) and one-to-one discussions with villagers who appeared to be benefiting less from the interventions.

II.C. Criticisms of methodology

The following problems, inter alia, were encountered in the data collection phase.

1. **Time constraints and the scope of data**: the impact assessment was completed in a period of approx. 6 weeks and, as a consequence, necessarily limited in breadth and depth. In particular:
    a. **Socio-economic impact**: changes in proportion of income deriving from agriculture and allied activities versus other sources such as labouring; the impact of village-level institutions and capacity building activities on village social strata and cohesion.
    b. **Environmental impact**: the impact of wasteland reclamation and plantation activities.

2. **Sample size**: as indicated above, the target sample sizes for (i) villages and (ii) households were not met due to time constraints.

3. **Sample stratification**:
    a. **Village stratification**: the stratification by the 'number of water structures installed in each village per household' did not take into account the range of *landholding* amongst villagers.

    b. **Household stratification**: the peer-based stratification by economic status did not account for *tribal/non-tribal status*. The sample is consequently limited in its demographic representation.

4. **Absence of sample controls**: data collection was limited to the project beneficiary villages. Whilst the sample included a substantial portion of *less-benefiting villagers*, data analysis would be more reliable if it included controls in terms of:
    a. *non-beneficiary householders* from beneficiary villages; and/or
    b. *non-beneficiary village(s)*.

5. **Insufficient triangulation**:
    a. The *quantitative* data from questionnaires was insufficiently triangulated with other sources of quantitative data such as *village-held or government-held records*.

b. Similarly, the number of focus group discussions was insufficient to provide substantial triangulation of *qualitative* data.

6. **Translation problems**: questionnaires and FGDs were conducted, and translated for the assessor, by TSRDS team members. This time-inefficient process compromised the quantity and quality of data. This particularly affected the richness of farmers' personal accounts of their problems and wellbeing.

7. **Reliance on villager participation**: since data was collected from villagers' personal accounts, rather than objective sources, it may be compromised by absence of inaccuracy of their recollection, reticence or distortion in disclosing sensitive personal information, and related problems. In particular:
    a. *Income*: from agriculture and allied activities
    b. *Migration*: months of migration and income gained from migratory labour in previous years

III. Impact assessment: data presentation and analysis

III.A. Overview of analysis

The collected data was analysed using the following framework:

1. Agricultural impact
    a. Kharif crop-focused interventions
    b. Rabi crop-focused interventions
    c. Overall impacts across both seasons
2. Socio-economic impact
    a. Income from agriculture and allied activities
    b. Food security
    c. Migration
    d. Other socio-economic indicators
        i. Capacity building through village-level institutions
        ii. Financial security (specifically, bank accounts and debt)
        iii. Dietary patterns
        iv. School attendance

III.B. Agricultural impact

III.B.I. Kharif crop interventions

The interventions were focused on reducing two main problems facing farmers in the kharif season:

1. **Rainfall failure** – late, reduced or no rainfall, especially failure of the nursery period or September '*Hathia*' rains
2. **Low productivity** – mainly due to poor quality seeds and inefficient local cultivation methods

The main interventions included:

1. **Support water:** Installing water structures to provide support water to mitigate rainfall failures
2. **Paddy stabilisation:** Introducing 'High Yielding Variety' paddy seeds and more efficient paddy cultivation methods, namely 'transplanting' or 'linear seeding'
3. **Kharif diversification:** encouraging farmers to adopt non-paddy crops in kharif
4. **Training sessions:** training targeting both paddy and non-paddy crops (i.e. stabilisation and diversification) – to support the above interventions

III.B.I.1. Paddy crop stabilisation

Note: data on the impact of water structures kharif season is included below in the 'Rabi crop interventions' section.

Adoption of fertilisers, transplanting and linear seeding

Table 3 shows the adoption of the new cultivation methods and fertilisers in terms of the percentage of cultivable land covered by each method across the sample villages.

Table 3 % Adoption of each cultivation method and of fertilisers in terms of land coverage

	% Land coverage			
	Broadcasting	Transplanting	Linear seeding	Fertilisers
Before	100.00	0.00	0.00	1.59
After	42.63	41.67	15.70	24.21
Difference	-57.37	41.67	15.70	22.62

Table 3 indicates that jthe new cultivation methods (either transplanting *or* linear seeding) were used on 57% of land in the last seeding period, whereas all land was sown using the local broadcasting technique before project intervention.

The corresponding increase in fertiliser was lower. Before the project, only 1.59% of land was fertilised; in the later period, this had increased to 22% of land was fertilised.

However, analysis of the percentage of farmers adopting each method provides greater indication of farmers' perception and is not distorted by differences in the size of farmers' landholding. This is shown in Table 4.

Table 4 % Adoption of each cultivation method and of fertilisers in terms of number of farmers

	% Farmers			
	Broadcasting only	Combination of methods	New methods only	Fertilisers
Before	100.00	0.00	0.00	3.70
After	27.78	51.85	20.37	31.48
Difference	-72.22	51.85	20.37	27.78

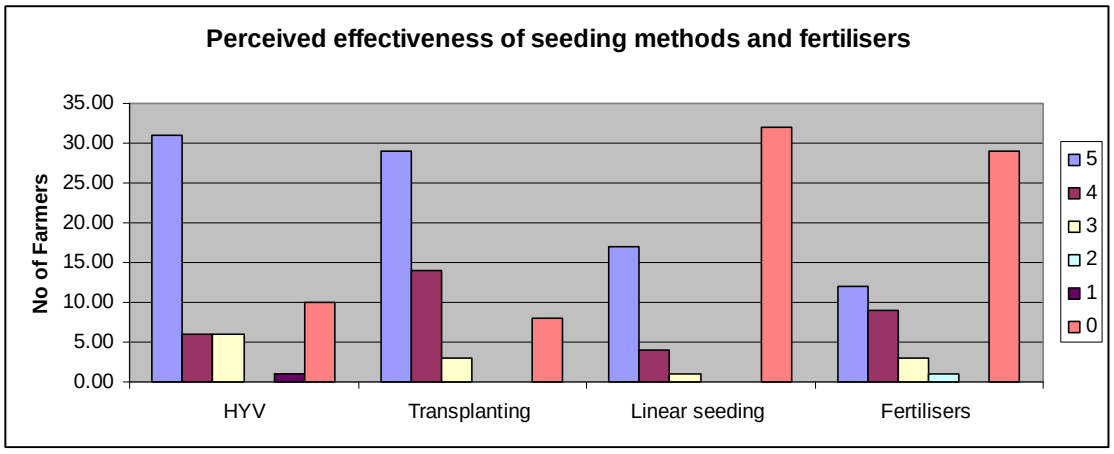
On this analysis, broadcasting is predominant: 25% farmers use broadcasting exclusively (i.e. on *all* of their land) and 51% farmers use broadcasting on *some* of their land, in combination with either transplanting or linear seeding.

On the same analysis, the usage of fertilisers – by 31% of farmers – is higher.

Perceived effectiveness of seeding methods and fertilisers

The data in Tables 3 and 4 was triangulated with an assessment of the effectiveness of each method in farmers' perceptions presented in Figure 1. Farmers were asked to rank each method from 1 – 5, from very ineffective (1) to very effective (5). A score of 0 indicates that the farmer does not use the method or did not disclose his perception of the structures' effectiveness.

Figure 1 Perceived effectiveness of each cultivation method and of fertilisers in terms of number of farmers



According to Figure 1, 31 farmers (57%) scored HYV seeds at 5 out of 5, whilst 12 farmers (22%) scored them at 3 or 4 out of 5. Resoundingly, therefore, farmers perceive HYV seeds to be more effective than local paddy seeds.

Regarding cultivation methods, 29 farmers (53%) perceived transplanting to be very effective, and 17 farmers (31%) scored linear seeding in the same way. The score for the latter is lower because linear seeding has not been introduced in all sample villages.

The perceived effectiveness of fertilisers is much lower, with only 12 farmers (22%) giving a 5 out of 5 score. However, on the basis of discussions with respondent farmers, it is suggested that farmers discounted some of the effectiveness of fertilisers due to their high cost.

Paddy productivity

Whereas Tables 3 and 4 present the impact of paddy interventions in terms of *changes in farming habits* (particularly in the initial stages of kharif season), Table 5 presents their impact in terms of *output*. Table 5 shows the productivity of paddy crops before and after project intervention, measured as the average KG yield per acre.

Table 5 Comparison of local and HYV paddy productivity before and after product intervention

	Paddy productivity (average yield per acre)	
Local paddy	Average local paddy productivity: Before	930.11
	Average local paddy productivity: After	1149.19
	Cumulative average local paddy productivity: Before + After	1039.65
HYV paddy	Average HYV paddy productivity: After only	1825.99
Differences	Difference: Local after - Local before	**219.08**
	Difference: HYV - Local (cumulative)	**786.35**

Two comparisons are pertinent. First, as between *local paddy before and after* intervention, productivity has increased by 219.08 KG/acre. Second, as between *HYV paddy and local paddy* (measured as an average of productivity before and after intervention), HYV is 786.35 KG/acre more productive. This method of comparing the two crop varieties independently shows that *both* HYV seeds and new cultivation methods are contributing to greater paddy productivity.

Land suitability and appropriate technology

However, the results in Tables 3, 4 and 5 do not account for variations in land topography. The new cultivation methods (transplanting and linear seeding) are only suited to low- or middle-land areas. Consequently, adoption rates and productivity are concentrated in those areas, whilst upland farmers benefit much less from the project interventions. The underlying problem of land suitability raises issues of appropriate technology, discussed in the Recommendations section.

III.B.I.2. Kharif crop outputs

Table 6 details the average (per farmer) coverage, yield, productivity of the last kharif crop. It also details farmers' approximate revenue, calculated on the basis of actual revenue figures or on the going market rate (Rs per KG) of each crop.

Table 6 Average kharif crop outputs before and after project intervention

Crop Type	Output	Before	After	Difference	% Increase
Local paddy	Coverage (Acres)	2.86	1.57	-1.29	
	Yield (KG)	2658.98	1800.93	-858.06	
	Productivity (KG per acre)	930.11	1149.19	219.08	
	Revenue (Rs)	13361.11	10884.63	-2476.48	
HYV paddy	Coverage	0.00	1.47	1.47	
	Yield	0.00	2679.81	2679.81	
	Productivity	0.00	1825.99	1825.99	
	Revenue	0.00	19095.37	19095.37	
Cereals	Coverage	0.01	0.02	0.01	
	Yield	5.56	6.48	0.93	
	Productivity	600.00	350.00	-250.00	
	Revenue	66.67	666.67	600.00	
Vegetables	Coverage	0.00	0.08	0.08	
	Yield	0.00	21.41	21.41	
	Productivity	0.00	267.28	267.28	
	Revenue	0.00	1680.96	1680.96	
Oilseed	Coverage	0.00	0.01	0.01	
	Yield	0.00	1.48	1.48	
	Productivity	0.00	160.00	160.00	
	Revenue	0.00	59.26	59.26	
Pulses	Coverage	0.00	0.06	0.06	
	Yield	0.00	45.74	45.74	
	Productivity	0.00	823.33	823.33	
	Revenue	0.00	22.22	22.22	
TOTAL	Coverage	2.87	3.20	0.33	111.51
	Yield	2664.54	4555.85	1891.31	170.98
	Productivity	929.04	1424.53	495.49	153.33
	Revenue	13427.78	32409.11	18981.33	241.36

As Table 6 indicates, average kharif outputs have increased significantly since project intervention. Over the project period, average crop coverage has increased by approximately 112% from 2.87 acres to 3.20 acres per farmer; yield has increased by over 170%; and productivity by over 153%.

Similarly, on these statistics, overall average kharif revenue has increased by 241%. However, the inclusion of approximate paddy revenues is subject to criticism since a substantial portion of the farmers' paddy crop goes to their own consumption. Further enquiry into the proportion of increased paddy yields going to consumption, as opposed to cash income, are necessary. For the purposes of approximating average farmer incomes, potential paddy income figures have been excluded (see below).

III.B.II. Rabi crop interventions

The main problem facing farmers in rabi season is water supply. The interventions aimed to mitigate this problem include:

1. **Water harvesting and storage:** Installing water structures to harvest and store water across both seasons for use in rabi season.
2. **Training sessions:** training for productive growth of non-paddy (vegetables, cereals, pulses, oilseeds, etc) crops

III.B.II.1. Water structure interventions

Number of water management structures

Table7 details the number of water structures installed in the sample villages across the project period.

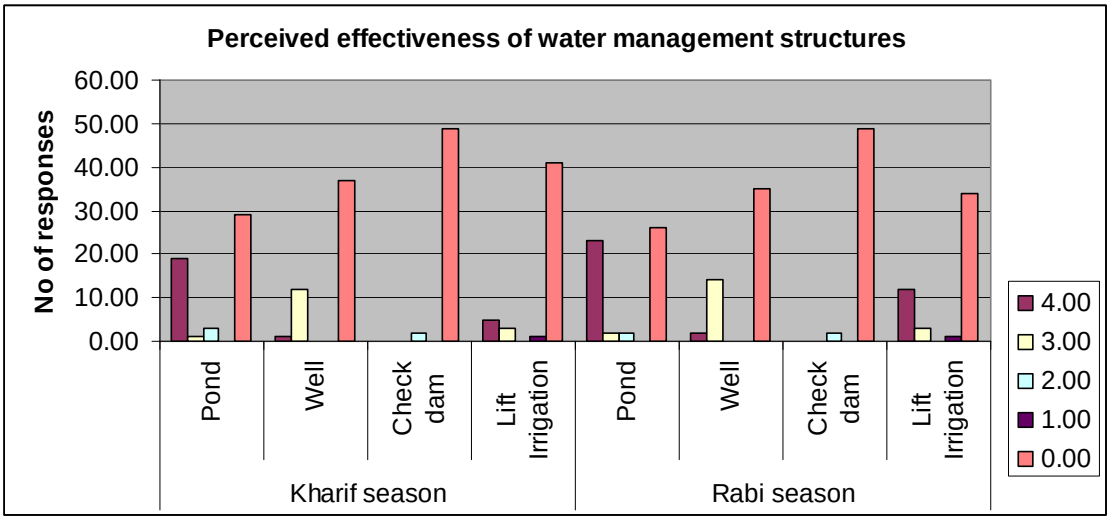
Table 7 Number of water management structures installed in the sample villages

Village	Ponds	Irrigation Well	Check Dam	Lift Irrigation	Total
Mosodih	5	2	0	0	7
Sarmali	3	4	0	1	8
Kendua	4	5	0	0	9
Lakhodih	1	4	0	1	6
Saharbeda	0	1	0	0	1
TOTAL	13	16	0	2	31

Perceived effectiveness of water management structures

Figure 2 indicate the ranked effectiveness of each water structure in each season as perceived by farmers. A ‘0’ score indicates that the farmer did not have access to any water structures or did not disclose their effectiveness.

Figure 2 Perceived effectiveness of water management structures



Irrigated cultivable land increase

The installation of the 30 water structures across the 4 sample villages (excluding Saharbeda, for which quantitative data was not obtained) has triggered a substantial increase in the area of irrigated land relative to non-irrigated or uncultivable land. Table 9 details these changes and indicates that over 26% of all land has been become irrigated over the project period. The total irrigated land area now stands at 84.13 acres, representing 47.58% of all land.

Table 8 Area of land types before and after project intervention

Type of land	Area (acres)	Before	After	Difference
Irrigated land	Total land	**34.75**	**84.13**	**49.38**
	Average land per farmer	0.66	1.56	**0.90**
	% of all land	21.68	47.58	**25.90**
Non-irrigated land	Total land	**120.88**	**88.50**	-32.38
	Average land per farmer	2.28	1.64	-0.64
	% of all land	75.41	50.06	-25.35
Uncultivable land	Total land	**4.68**	**4.18**	-0.50
	Average land per farmer	0.09	0.08	-0.01
	% of all land	2.92	2.36	-0.55

However, qualitative data obtained through discussions with farmers indicates that project intervention could produce a greater impact on land irrigation.

Factors affecting water availability

Table 9 shows a range of factors affecting water availability in the sample villages. Farmers were asked to state whether or not each of the listed factors affects their water availability. However, only 13 out of 54 farmers responded,

citing in particular ‘access,’ (approx 38%), ‘lack of resources’ (30%), ‘remoteness’ (7%) and physical hindrance (15%).

While the data is not representative of the entire sample group (representing only 24% of the sample), it can still be said that, at lease to some extent, the presence of the cited factors acts a barrier to equal distribution of the benefits of project intervention. As such, these factors limit the overall impact of project intervention and should be targeted over the course of further project intervention.

Table 9 Factors affecting water availability in the sample villages

	Access	Social rivalry	Lack of resources	Remoteness	Physical hindrance	Alternative activities	Seasonality
% Responding farmers	38.46	0.00	30.77	7.69	15.38	0.00	7.69
% All farmers	9.26	0.00	7.41	1.85	3.70	0.00	1.85

III.B.II.2. Rabi crop outputs

Adoption of multi-cropping

Multicropping describes the growing of more than one crop per year – in this case, in kharif and rabi seasons. The latter is only possible when sufficient water is available and is thus facilitated by water management structures. Table 10 shows the number of farmers adopting multicropping (i.e. growing a crop in kharif and rabi season) before and after the project period. Over the period, approximately 72% of farmers have begun multicropping, which represents over 73% of tribal farmers and 72% of non-tribal farmers.

Table 10 Rate of multicropping across the sample villages

Multicropping rate	Before	After	Difference
No of tribal farmers	1.00	18.00	17.00
% of tribal farmers	4.35	78.26	73.91
No of non-tribal farmers	1.00	23.00	22.00
% of non-tribal farmers	3.23	74.19	70.97
Total no of farmers	2.00	41.00	**39.00**
% of all farmers	3.70	75.93	**72.22**

Rabi crop outputs

Table 11 details the average (per farmer) coverage, yield, productivity of the last rabi crop. It also details farmers' approximate revenue, calculated on the basis of actual revenue figures or on the going market rate (Rs per KG) of each crop.

Table 11 Average rabi crop outputs before and after project intervention

Crop type	**Output**	**Before**	**After**	**Difference**	**% Increase**
Cereals	Coverage (Acres)	0.00	0.32	0.32	
	Yield (KG)	0.00	109.63	109.63	
	Productivity (KG per acre)	0.00	344.69	344.69	
	Revenue (Rs)	0.00	985.19	985.19	
Vegetables	Coverage	0.00	0.55	0.55	
	Yield	5.56	939.07	933.52	
	Productivity	6000.00	1696.70	-4303.30	
	Revenue	27.78	7768.70	7740.93	
Oilseed	Coverage	0.01	0.07	0.07	
	Yield	2.04	16.74	14.70	
	Productivity	220.00	224.60	4.60	
	Revenue	71.30	614.07	542.78	
Pulses	Coverage	0.00	0.00	0.00	
	Yield	0.00	0.11	0.11	
	Productivity	0.00	240.00	240.00	
	Revenue	0.00	5.56	5.56	
TOTAL	Coverage	0.01	0.95	0.94	9293.18

	Yield	7.59	1065.56	1057.96	14034.15
	Productivity	745.45	1125.75	380.30	151.02
	Revenue	99.07	9373.52	9274.44	9461.12

As Table 11 indicates, average rabi outputs have increased significantly since project intervention. Over the project period, average crop coverage has increased from an average of only 0.01 acres to 0.95 acres per farmer; yield has increased by over 1065 KG per farmer; and productivity by over 151%.

Similarly, on these statistics, overall average kharif revenue has increased by Rs 9274 per farmer. This figure provides a more accurate indication of farmers' revenues since a substantial part of rabi crop is sold for cash, whereas kharif paddy is retained for consumption. This is considered below in the discussion of increases in farmers' income.

III.B.III. Overall impact on agriculture

III.B.III.1. Cropping intensity

Cropping intensity and land use efficiency

Cropping intensity (calculated on the basis of the area of each farmer's land cropped across kharif and rabi season cumulatively) has increased by 1.27 acres per farmer, of which 0.94 acres represent rabi crop coverage.

Table 12 Cropping intensity before and after project intervention

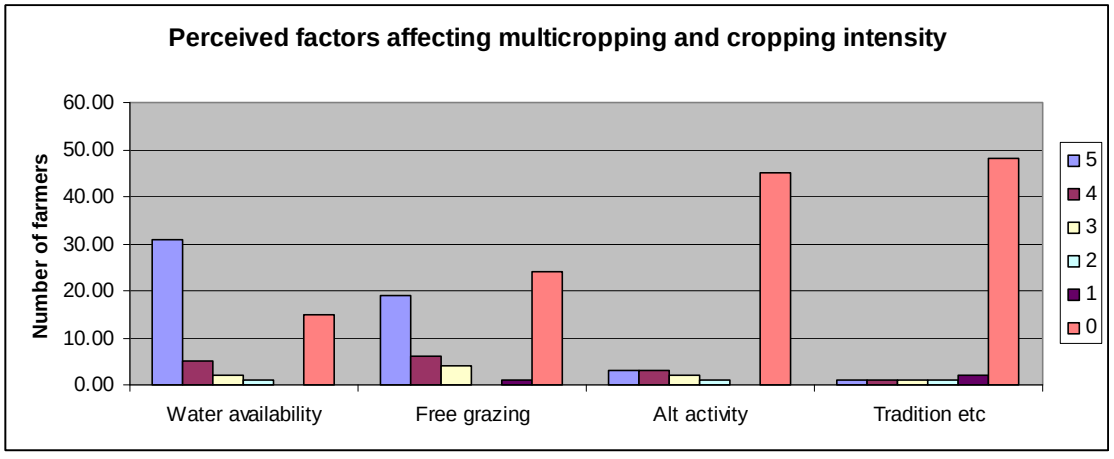
	Cropping Intensity (Acres)								
	Before			After			Difference		
	Kharif	Rabi	TOTAL	Kharif	Rabi	TOTAL	Kharif	Rabi	TOTAL
Total area cropped	154.88	0.55	**155.43**	172.70	51.11	**223.81**	17.83	50.56	**68.39**
Average area cropped (per farmer)	2.87	0.01	**2.88**	3.20	0.95	**4.14**	0.33	0.94	**1.27**

This increased cropping intensity promotes more efficient land use since land is not lying fallow in rabi season. In fact, given that the average cultivable area is 3.19 acres per farmer, the cropping intensity of 4.14 acres after intervention represents 130% land use efficiency.

Factors affecting cropping intensity

However, from farmers' perspectives, there remains scope for greater cropping intensity, and more efficient land use. Figure 3 details farmers' rankings of the effect of four factors on multicropping and crop intensity. A scale between 0 (no effect) and 5 (very substantial effect) was used. However, a '0' score was also given to non-responses, which may distort findings.

Figure 3 Factors affecting multicropping and cropping intensity as perceived by farmers



Evidently, farmers perceive that ‘water availability’ and ‘free grazing’ are greater bars than an ‘alternative profitable activity’ or ‘tradition etc’ (such as a reluctance to renounce traditional cultivation methods).

Since the former bar falls directly under the remit of the SRTT-CInI Project, this observation indicates further interventions may be required. The latter, falling outside the project remit, could be made the subject of future interventions.

III.B.III.2. Crop diversity

Adoption of diverse crops

Table 13 shows the number and percentage of farmers adopting each type crop in each season, and cumulatively across both seasons, before and after project intervention.

Table 13 Adoption of crops in each season before and after project intervention

Crop type	Proportion of farmers	Before			After			Difference		
		Kharif	Rabi	Both	Kharif	Rabi	Both	Kharif	Rabi	Both
Local paddy	No. of farmers	54.00	0.00	54	38.00	22.00	60	-16.00	22.00	6
	% of all farmers	100.00	0.00	100	70.37	40.74	111.11	-29.63	40.74	11.11
HYV paddy	No. of farmers	0.00	1.00	1	47.00	39.00	86	47.00	38.00	85
	% of all farmers	0.00	1.85	1.85	87.04	72.22	159.26	87.04	70.37	157.41
Cereals	No. of farmers	1.00	1.00	2	2.00	12.00	14	1.00	11.00	12
	% of all farmers	1.85	1.85	3.7	3.70	22.22	25.92	1.85	20.37	22.22
Vegetables	No. of farmers	0.00	0.00	0.00	14.00	1.00	15	14.00	1.00	15
	% of all farmers	0.00	0.00	0.00	25.93	1.85	27.78	25.93	1.85	27.78
Oilseed	No. of farmers	0.00	2.00	2	1.00	41.00	42	1.00	39.00	40
	% of all farmers	0.00	3.70	3.7	1.85	75.93	77.78	1.85	72.22	74.07
Pulses	No. of farmers	0.00	0.00	0.00	3.00	22.00	25	3.00	22.00	25
	% of all farmers	0.00	0.00	0.00	5.56	40.74	46.3	5.56	40.74	46.3

As Table 13 indicates, the adoption of non-paddy crops has increased over the project period. In relation to cereal crops, 1.85% more farmers adopt the crop in kharif, and 20.37% more in kharif, than before intervention. The percentage increases for vegetables, oilseeds and pulses are 25.93% and 1.85%, 1.85% and 72.22%, and 5.56% and 40.74%, respectively.

Coverage of diverse crops

Table 14 shows crop diversity in terms of the area covered by each crop type in each season before and after project intervention. The coverage of each crop is shown in terms of actual acres, and as a percentage of total crop coverage.

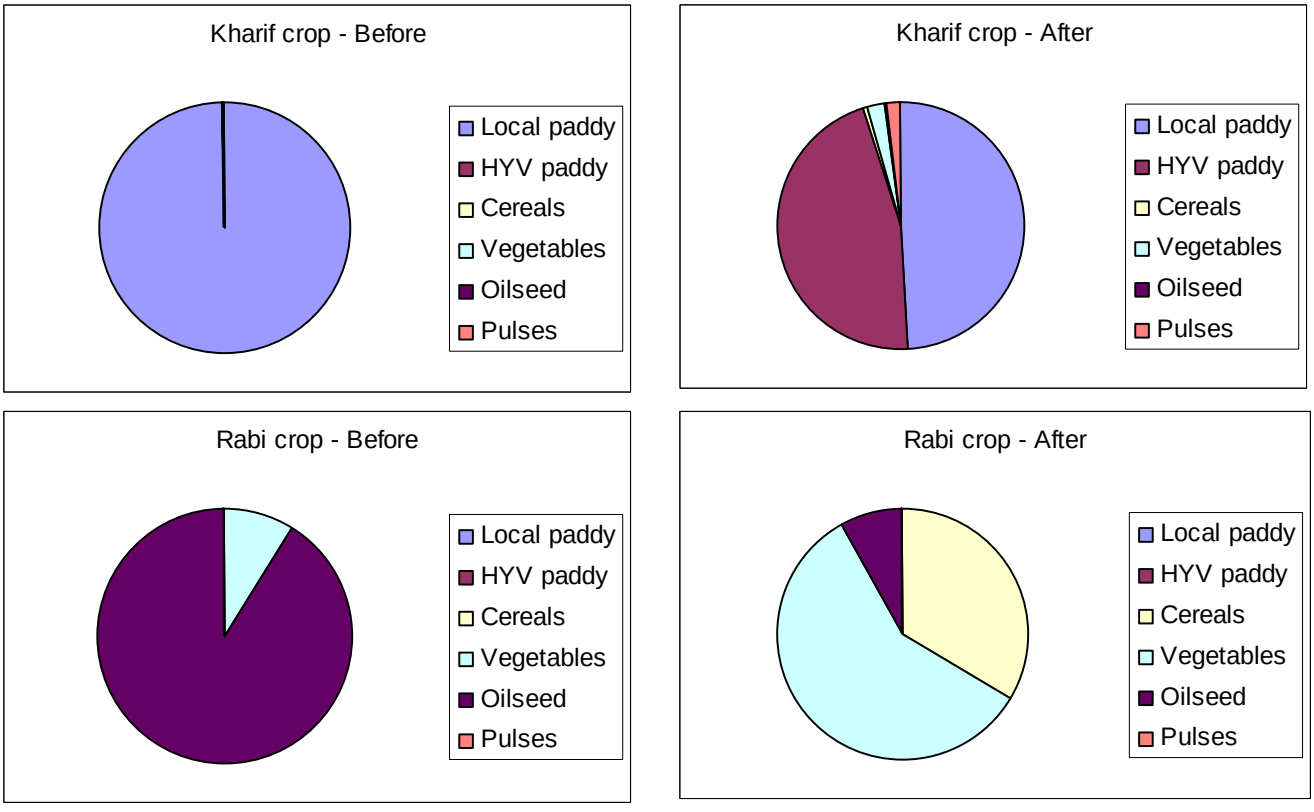
Table 14 Coverage of crops in each season, and cumulatively, before and after project intervention

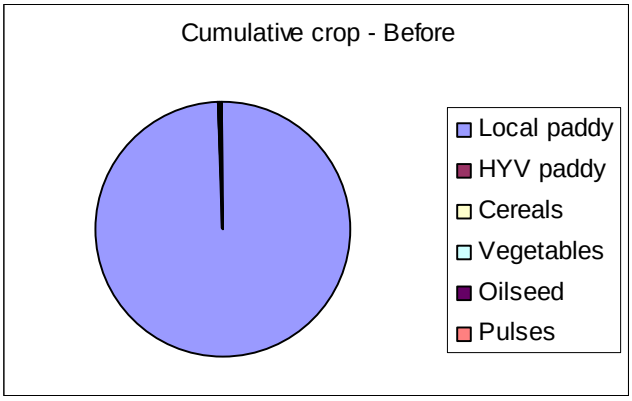
Crop type	Proportion of crop	Before			After			Difference		
		Kharif	Rabi	Both	Kharif	Rabi	Both	Kharif	Rabi	Both
Local paddy	Coverage (acres)	154.38	0.00	154.38	84.63	0.00	84.63	-69.75	0.00	-69.75
	% Total crop coverage	99.68	0.00	99.32	49.00	0.00	37.81	-50.68	0.00	-61.51
HYV paddy	Coverage (acres)	0.00	0.00	0.00	79.25	0.00	79.25	79.25	0.00	79.25
	% Total crop coverage	0.00	0.00	0.00	45.89	0.00	35.41	45.89	0.00	35.41
Cereals	Coverage (acres)	0.50	0.00	0.50	1.00	17.18	18.18	0.50	17.18	17.68
	% Total crop coverage	0.32	0.00	0.32	0.58	33.60	8.12	0.26	33.60	7.80
Vegetables	Coverage (acres)	0.00	0.05	0.05	4.33	29.89	34.21	4.33	29.84	34.16
	% Total crop coverage	0.00	9.09	0.03	2.50	58.47	15.29	2.50	49.38	15.25
Oilseed	Coverage (acres)	0.00	0.50	0.50	0.50	4.03	4.53	0.50	3.53	4.03
	% Total crop coverage	0.00	90.91	0.32	0.29	7.87	2.02	0.29	-83.03	1.70
Pulses	Coverage (acres)	0.00	0.00	0.00	3.00	0.03	3.03	3.00	0.03	3.03
	% Total crop coverage	0.00	0.00	0.00	1.74	0.05	1.35	1.74	0.05	1.35
TOTAL	Coverage (acres)	154.88	0.55	155.43	172.70	51.11	223.81	17.83	50.56	68.39

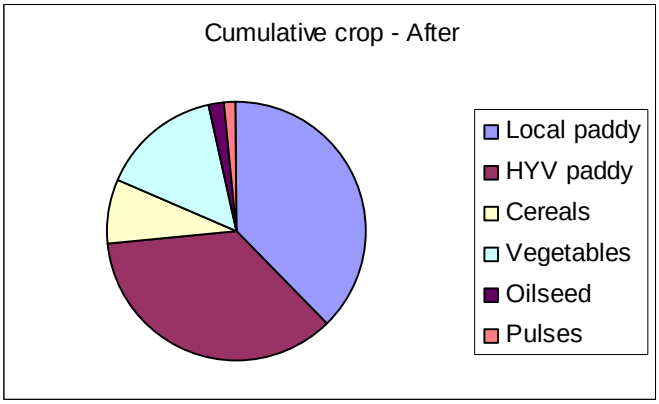
From this table, it can be seen that paddy crop accounted for 99.32% of the total crop. After project intervention, this figure has reduced to 73.22% (accounting for both local and HYV varieties). By contrast, the percentage of non-paddy crops has increased from 0.68% to 26.78% of the total crop.

These observations are observed more clearly when the findings are presented diagrammatically, as in Figure 4.

Figure 4 Pie charts showing crop diversity before and after project intervention







Observed dietary changes

In addition to the changes noted above in relation to quantitative data, discussions with villagers confirmed that the increased production of non-paddy crops has precipitated into changes in dietary patterns, i.e. it is being used as a food crop, not only simply as a cash crop. A significant number of villages stated that their diets now included chapatis, gringal, potatoes and ladies' fingers, amongst other vegetables.

III.C. Socio-economic impact

III.C.I. Agricultural revenue

Table 15 presents an approximation of the average agricultural revenue per farmer. This was calculated, primarily, on the basis of the actual sale price obtained for their produce. Where no such data were available, revenue was estimated by multiplying the yield by the annual average going market rate for each crop. However, paddy was deducted from the final analysis because the bulk of paddy crop goes to consumption, not revenue. According to Table 15, therefore, total revenue has increased by Rs 11636 per farmer.

Table 15 Approximate average agricultural revenue per farmer

Average revenue per farmer	**Before**	**After**	**Difference**
Kharif total revenue (Rs)	13427.78	32409.11	**18981.33**
Kharif non-paddy revenue (Rs)	66.67	2429.11	**2362.44**
Rabi total revenue (Rs)	99.07	9373.52	9274.44
Total revenue[1] (Rs)	165.74	11802.63	11636.88

The data in Table 15 can be analysed alongside the data on the approximate average agricultural outgoings per farmer *for the last year*, collected in Table 16. As such, the average agricultural income for the last year can be calculated as Rs 3290.88 (Total revenue – Total outgoings).

Table 16 Approximate average agricultural outgoings per farmer

Season	**Outgoings**			
	Seed cost	Labour cost	Fertiliser cost	TOTAL Cost
Kharif	907.87	3986.85	1480.28	6375.00
Rabi	600.83	731.48	638.80	1971.11
Difference (rabi – kharif)	-307.04	-3255.37	-841.48	-4403.89
Total (rabi + kharif)	1508.70	4718.33	2119.07	8346.11

Reliability of data on agricultural revenue and outgoings

However, it is suggested that the data presented Tables 15 and 16 are not totally reliable or representative. This is for a number of reasons.

- Revenue was estimated where actual sale prices were unavailable;
- No account was taken of the actual percentages of yield going to revenue, as opposed to consumption – especially in relation to paddy crop;
- Outgoings were only calculated in relation to the last year, so no comparison can be made between outgoings before and after the project intervention.

[1] Calculated as: Kharif non-paddy revenue + Rabi total revenue

III.C.II. Food security and out migration

Farmers were asked to indicate in which months over the past year they had experienced 100% food security and in which months had migrated out of the villages for employment elsewhere (mostly to Calcutta for bricklaying).

Figure 5 shows the results per month. In terms of food security, 100% of farmers experienced food security from January to May. However, this figure dropped from June onwards, with only 87% of farmers having food security in October and November. The figures for migration were less positive, with an average of 6.6% of farmers migrating for at least one month across the year.

Figure 5 Line graph showing (a) the number of farmers with 100% food security and (b) the number of farmers migrating for each month over the past year

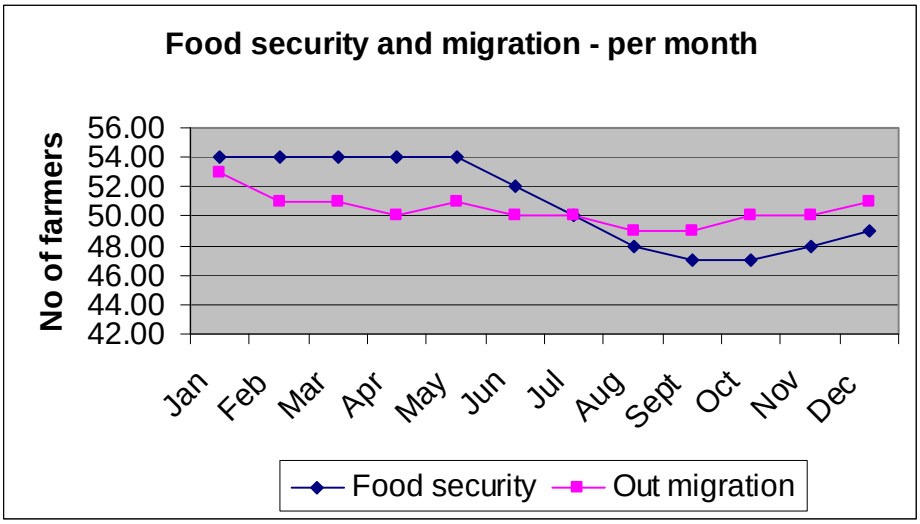
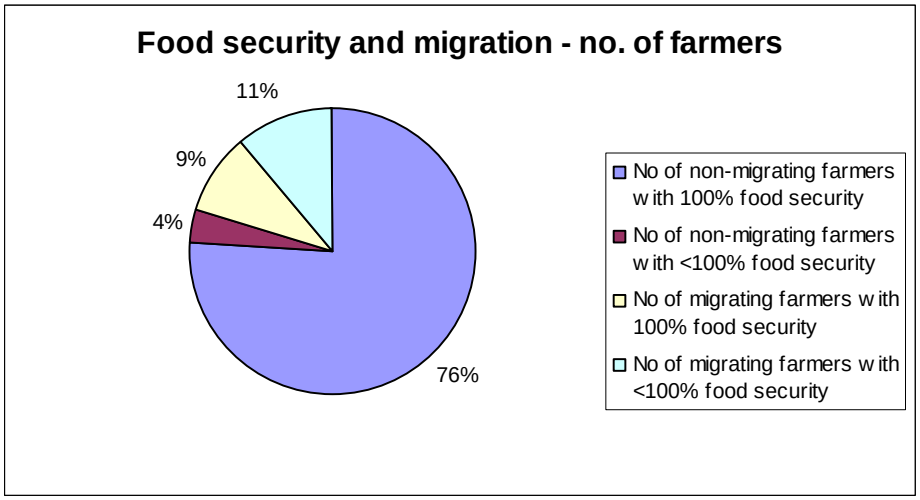


Figure 6 represents the results in relation to the number of farmers. 76% of farmers indicated both that they experienced both 100% food security and did not migrate.

Figure 6 Pie chart showing food security and migration rates in terms of the number of farmers



III.C.III. Other socio-economic indicators

Quantitative and qualitative data was collected in relation to a number of other socio-economic indicators, including financial security, school attendance by village children and capacity building.

Financial security
Out of the sample of 54 households, 64.81% of households held a bank account, and 22.22% were in debt.

School attendance
Out of the 43 households with children, the children of 95.35% of the households attended school.

Capacity building through training sessions and village-level institutions
In both individual and group discussions, all farmers consistently responded that the village-level institutions (Village Development Committees, Water User Groups, Self-Help Groups, etc) introduced by the project were *suitable*, *effective* and *sustainable*. However, many farmers did not know from where the village-level institutions could obtain funds.

In relation to the training sessions, those farmers who had attended training sessions regarded them as *effective*. Some expressed preferences regarding:

- Number: most farmers requested more training sessions.
- Type: many farmers requested *agriculture*-focused, and particularly *rabi*-focused, training sessions. Some farmers also requested emphasised training sessions focusing on *uphill farming*.
- Location: many farmers requested *on-site* (i.e. in-village) training sessions.

However, some farmers appeared to be unaware of some of the training sessions and so could not benefit by attending.

III.C.IV.Sustainability of interventions

Source of seeds used in kharif and rabi seasons

Farmers were asked from where they sourced their seeds for kharif and rabi season before and after project intervention. A comparison of Figures 7 and 8 shows that there is an increased dependence on TSRDS for seeds: whereas previously, TSRDS provided 6% of seeds, it is now the source of 62% of seeds. Correspondingly, the percentage of seeds sourced by farmers from their own supplies has decreased from 73% to 20%.

Figure 7 Pie chart showing the source of seeds before project intervention

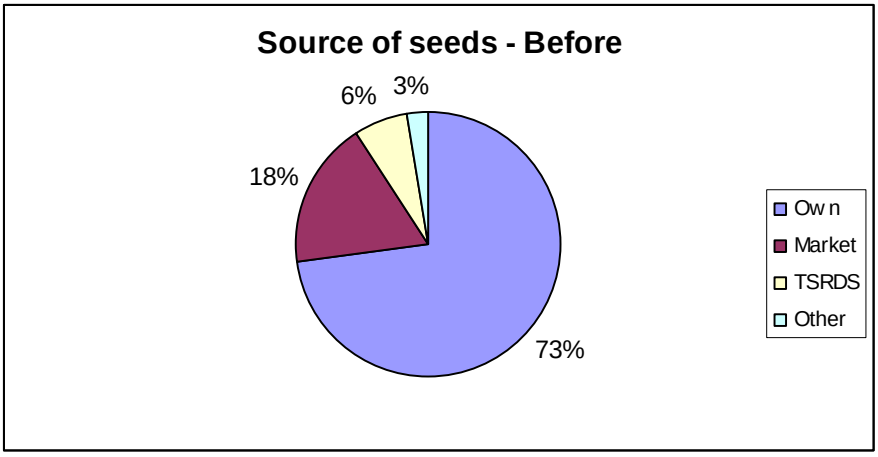
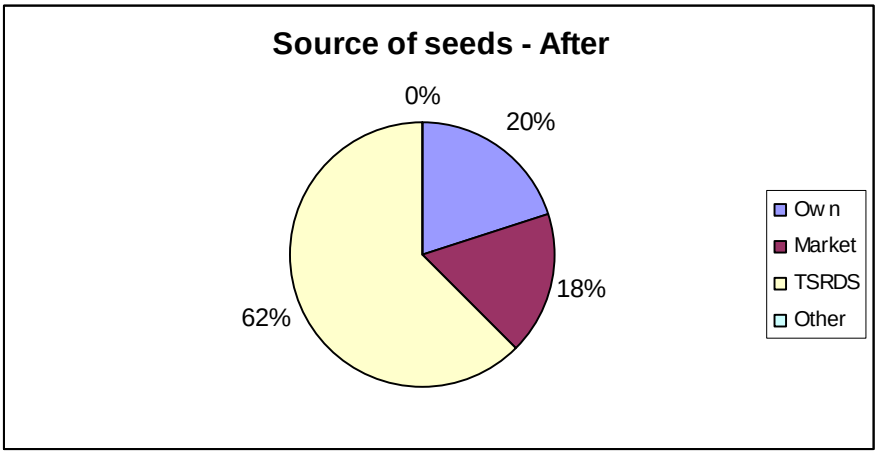


Figure 8 Pie chart showing the source of seeds after project intervention



Funding of water structures

Through individual and group discussions with villagers, it is apparent that many farmers perceive that the majority of funding for the water structures (for installation and maintenance) has been – or will be – provided by TSRDS. Whilst in reality the funding is borne or shared by the villagers (either individually or collectively), it is concerning that the above (erroneous) perception prevails. As a consequence, there is a lack of future planning regarding the water structures in

the village communities. In particular, many Water User Groups had not introduced water charges or established a corpus fund to provide for maintenance, nor had they considered insurance for the water structures.

IV. Recommendations

The following section includes some recommendations as to how the SRTT-CInI Project might be modified, strengthened or re-focused to maximise the benefit to the village communities in Sarakeila-Kharsawan District.

General approach to intervention

It is suggested that the current interventions are individually well-focussed, but lack an overarching framework. Consequently, villagers cannot understand how individual projects contribute to their overall wellbeing and thus do not appreciate the wider benefits of the interventions, for example how a successful *rabi* crop can support a nutritionally better-balanced diet.

It is therefore recommended that the project adopts a more holistic approach in its programme of interventions and underpin the interventions with an *educational programme* aimed at informing villagers how the individual projects combine together to produce long-term improvements in nutrition lifestyle, etc.

In addition, by *focusing on villagers' perspective* (i.e. ensuring that villagers understand the logic of the interventions), the project could encourage more community-level *collective action*. It is suggested that one particular benefit of this approach would be the introduction of both:

1. **Community-level target setting** – encouraging the community to agree upon targets for it to meet, for example in increasing the adoption rates of linear seeding or in increasing the productivity of the *rabi* crop.
2. **Development roadmaps** – mapping out for villagers the long-term programme of development in comprehensible steps.

A further consequence of a *collective-action centred approach* would be that it may facilitate the transition to the *collectivisation* of agriculture in the village communities, which may entail more efficient land use and greater productivity.

<u>Key target areas:</u>

1. Collective action to **combat *free grazing***
2. **The 'food vs cash' balance** – increasing awareness of the importance of nutrition in food security and encouraging farmers to divert more rabi crop for their own consumption, rather than committing all to cash crop
3. **Environmental projects** – particularly wasteland reclamation and renewable energy projects

Project sustainability

Similarly, it is recommended that it is ensured – via an educational programme – that villagers are aware project *intervention is finite* and that as such the long-term sustainability of the interventions depends on the villagers' actions. In particular, it is recommended that future interventions are made *conditional upon villagers' planning* for the sustainability of the intervention.

Key target areas:

1. **Seed sourcing** – ensuring the sustainability of seeds by introducing *charges* for the seeds provided by TSRDS and by encouraging farmers to produce their own seeds, i.e. promoting *self-sufficiency*.
2. **Water structure corpus funds** – encouraging villagers (via the relevant WUGs) to pay charges for the use of water structures, or to contribute to a corpus fund for the insurance and maintenance of the structures.

Equal distribution of project benefits

It was revealed, particularly through qualitative data derived from discussions with farmers, that the benefits of the project interventions were not being distributed equally amongst households. In particular, it was noted that upland households were receiving little benefit from both paddy and rabi crop-related interventions. In the long-term, this could produce further disparity amongst farmers (with upland farmers become further marginalised) and compromise community cohesion. It is therefore suggested that project interventions are reoriented so that equal distribution of benefits is made a *primary criterion underpinning the programme of interventions*.

In particular, it is recommended that the projects are guided by an *appropriate technology approach* taking into account factors such as land suitability and the natural resources present in the villages in question.

Key target areas:

1. Interventions focusing on *upland agricultural development* and, where necessary, *soil improvement*
2. Interventions focusing on other non-beneficiary groups

Administrative issues

In addition to the above implementation-focused recommendations, some recommendations are made regarding the administration of the project.

1. **Data management** – a systematic approach to keeping data on the existing programme of interventions. (In conducting the research for the impact assessment, it proved difficult to obtain relevant secondary data on the projects because data was not recorded systematically.)
2. **Tata-wide knowledge sharing** – many of the projects closely resemble projects conducted by other Tata Group companies and would benefit from the learning generated by those projects. As such, knowledge sharing (in the form of annual reports, case study databases, and best practice guides etc) across the Tata network would improve the success of projects overall, for example removing the need for a trial-and-error period for each new project.

V. Continuation of impact assessment

The above impact assessment could be extended in its breadth and depth. The following section includes some recommendations as to how to continue the impact assessment with regard to both the data collection and the data analysis stages.

V.A. Further data collection

The Methodology section discusses how the sampling and data collection methods may be improved to generate more reliable data.

Similarly, further data could be collected to extend the *breadth* of data:

1. *Environmental projects* – particularly on wasteland reclamation, tree plantations and renewable energy projects
2. *Capacity building* – particularly on the training programmes and village-level institutions

Further data could also be collected to improve the *depth* of the existing data:

1. *Land type* – taking account of the distribution of benefits as between upland and lowland farmers (this would, for example, be reflected in the data on cultivation method adoption rates and crop productivity)
2. *Crop-specific output figures* – esp comparing varied range of veg crops
3. *Food security* – comparative data for before and after intervention; improvements in dietary nutrition
4. *Agricultural inputs* – specific data on the use of different types of fertiliser; comparative time- and labour-intensity of cultivation methods (both quantitative data and qualitative data on farmers' perceptions)
5. *Adoption rates* – qualitative data on farmers' perceptions of the time- and labour-efficiency of each method
6. *Yearwise changes* across the project period – in particular: adoption rates, productivity and water supply
7. *Income estimation* – proportion of income deriving from agriculture as opposed to other sources; proportion of increased paddy productivity used as cash/food crop (i.e. sale versus consumption)

V.B. Further analysis of existing data

In addition, it is recommended that the existing data be further analysed. In particular:

1. *Villager preferences* (and feedback) on the capacity building aspects (training and village-level institutions)
2. *Demographic analyses* – analysing adoption rates, productivity etc in terms of caste (ST, SC or OBC)

VI. Appendix: example questionnaire

Village individual questionnaire

INDIVIDUAL PROFILE

1) Caste status: ST / SC / Non-tribal

2) Family size: Adults ____ Children ____

3) Land holding:
   a) Please specify how much land you own/lease. [Write **ACRES/BIGHAS**]

Total Land (Acres/Bighas)	**Cultivable land**			
	Own land	Leased in	Leased out	Total (i.e. Net cropped area)

b) If you do own land, how do you use your land? [Write **ACRES/BIGHAS**]

Type of land		**Area (Acres/Bighas)**	
		Before	After
Cultivable	Irrigated		
	Non-irrigated		
Uncultivable/wasteland			

AGRICULTURAL PRODUCTIVITY

4) Crop coverage and productivity during KHARIFSEASON

What were the coverage, yield and income of your KHARIF crop before the project and last year? [Write **ACTUAL INCOME** or **RATE PER KG**]

Crop type	**Coverage (Acres/Bighas)**		**Yield (KG)**		**Income/Rate per KG**	
	Before	After	Before	After	Before	After
Paddy (i) Local						
(ii) HYV						
Cereals						
Vegetables (i) (ii) (iii) (iv)						
Oilseed						
Pulses						

Other						

5) Adoption of cultivation methods and HYVs

a) Over how much land have you been using these cultivation methods? [Write in **ACRES/BIGHAS**]

Cultivation method	**Kharif (Acres/Bighas)**	
	Before	After
Broadcasting (local seeds)		
Transplanting (HYV seeds)		
Linear seeding (HYV seeds)		
Use of fertilisers		

b) How effective are the new seeds and cultivation methods? Give each a score (from 0 – 5), or write if same as before. [5 = very effective; 1 = not effective]

Method	5	4	3	2	1	Same as before
HYV seeds						
Transplanting						
Linear seeding						
Fertilisers						

6) Crop coverage and productivity during rabi season

a) What were the coverage, yield and income of your rabi crop this year? [Write **ACTUAL INCOME** or **RATE PER KG**]

Crop type	**Coverage**		**Yield**		**Income/sale price**	
	Before	After	Before	After	Before	After
Cereals						
Vegetables (i) (ii) (iii) (iv)						
Oilseed						
Pulses						
Other						

b) To what extent do these factors affect your cropping pattern and intensity (especially your decision whether to grow in rabi season)? [Score 1 to 5.]

Factor	**5**	**4**	**3**	**2**	**1**	**No effect**
Water availability						
Free grazing						
More profitable alternative activity						
Tradition, reluctance, etc.)						

7) Agricultural inputs

a) What are your main agricultural inputs (seeds, labour, fertilisers, etc.)?

Season	**Input**	**Coverage (Acres/Bighas)**	**Cost (Rs)**
Kharif	Seeds		
	Labour		
	Fertiliser		
Rabi	Seeds		
	Labour		
	Fertiliser		

b) Where do you source your seeds from? [Tick the appropriate box]

Source of seeds	**Kharif**		**Rabi**	
	Before	After	Before	After
Own				
Market				
TSRDS				
Other sources				

8) Availability of water management facilities

a) How much of your land is irrigated by each type of structure in each season? [Write **ACRES/BIGHAS**; Tick box if structure not available]

Structure	**Area irrigated (Acres/Bighas)**								**Not available**
	Kharif*		Rabi		Summer		TOTAL		
	Before	After	Before	After	Before	After	Before	After	
Intake well									
Pond									
Check dam									
Lift irrigation									
Others									

b) If you have access to water structures, rank the types of structure in order of effectiveness for each season. [Write rank 1 to 4]

Rank (1-4)	Pond	Well	Check Dam	Lift Irrigation
Kharif (storage)				
Rabi (irrigation)				

c) *If you do not use water management structures, please indicate whether any of these factors explain why.* [Tick appropriate box]

Factor	Is it a relevant factor?
Access	
Social rivalry	
Lack of resources	
Remoteness	
Physical hindrance	
Alternative activities	
Seasonality	
Other (explain)	

d) *If you do use water management facilities, how are they funded?*

	Installation	Maintenance during project	Maintenance after withdrawal
Individual funds			
Collective funds			
Govt support			
NGO support			

e) *Has the village/WUG started to, or agreed to, raise funds for future maintenance?*

f) *Are water charges collected? If so, on what basis?*

g) *Are the water management facilities insured?*

N.B. Ask about users' other preferences regarding water management.

- number
- *type* of structure – existing/needed
- necessity/suitability
- effectiveness
- water availability/adequacy of supply
- improvements

SOCIO-ECONOMIC IMPACT

9) Food security

During which months did you feel that your food supply was sufficient/ insufficient? Please give reasons. [Tick if sufficient; Cross if insufficient]

	Sufficient or insufficient?		**Reason**
	Food	Cash	
January			
February			
March			
April			
May			
June			
July			
August			
September			
October			
November			
December			

Details: e.g. Have your dietary patterns changed?

10) Out migration + non-agricultural employment

During which months did you or your family members feel the need to (a) migrate from your village, (b) seek other employment? Please give reasons (e.g. rainfall failure, crop failure or other reasons).

	Migrated	**Other employment**	**Reason**
January			
February			
March			
April			
May			
June			
July			
August			
September			
October			
November			
December			

Details:

11) Allied activities

Please detail your annual income from various allied activities.

Allied activities	Annual income	
	Before	After
Goats		
Cows		
Poultry		
Sheep		
Fish		
Lac culture		
Other		

Details:

12) Forest dependency

Please detail your dependency on before/after the project?

Forest	Annual income / Days committed to forestry	
	Before	After
Forestry/tree-cutting		

Details: Was the forestry for sale or consumption?

13) Other socio-economic indicators

a) How secure is your financial position?
   i) Do you have a bank account?
   ii) Are you in debt?

b) Do your children attend school?

CAPACITY BUILDING

14) Education/training activities attended – type + approx number

15) User preferences regarding education/training activities
   a) Number – should there be more/fewer activities?

   b) Type – should there be other types of activities?

   c) Location – should the activities be located elsewhere?

   d) Effectiveness – are the activities effective? What could make them more effective?

16) Participation in capacity-building institutions (VDCs, WUGs, SHGs, etc)

17) User preferences regarding capacity-building institutions
   a) Are the institutions suitable? Should there be different types?

   b) Are the institutions effective?

   c) Do you think the institutions will be sustainable after the project?

   d) Do you think the institutions are representative of all members of your village community?

   e) Do you know how the institutions are funded?