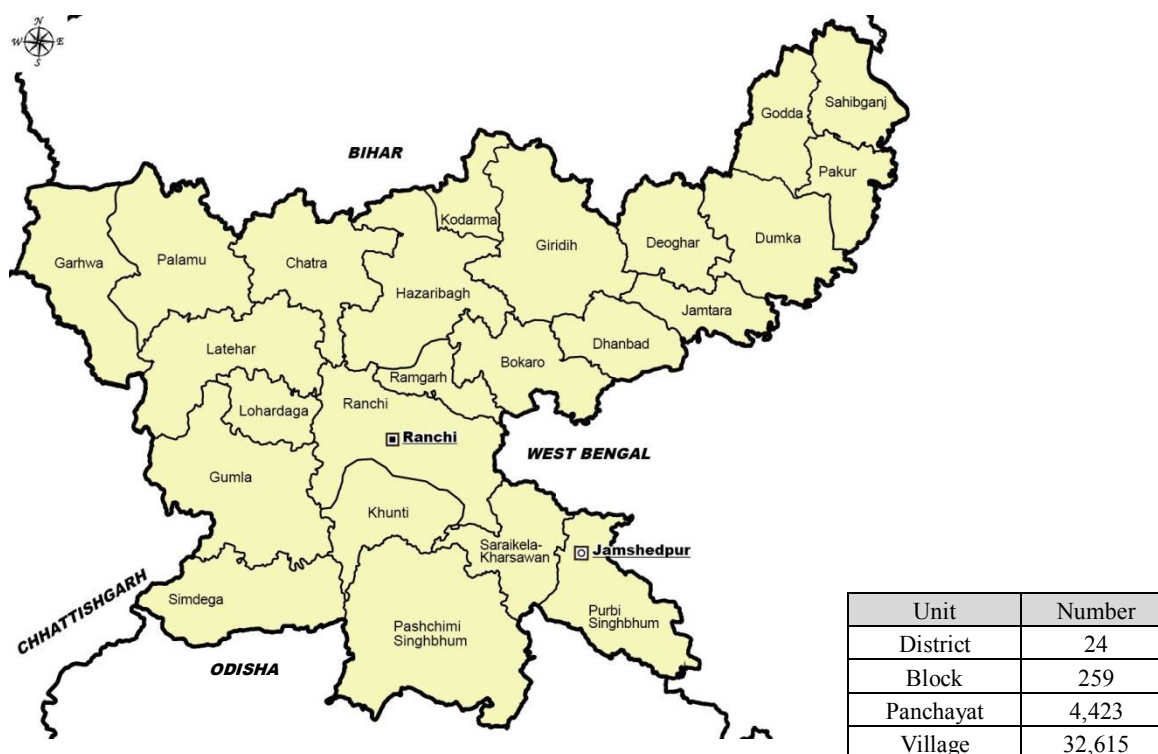


CHAPTER 3 PRESENT CONDITIONS OF JHARKHAND STATE

3.1 Local Administration

Jharkhand is a state located in eastern India. It was carved out of the southern part of Bihar on 15 November 2000. Jharkhand shares its border with the states of Bihar to the north, Uttar Pradesh and Chhattisgarh to the west, Odisha to the south, and West Bengal to the east. The city of Ranchi is the state capital and Dumka is the subcapital, whilst Jamshedpur is the largest and the biggest industrial city of the state. The state has an area of about 79,000 km², one of the smaller states in India in terms of area, and consists of several administrative units as shown in Figure 3.1.1.



Source: Census of India 2011

Figure 3.1.1 Administrative Units and District Boundary of Jharkhand

3.2 Demography and Economy

3.2.1 Population

The population of Jharkhand is 33 million, of which 76% lives in rural areas and the balance of 24% in urban areas, in accordance with Census of India 2011, making it the 13th most populated state in India. The state makes up about 2.7% of the country's population. The population density is about 414/km², which is above the national average. The district-wise distribution of population is shown in Table 3.2.1. Original data of Census 2011 are shown in Attachment 3.2.1.

Table 3.2.1 District-wise Population in Jharkhand

District	Population	District	Population
Garhwa	1,322,784	Latehar	726,978
Chatra	1,042,886	Hazaribagh	1,734,495
Kodarma	716,259	Ramgarh	949,443

District	Population	District	Population
Giridih	2,445,474	Dumka	1,321,442
Deoghar	1,492,073	Jamtara	791,042
Godda	1,313,551	Ranchi	2,914,253
Sahibganj	1,150,567	Khunti	531,885
Pakur	900,422	Gumla	1,025,213
Dhanbad	2,684,487	Simdega	599,578
Bokaro	2,062,330	Pashchimi Singhbhum	1,502,338
Lohardaga	461,790	Saraikela-Kharsawan	1,065,056
Purbi Singhbhum	2,293,919	Jharkhand	32,988,134
Palamu	1,939,869	India	1,210,854,977

Source: Census of India 2011

3.2.2 Employment

Agriculture is the main economic activity in which about 63% of the rural population of the state is engaged. It is their employment and primary income-generating activity. The detailed information of employment is summarised in Table 3.2.2 as follows:

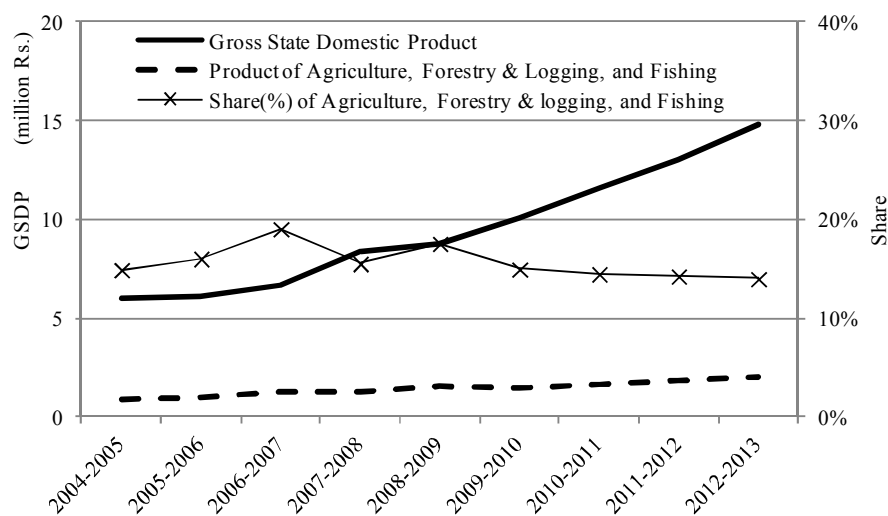
Table 3.2.2 Employment by Different Categories in Jharkhand

Item	Jharkhand		India
	Nos.	Share %	Share %
Total No. of Workers	13,098,274	39.71	39.80
Male	8,424,769	64.32	68.88
Female	4,673,505	35.68	31.12
Main Workers	6,818,595	52.06	75.24
Marginal Workers	6,279,679	47.94	24.76
Cultivators	3,814,832	29.12	24.65
Agricultural Labours	4,436,052	33.87	29.95
Workers in Household Industries	455,162	3.47	3.81
Other Workers	4,392,228	33.53	41.59

Source: Census of India 2011

3.2.3 Economy

As mentioned in Section 3.2, agriculture is the main economic activity in Jharkhand. The share of agriculture, however, occupying the gross state domestic product (GSDP) of Jharkhand is just 14% from 2012 to 2013 as shown in Figure 3.2.1. It indicates poor labour productivity of agriculture in Jharkhand.



Source: Planning and Development Department (PDD)

Figure 3.2.1 Fluctuation in GSDP and Agricultural Product of Jharkhand

3.3 Poverty and Socioeconomic Situation

3.3.1 Scheduled Castes and Tribes

According to Census of India 2011, the rate of Scheduled Castes (SCs) is lower than the national average in Jharkhand. On the other hand, the rate of Scheduled Tribes (STs) is higher than the average. The rate of SC and ST are variable by location. Chatra District marks the highest rate of SCs (32.65%) and Khunti District holds the highest rate of STs (73.25%). The total rate of SCs and STs in Jharkhand is about 1.5 times higher than the average of the country.

Table 3.3.1 District-wise Percentage Distribution of SCs and STs in Jharkhand

District	SC (%)	ST (%)	SC+ST (%)
Garhwa	24.19	15.56	39.75
Chatra	32.65	4.37	37.02
Kodarma	15.22	0.96	16.18
Giridih	13.31	9.74	23.05
Deoghar	12.74	12.13	24.87
Godda	8.80	21.26	30.06
Sahibganj	6.29	26.80	33.09
Pakur	3.16	42.10	45.26
Dhanbad	16.29	8.68	24.97
Bokaro	14.51	12.40	26.91
Lohardaga	3.32	56.89	60.21
Purbi Singhbhum	4.86	28.51	33.37
Palamu	27.65	9.34	36.99
Latehar	21.31	45.54	66.85
Hazaribagh	17.50	7.02	24.52
Ramgarh	11.20	21.19	32.39
Dumka	6.02	43.22	49.24
Jamtara	9.21	30.40	39.61
Ranchi	5.25	35.76	41.01
Khunti	4.52	73.25	77.77
Gumla	3.17	68.94	72.11
Simdega	7.45	70.78	78.23
Pashchimi Singhbhum	3.79	67.31	71.10
Saraikela-Kharsawan	5.28	35.18	40.46
Jharkhand	12.08	26.21	38.29
India	16.63	8.63	25.26

Source: Census of India 2011

3.3.2 Poverty

Jharkhand has higher rural poverty rate amongst other Indian states; it is ranked 3rd lowest in the monthly income per capita, the 7th highest in the number of people living below poverty line (BPL), and the 3rd highest in the rate of BPL, in the country. Jharkhand is therefore regarded as a relatively poor state in India.

According to the National Sample Survey Office of India (National Sample Survey Organisation (NSSO), 55th round), Jharkhand is one of the most food insecure and malnourished state in the country. More than 10% of the households face seasonal food insecurity.

To bridge the gap in major developmental indicators in order to come up at least at par with the national level, the Government of Jharkhand (GoJ) has set targets in the State Twelfth Five-Year Plan to accelerate GSDP growth rate to 7.5% and double the per capita income in 2012-2017.

Table 3.3.2 Conditions of Poverty by State

State	Poverty Line (Rs., Monthly per Capita)		No. of BPL (lakh)			Rate of BPL (%)		
	Rural	Urban	Rural	Urban	Total	Rural	Urban	Total
Andra Pradesh	860	1,009	61.8	16.98	78.78	10.96	5.81	9.2
Arunachal Pradesh	930	1,060	4.25	0.66	4.91	38.93	20.33	34.67
Assam	828	1,008	92.06	9.21	101.27	33.89	20.49	31.98
Bihar	778	923	320.4	37.75	358.15	34.06	31.23	33.74
Chhattisgarh	738	849	88.9	15.22	104.11	44.61	24.75	39.93
Delhi	1,145	1,134	0.5	16.46	16.96	12.92	9.84	9.91
Goa	1,090	1,134	0.37	0.38	0.75	6.81	4.09	5.09
Gujarat	932	1,152	75.35	26.88	102.23	21.54	10.14	16.63
Haryana	1,015	1,169	19.42	9.41	28.83	11.64	10.28	11.16
Himachal Pradesh	913	1,064	5.29	0.3	5.59	8.48	4.33	8.06
Jammu and Kashmir	891	988	10.73	2.53	13.27	11.54	7.2	10.35
Jharkhand	748	974	104.09	20.24	124.33	40.84	24.83	36.96
Karnataka	902	1,089	92.8	36.96	129.76	24.53	15.25	20.91
Kerala	1,018	987	15.48	8.46	23.95	9.14	4.97	7.05
Madhya Pradesh	771	897	190.95	43.1	234.06	35.74	21	31.65
Maharashtra	967	1,126	150.56	47.36	197.92	24.22	9.12	17.35
Manipur	1,118	1,170	7.45	2.78	10.22	38.8	32.59	36.89
Meghalaya	888	1,154	3.04	0.57	3.61	12.53	9.26	11.87
Mizoram	1,066	1,155	1.91	0.37	2.27	35.43	6.36	20.4
Nagaland	1,270	1,302	2.76	1	3.76	19.93	16.48	18.88
Odisha	695	861	126.14	12.39	138.53	35.69	17.29	32.59
Punjab	1,054	1,155	13.35	9.82	23.18	7.66	9.24	8.26
Rajasthan	905	1,002	84.19	18.73	102.92	16.05	10.69	14.71
Sikkim	930	1,226	0.45	0.06	0.51	9.85	3.66	8.19
Tamil Nadu	880	937	59.23	23.4	82.63	15.83	6.54	11.28
Tripura	798	920	4.49	0.75	5.24	16.53	7.42	14.05
Uttarakhand	880	1,082	8.25	3.35	11.6	11.62	10.48	11.26
Uttar Pradesh	768	941	479.35	118.84	598.19	30.4	26.06	29.43
West Bengal	783	981	141.14	43.83	184.98	22.52	14.66	19.98
Puducherry	1,301	1,309	0.69	0.55	1.24	17.06	6.3	9.69
Andaman and Nicobar Islands	N.A.	N.A.	0.04	0	0.04	1.57	0	1
Chandigarh	N.A.	N.A.	0.004	2.34	2.35	1.64	22.31	21.81
Dadra and Nagar Haveli	N.A.	N.A.	1.15	0.28	1.43	62.59	15.38	39.31
Daman and Diu	N.A.	N.A.	0	0.26	0.26	0	12.62	9.86
Lakshadweep	N.A.	N.A.	0	0.02	0.02	0	3.44	2.77
India	816	1,000	2166.58	531.25	2697.83	25.7	13.7	21.92

Source: Press Note on Poverty Estimates, 2011-12, Government of India Planning Commission, July 2013

3.3.3 Education/Literacy Rates

The literacy rate in Jharkhand State is about 56%. There is a big difference between male literacy rate and female literacy rate. Male literacy stands at 64.3% whilst female literacy is at 46.4%. Growth of agricultural production can only be realised when the new technology is widely diffused. Households with higher level of education are expected more likely to adopt new technologies. To reach the objectives of food security, there is a need to transform subsistence-oriented agriculture with improved farm technologies.

As shown in Table 3.3.3, the literacy rate was highest in Purbi Singhbhum at 65.7% followed by Ranchi (65.6%), Dhanbad (64.2%), and Ramgarh (62.8%). There is a big difference in the literacy rate between rural and urban areas, and male and female.

Table 3.3.3 Literacy Rate in Jharkhand

District	Literacy Rate (%)		
	Male	Female	Total
Garhwa	59.27	38.85	49.40
Chatra	56.92	40.51	48.91
Kodarma	65.02	43.40	54.48
Giridih	62.30	39.56	51.26
Deoghar	63.20	42.35	53.18
Godda	55.49	35.92	46.02
Sahibganj	48.75	34.92	42.00
Pakur	45.73	32.58	39.19
Dhanbad	72.19	55.32	64.15
Bokaro	70.76	51.99	61.75
Lohardaga	64.29	48.06	56.24
Purbi Singhbhum	72.78	58.30	65.73
Palamu	61.78	43.15	52.82
Latehar	56.73	39.45	48.24
Hazaribagh	66.91	49.45	58.42
Ramgarh	70.82	54.14	62.83
Dumka	60.77	40.76	50.88
Jamtara	63.79	43.51	53.89
Ranchi	72.59	58.21	65.59
Khunti	61.85	45.13	53.50
Gumla	62.56	46.58	54.60
Simdega	63.93	50.62	57.29
Pashchimi Singhbhum	58.62	38.29	48.43
Saraikela-Kharsawan	67.11	47.57	57.56
Jharkhand	64.28	46.37	55.56
India	69.76	55.97	63.07

Source: Census of India 2011

3.3.4 Sex Ratio

According to the Census of India 2011, sex ratio is imbalanced not only in Jharkhand but also in the whole of India. Generally, population of male is higher than female. The district-wise sex ratio in Jharkhand are summarised in Table 3.3.4 below. In addition, there are many differences between males and females like literacy as mentioned above.

Table 3.3.4 Sex Ratio in Jharkhand

District	Sex Ratio (Male=1000)	District	Sex Ratio (Male=1000)
Garhwa	935	Latehar	967
Chatra	953	Hazaribagh	947
Kodarma	950	Ramgarh	921
Giridih	944	Dumka	977
Deoghar	925	Jamtara	954
Godda	938	Ranchi	949
Sahibganj	952	Khunti	997
Pakur	989	Gumla	993
Dhanbad	909	Simdega	997
Bokaro	922	Pashchimi Singhbhum	1,005
Lohardaga	985	Saraikela-Kharsawan	956
Purbi Singhbhum	949	Jharkhand	948
Palamu	928	India	943

Source: Census of India 2011

3.4 Agro-climatic Sub-zones

(1) Climate Profile of India

India is strongly influenced by monsoon and divided into four seasons: (i) winter season/cold weather season (January and February), (ii) pre-monsoon season/summer season/hot weather season/thunderstorm season (March, April, and May), (iii) south-west monsoon/summer monsoon (June, July, August, and September), and (iv) post-monsoon/northeast monsoon/retreating southwest monsoon season (October, November, and December). General features of each season are shown in the following Table 3.4.1.

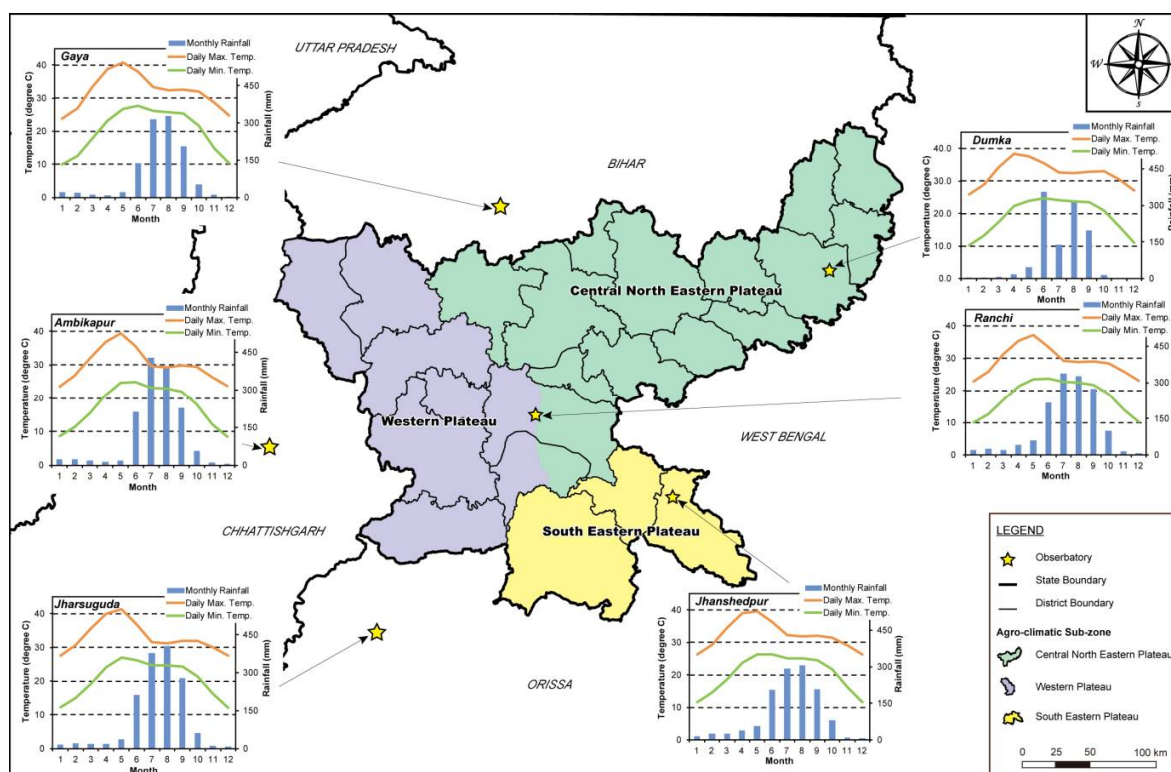
Table 3.4.1 Features of Four Seasons

No.	Period	Category	Description
1.	January and February	Winter season/Cold weather season (January and February)	- Clear sky, fine weather, light northerly winds, low humidity and temperature, large daytime variation of temperature
2.	March–May	Pre-monsoon season/ Summer season/Hot weather season/ Thunderstorm season	- Interior parts of peninsula record 30–35 °C - Many locations of Central India reach 40 °C - Cyclonic storm and thunderstorm associated with strong winds and rains
3.	June–September	Southwest monsoon/ Summer monsoon	- Widespread rain over most parts of India - Actual period of the season varies from less than 75 days to more than 120 days - Most parts of India receive more than 50% of the annual rainfall in the season
4.	October–December	Post-monsoon/ Northeast monsoon/ Retreating southwest monsoon season	- Temperature decline sharply - Decrease in humidity and clear skies over most part of north and central India after mid-October

Source: Prepared by the JICA Survey Team based on the “Climate Profile in India”, India Meteorological Department, 2010

(2) Climate Profile of Jharkhand

Jharkhand receives rainfall in the range of 1,200–1,600 mm per year. The long-term trends of several cities in/around the state are shown in Figure 3.4.1. The northwest part of the state receives relatively smaller amount of rainfall in accordance with the observed data. The temperature in Ranchi, one of the six observatories shown in the figure, is more moderate than the other five cities due to relatively higher elevation. The patterns of annual variability of temperature are similar amongst these five cities.



Source: World Weather Information Service, WMO (http://www.wmo.int/pages/index_en.html)
 Agricultural Meteorology Division, India (<http://www.imdagrimet.gov.in/node/290>)

Figure 3.4.1 Weather Conditions and Agro-climatic Sub-zones in Jharkhand

(3) Agro-climatic Sub-zone of Jharkhand

A total of 127 agro-climatic sub-zones have been identified in India under the National Agricultural Research Project based on rainfall pattern, soil type, availability of irrigation water, existing cropping pattern and administrative units. Jharkhand is divided into three agro-climatic sub-zones: Central North Eastern Plateau, Western Plateau, and South Eastern Plateau as shown in Table 3.4.2 and Figure 3.4.1.

Table 3.4.2 Three Agro-climatic Sub-zones in Jharkhand

ID	Name of Sub-zone	Features
IV	Central North Eastern Plateau	<ul style="list-style-type: none"> - Low water retention capacity of the soil particularly that of uplands - Late arrival and early cessation of monsoon and erratic and uneven distribution of rainfall - Lack of safe disposal of runoff water during monsoon and water storage and moisture conservation practices for raising <i>Rabi</i> crops - Drying of tanks and wells by February results in no <i>Rabi</i> crop production
V	Western Plateau	<ul style="list-style-type: none"> - Late arrival and early cessation of monsoon - Erratic/uneven distribution of rainfall - Low water retention capacity of soils - Lack of soil and water conservation practices
VI	South Eastern Plateau	<ul style="list-style-type: none"> - Uneven distribution of rainfall - Low water holding capacity - Eroded soils - Poor soil fertility

Source: State Agricultural Management and Extension Training Institute (SAMETI)

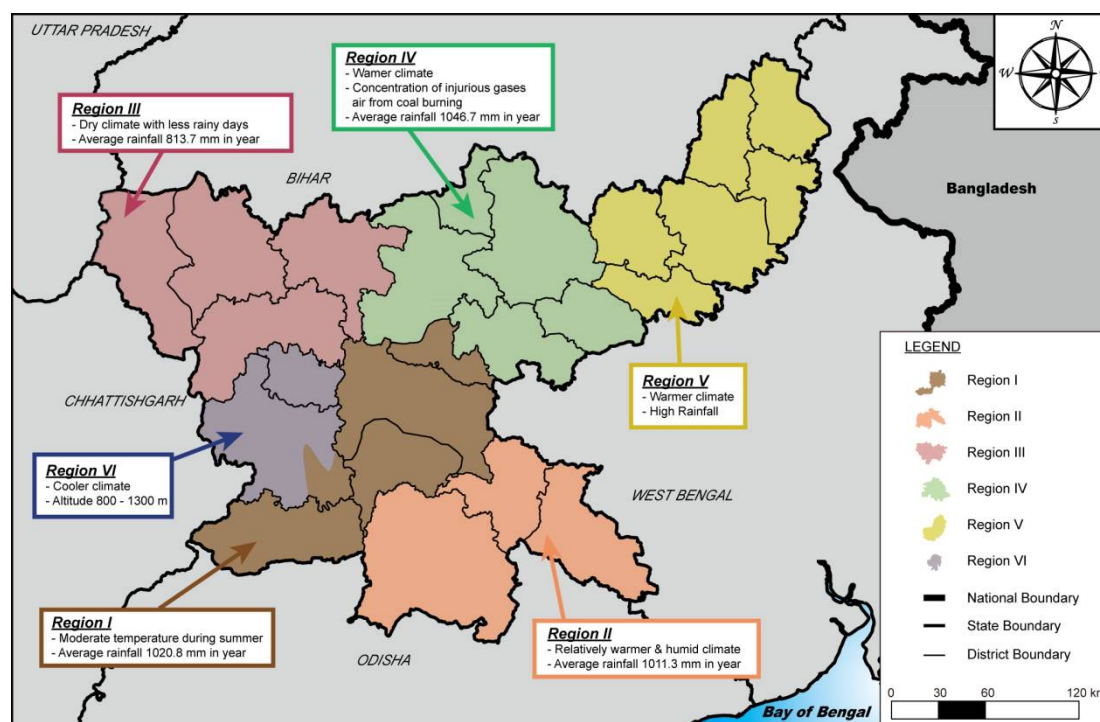
Furthermore, the National Horticulture Mission (NHM) has classified the state into six regions in terms of horticulture production as described in Table 3.4.3 and Figure 3.4.2.

Table 3.4.3 Six Agro-climatic (Iso-climate) Regions in Jharkhand

Region	Item	Description
I	Area coverage (districts)	Ranchi, part of Hazaribagh, Ramgarh, Lohardaga, Gumla, and Simdega
	Agro-climate	Moderate temperature during summer, rainfall of 1020.8 mm
	Suitable crops	- Fruits Mango, guava, strawberry, custard apple, ber, banana, papaya, peach, - Vegetables Kharif potato and onion, brinjal, cabbage, capsicum, cauliflower, chili, tomato, peas, beans, root crop, leafy vegetable, and cucurbits - Traditional tubers Sweet potato, cassava, elephant foot yam, colocasia, dioscorea - Flowers Carnation, gerbera, rose, chrysanthemum, marigold - Spices Ginger, turmeric, fenugreek
II	Area coverage (districts)	Pashchimi Singhbhum, Purbi Singhbhum, and Saraikela-Kharsawan
	Agro-climate	Relatively warmer and humid climate, rainfall of 1011.3 mm and climate is affected by sea changes
	Suitable crops	- Fruits Mango, guava, banana, papaya, custard apple, mandarin, sweet orange - Vegetables Brinjal, cabbage, capsicum, cauliflower, chili, tomato, peas, beans, root crop, leafy vegetable, and cucurbits - Traditional tubers Sweet potato, cassava, elephant foot yam, colocasia, dioscorea - Flowers Tube rose, chrysanthemum, marigold - Spices Turmeric, ginger, fenugreek
III	Area coverage (districts)	Garhwa, Palamu, Chatra, and Latehar
	Agro-climate	Dry climate with less rainy days and low rainfall of 813.7 mm
	Suitable crops	- Fruits Acid lime, kinnow, guava, mango, ber - Vegetables Kharif potato, onion, brinjal, cabbage, capsicum, cauliflower, chili, tomato, peas, beans, root crop, leafy vegetable, and cucurbits - Traditional tubers Sweet potato, cassava, elephant foot yam, colocasia, dioscorea - Flowers Marigold - Spices Turmeric, ginger, fenugreek
IV	Area coverage (districts)	Kodarma, Giridih, Dhanbad, Bokaro, and part of Hazaribagh
	Agro-climate	Warmer climate, average rainfall of 1046.7 mm and concentration of injurious gases in air from coal burning
	Suitable crops	- Fruits Guava, custard apple, ber, papaya, banana - Vegetables Brinjal, cabbage, capsicum, cauliflower, chili, tomato, peas, beans, root crop, leafy vegetable, and cucurbits - Traditional tubers Sweet potato, cassava, elephant foot yam, colocasia, dioscorea - Flowers Marigold, rose, chrysanthemum - Spices Ginger, turmeric, coriander

Region	Item	Description
V	Area coverage (districts)	Deoghar, Jamtara, Dumka, Godda, Sahibganj, and Pakur
	Agro-climate	Warmer climate with high rainfall
	Suitable crops	<ul style="list-style-type: none"> - Fruits Mango, guava, ber, custard apple, acid lime, banana - Vegetables Brinjal, cabbage, capsicum, cauliflower, chili, tomato, peas, beans, root crop, leafy vegetable, and cucurbits - Traditional tubers Sweet potato, cassava, elephant foot yam, colocasia, dioscorea - Flowers Rose, tube rose, marigold - Spices Ginger, turmeric, coriander
VI	Area coverage (districts)	Hills of Gumla and Lohardaga
	Agro-climate	Cooler region on altitude between 800 m and 1,300 m above sea level
	Suitable crops	<ul style="list-style-type: none"> - Fruits Strawberry, pear, peach, plum, guava - Vegetables Kharif potato, brinjal, cabbage, capsicum, cauliflower, broccoli, chili, tomato, peas, beans, root crop, leafy vegetable, and cucurbits - Flowers Terrestrial orchids, bulbous flower, and chrysanthemum - Vegetable seeds Brinjal, cucurbitaceous crops, okra, cowpea, and French beans

Source: Prepared by the JICA Survey Team based on the "Jharkhand Agriculture Development Vision, Indian Council of Agricultural Research, New Delhi"

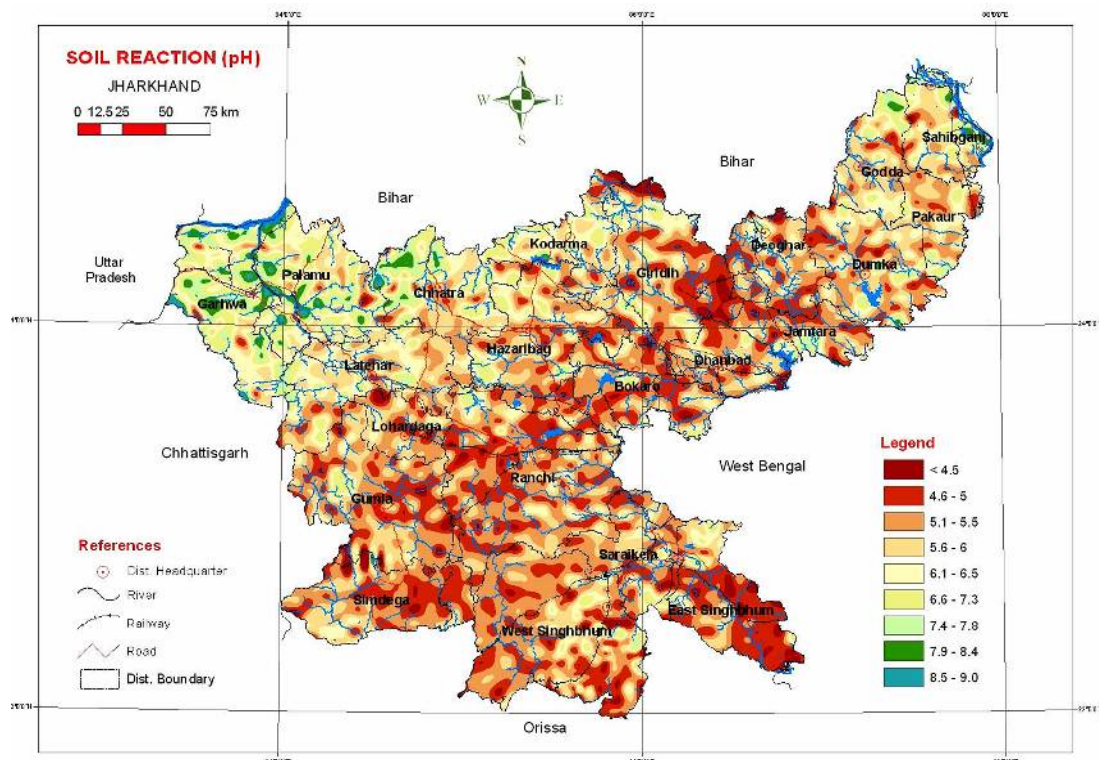


Source: Prepared by the JICA Survey Team based on the "Report of the Joint Inspection Team for their visit to Chhattisgarh State During 18-24th June 2012 to review the National Horticulture Mission Progress"

Figure 3.4.2 Six Agro-climatic Regions in Jharkhand

3.5 Soil

In Jharkhand, soils in about 49% of the total geographical area are highly acidic with pH ranging from pH 4.5 to 5.5. Neutral soils (pH 6.6 to 7.3) accounts for only about 8%. The following map shown in Figure 3.5.1 and Table 3.5.1 show the distribution of soils under different reaction classes in Jharkhand.



Source: SAMETI

Figure 3.5.1 Map of the Distribution of Soils under Different Reaction Classes in Jharkhand

Table 3.5.1 Soils under Different Reaction Classes in Jharkhand

Soil Reaction Class	Area ('00 ha)	% of Total Geographical Area
Extremely Acidic (pH<4.5)	1,053	1.32
Very Strongly Acidic (pH 4.5 to 5.0)	14,973	18.78
Strongly Acidic (pH 5.1 to 5.5)	22,906	28.74
Moderately Acidic (pH 5.6 to 6.0)	17,829	22.37
Slightly Acidic (pH 6.1 to 6.5)	11,015	13.82
Neutral (pH 6.6 to 7.3)	6,627	8.31
Slightly Alkaline (pH 7.4 to 7.8)	2,394	3.00
Moderately Alkaline to Strongly Alkaline (pH>7.8)	1,285	1.61

Source: SAMETI

The level of soil organic carbon content of about 47% of the total geographical area (TGA) ranges from low to medium (<math>< 0.5\%</math> to 0.75%). Soils of the majority area (about 70% of TGA) of the state have medium available nitrogen (N) content (280 to 560 kg/ha) and about 19.6% of the area has low available N content (<math>< 280</math> kg/ha). Soils of about 66% of the area are low (<math>< 10</math> kg/ha) in available phosphorous (P) content whilst about 28% of the area are found to be medium (10 –25 kg/ha) in available P content. Most of the soils (about 51% of TGA) have medium available potassium (K) content and about 18% are low (below 108 kg/ha) in available potassium content. Soils of about 38% of the area are low (<math>< 10</math> mg/kg) whereas soils of about 31% are medium (10-20 mg/kg) in available sulphur content. All the soils are

sufficient in iron (more than 4.5 mg/kg) and manganese (more than 2.0 mg/kg), whilst about 7% of the area is deficient in available zinc content (less than 0.5 mg/kg), 4% of soils are deficient in copper content (less than 0.2 mg/kg), and about 45% of soils are deficient in available boron content (less than 0.5 mg/kg). The following Table 3.5.2 shows the soil fertility status of Jharkhand.

Table 3.5.2 Soil Fertility Status of Jharkhand

Soil Parameters	Ratio (%)		
	Low	Medium	High
Organic Carbon	21.77 (<0.50%)	25.61 (0.50-0.75%)	50.57 (>0.75%)
Average Nitrogen	19.63 (<280 kg/ha)	70.04 (280-560 kg/ha)	8.28 (>560 kg/ha)
Average Phosphorus	65.77 (<10 kg/ha)	27.65 (10-25 kg/ha)	4.54 (>25 kg/ha)
Average Potassium	17.89 (<108 kg/ha)	50.91 (108-280 kg/ha)	29.15 (>280 kg/ha)
Soil Parameters	Ratio (%)		
	Deficient	Sufficient	
Average Zinc (DTPA extractable)	7.41 (<0.5 mg/kg)	90.55 (>0.5 mg/kg)	
Average Copper (DTPA extractable)	4.32 (<0.2 mg/kg)	93.64 (>0.2 mg/kg)	
Average Boron (DTPA extractable)	44.52 (<0.25 mg/kg)	53.43 (>0.25 mg/kg)	

Source: SAMETI

3.6 Surface Water and Groundwater Resources

3.6.1 Surface Water Resources

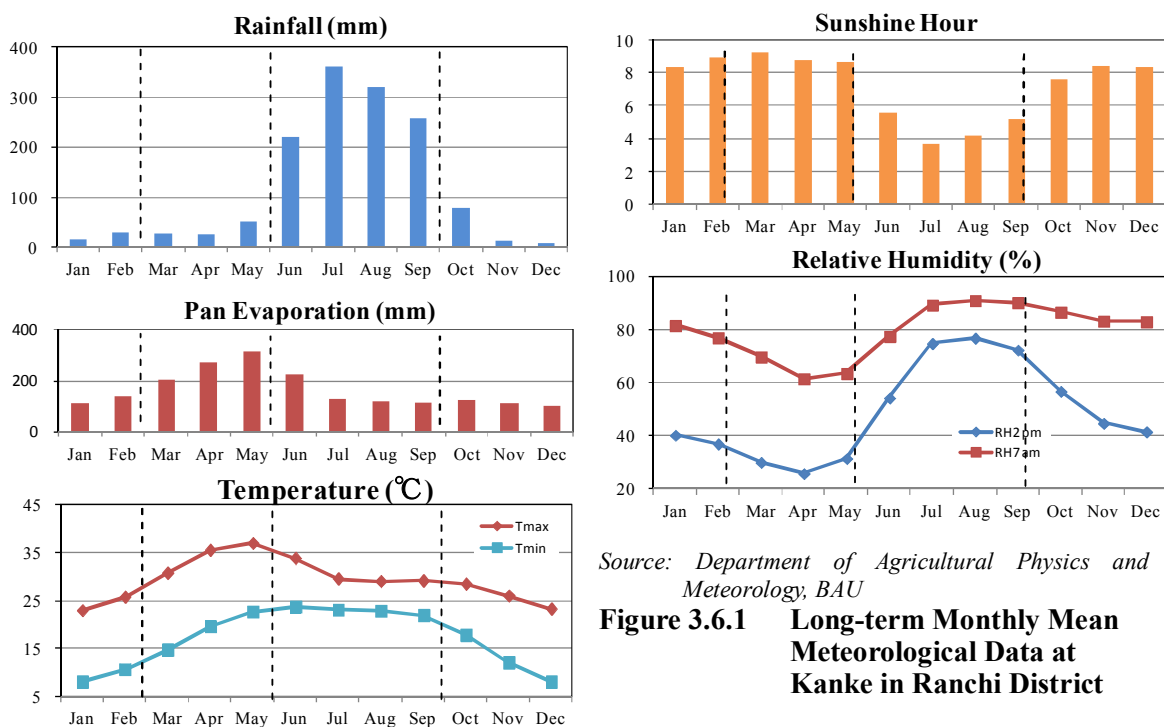
(1) Meteorology

The Birsa Agricultural University (BAU) has been measuring meteorological data from 1956 to 2012 at Kanke (EL. 631 m) in Ranchi District, which is summarised in Figure 3.6.1 and Table 3.6.1 in a form of monthly mean meteorological data. According to the meteorological data, annual mean rainfall is 1,409 mm with maximum annual rainfall of 2,457 mm in 2011 and minimum annual rainfall of 866 mm in 1979.

Jharkhand has three seasons, namely, monsoon, winter, and summer. Monsoon season generally starts in June and ends in September, more than 80% of annual rainfall is observed in this season. The sunshine hours are only 4.6 hours per day on average, which is shorter than other seasons. The monthly mean minimum temperature is stable at around 23 °C in this season, which is higher than summer season.

Winter season lasts for five months from October to February, with a monthly mean minimum temperature of 11.3 °C. The minimum temperature of 0.0 °C was recorded on 8 and 11 January in 2011. The sunshine hours are more than eight hours per day, which is the same level as summer season.

Summer season is from March to May, with a monthly mean maximum temperature of 34.4 °C and the maximum temperature of 44.6 °C was recorded on 5 May 1956. Summer season has high temperature, low humidity, and high evaporation.



Source: Department of Agricultural Physics and Meteorology, BAU

Figure 3.6.1 Long-term Monthly Mean Meteorological Data at Kanke in Ranchi District

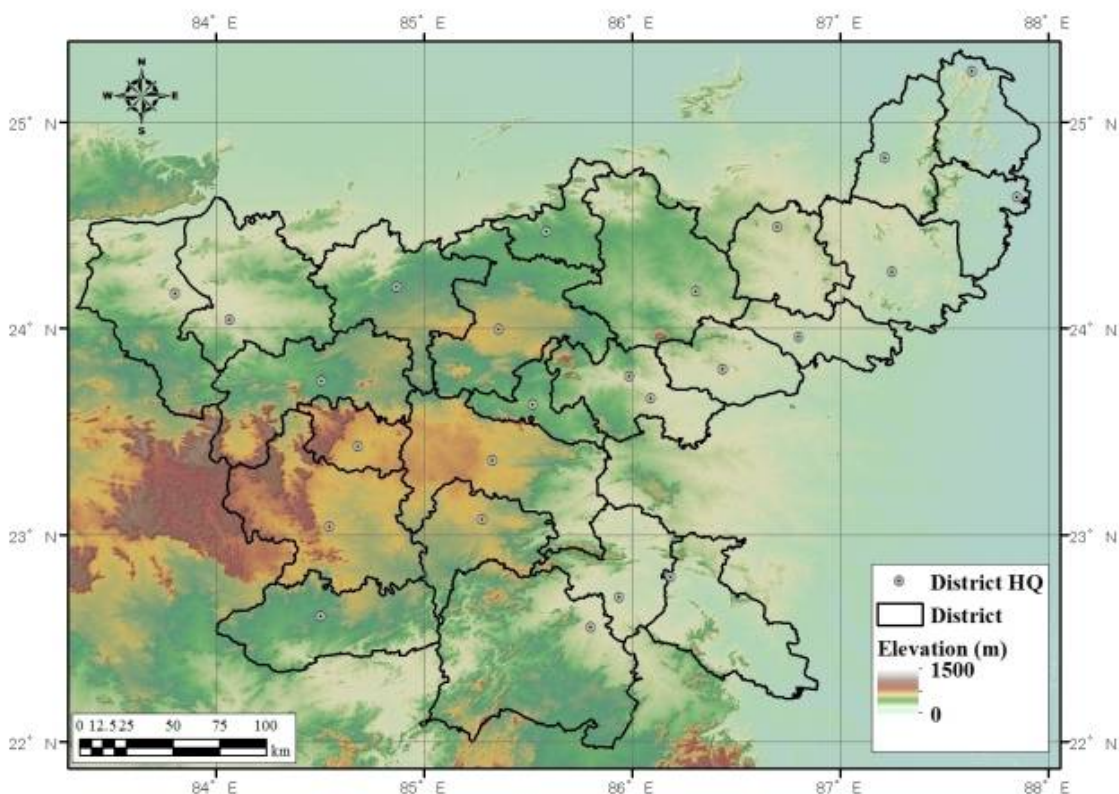
Table 3.6.1 Monthly Mean Meteorological Data at Kanke in Ranchi District

Item	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Rainfall (mm)	16.9	29.9	27.4	24.3	53.3	220.1	360.1	318.6	257.8	79.5	13.2	8.1	
Temperature (°C)	max	22.9	25.7	30.7	35.5	36.9	33.8	29.5	29.0	29.1	28.4	26.0	23.2
	min	8.0	10.7	14.7	19.6	22.6	23.7	23.0	22.8	21.9	17.8	12.1	8.1
Relative Humidity	7 am	40.3	37.0	30.1	25.9	31.6	54.3	74.8	76.7	72.3	56.8	44.8	41.6
	2 pm	81.5	76.9	69.8	61.5	63.5	77.5	89.2	90.8	90.0	86.5	83.2	83.0
Pan Evaporation (mm)	111.1	138.0	203.8	273.7	313.0	223.1	130.6	120.1	115.8	123.7	109.3	100.4	
Sunshine Hours	8.3	9.0	9.2	8.7	8.6	5.6	3.6	4.2	5.2	7.6	8.4	8.4	
Wind Speed (m/s)	3.9	4.8	5.4	6.4	7.1	7.9	7.1	6.8	5.8	3.8	3.3	3.4	

Source: Department of Agricultural Physics and Meteorology, BAU

(2) Topography and Hydrology

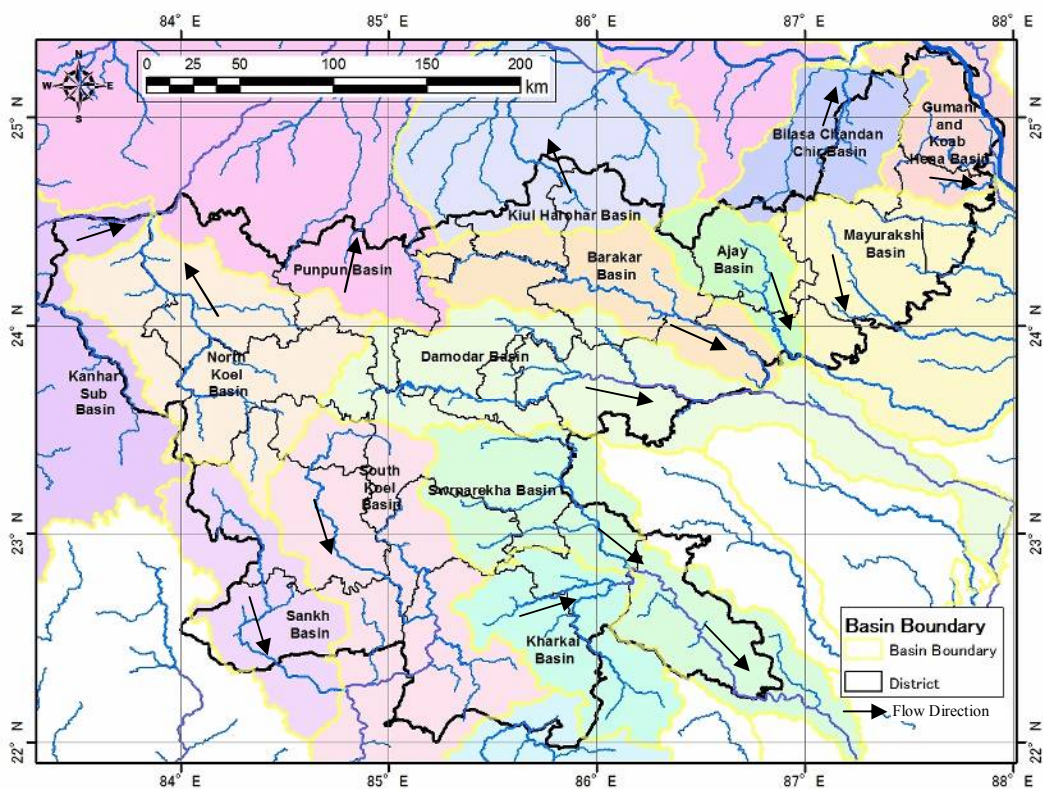
The topography of Jharkhand represents hilly and undulating terrain. The altitude varies from 40 m to 1,366 m. The west central part of Jharkhand State shows high mountainous area. Toward north, east, and south from the mountainous area, the altitude is getting lower gradually. Most of the area forms peneplain. The continental crust was uplifted, followed by a very long period of weathering and erosion of the uplifted mountain, and finally peneplain was formed. Inselberg is a remaining hill in such peneplain. Along the northeastern end of Jharkhand State, the Ganges River is flowing from west to south. The topographic features of Jharkhand is shown in Figure 3.6.2.



Source: Shuttle Radar Topography Mission (SRTM), NASA

Figure 3.6.2 Topographic Features of Jharkhand

Rivers form river basins depending on the topography. Jharkhand is divided into 16 river basins as shown in Figure 3.6.3 and Table 3.6.2.



Source: Department of Water Resources, GoJ, SRTM

Figure 3.6.3 River Basins in Jharkhand State

Table 3.6.2 River Basins and Water Resources in Jharkhand

No.	Name of River Basin/ Sub-basin	Area in Jharkhand (km ²)	Water Availability (MCM)			Irrigation Cultivable Command Area (km ²)
			Surface Water 75% dependable Surface Water	Ground Water	Total Water Availability	
1	Subernarekha River Basin	8,327	5,930	634	6,564	322.3
2	Kharkai River Sub-basin	4,169	-	244	244	301.5
3	South Koel River Basin	10,871	4,182	680	4,862	282.7
4	Barakar River Sub-basin	6,712	2,400	510	2,910	140.2
5	Damodar River Basin	9,682	3,400	721	4,121	106.6
6	Sankh River Basin	3,994	2,054	319	2,373	63.3
7	North Koel River Basin	10,621	-	694	694	437.3
8	Punpun River Basin	4,014	-	-	-	150.7
9	Kanhar Sub-basin	4,169	-	-	-	202.6
10	Mayurakshi River Basin	5,701	2,288	445	2,733	120.5
11	Ajay River Basin	2,681	1,239	253	1,492	26.3
12	Ganga Stem Basin	935	-	-	-	-
13	Gumani and Koab Hena Basin	1,951	1,663	363	2,026	32.6
14	Belsai Chandan Chir River Basin	2,200	-	-	-	169.9
15	Harohar River Basin	2,165	-	-	-	-
16	Small Streams Draining Independently outside the State	1,512	632	128	760	8.6
Total		79,714	23,789	4,992	28,781	2,365.1

Note: “ - “: data are not available.

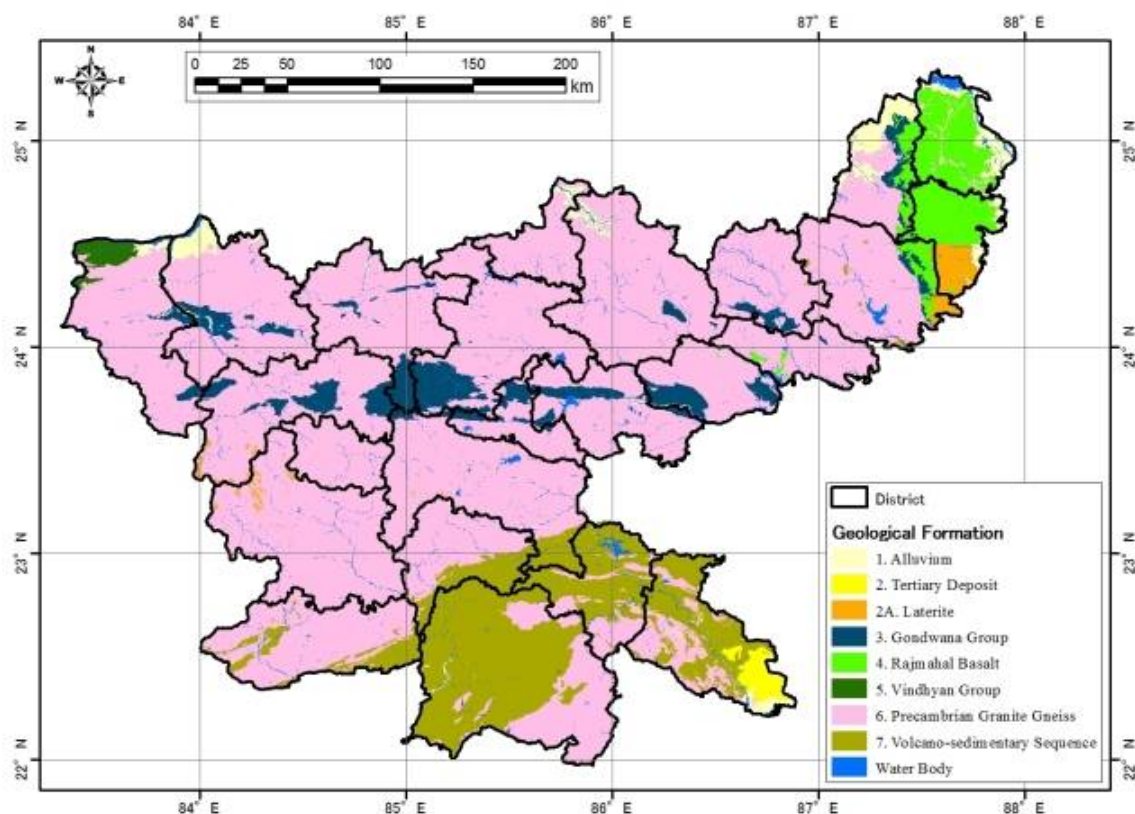
Source: *Compilation with the “Department of Water Resources, GoJ” and “Agricultural Resource Database of Jharkhand 2011-12, SAMETI”*

Table 3.6.2 shows basin-wise water resources availabilities calculated by Bihar Irrigation Commission. Presently, the availability of water resource is estimated at 28,781 million cubic meters (MCM), out of which 23,789 MCM is from surface water and the rest of about 4,992 MCM is from groundwater. On the other hand, the total utilisation of surface water and groundwater in the state for irrigation purposes is estimated at 4,736 MCM, of which 3,964 MCM is surface water and 772 MCM is groundwater, according to the Department of Agriculture and Sugarcane (DoA). The cultivable command areas of major and medium irrigation schemes are also shown in Table 3.6.2. The total irrigable area of 2,365 km² accounts for less than 3% of the total land area of the state.

3.6.2 Groundwater Resources

(1) Geology

Geologically, Jharkhand can be classified into seven parts. Figure 3.6.4 shows the geological map of the state corresponding to the seven formations, and Table 3.6.3 shows the stratigraphy and its features.



Source: Jharkhand Space Application Centre (JSAC), "Geological Map of Jharkhand" and "Dynamic Groundwater Resources of Jharkhand State (2011)"

Figure 3.6.4 Simplified Geological Map of Jharkhand

Table 3.6.3 Simplified Stratigraphy in Jharkhand

Era	Period	Formation	Age (Ma)	Symbol	Lithology	Shallow Groundwater Potential
Cenozoic	Quaternary	Alluvium	0 - 1.8	1	clay, silt, gravel, pebble	High
	Pleistocene - Tertiary	Tertiary Sediment	1.8 - 25	2	sand, silt, clay, pebble, gravel	Moderate
		Laterite	1.8 - 25	2A	primary and secondary laterite	Low
Mesozoic	Early Cretaceous - Carboniferous	Gondwana Supergroup	100 - 300	3	silt stone, sandstone, shale, conglomerate including intrusive	Moderate
	Early Cretaceous - Later Jurassic	Rajmahal Basalt	100 - 180	4	basalt flows with intertrappean fine-grained sediments	Low
Paleozoic	Early Cambrian - Proterozoic	Vindhyan Supergroup	500 - 1000	5	quartzite, conglomerate, limestone, sandstone, dolomite, chart, shale	Low
Precambrian	Proterozoic - Archean	Singhbhum Granite, Chhotanagpur Granite Gneiss Complex	1600 - 3400	6	granite, granite-gneiss, schist, phyllite, dolomite, basic and ultrabasic lava, amphibolite	Moderate
		Volcano-sedimentary Sequence	2000 -	7	schist, phyllite, basic and acidic intrusive	Low

Note: Ma: Million years ago

Source: "Geological Map of Jharkhand" and "Dynamic Groundwater Resources of Jharkhand State (2011)"

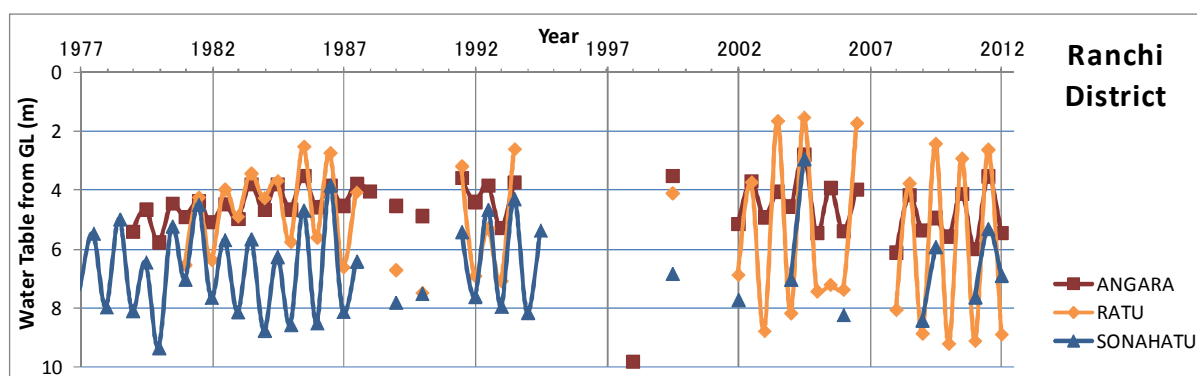
As shown in Table 3.6.3, Precambrian igneous and metamorphic rocks (symbols 6 and 7) occupy 84% of the total geographical area of Jharkhand. Volcanic rocks (4 and 7) cover 7% in the northeastern part

of Jharkhand. Sedimentary rocks, namely, Vindhyan and Gondwana series (3 and 5) also cover 7%. And alluvium and tertiary sediments (1, 2, and 2A) cover about 2%.

Since the geology is often the controlling factor with respect to availability, movement, and water quality of groundwater, understanding the distribution of geology is very important.

(2) Water Level of Dug Well

Groundwater level of dug well varies seasonally. The water level shows the lowest level before monsoon season, usually May and June, and the highest level is observed after monsoon season, usually in October. Figure 3.6.5 shows water level fluctuations in Ranchi District from 1977 to 2012 which data are measured by the Directorate of Groundwater, Department of Water Resources, the GoJ. Although there are some missing periods of observation, observation has been continuing twice a year in pre-monsoon and post-monsoon seasons. The number of observation wells is 204, which are distributed in 11 districts in Jharkhand as shown in Table 3.6.4. The table shows the averages of water level during pre-monsoon season and post-monsoon season and the averages of fluctuation. The fluctuations seem to be corresponding to the annual rainfall of the previous year. Average water level of pre-monsoon season is 7.37 m and the average water level of post-monsoon season is 4.26 m. Consequently, the annual fluctuation is 3.11 m.



Source: Directorate of Ground Water, Department of Water Resources, GoJ

Figure 3.6.5 Example of Long-term Shallow Groundwater Level Variation

Table 3.6.4 Average Groundwater Level by District

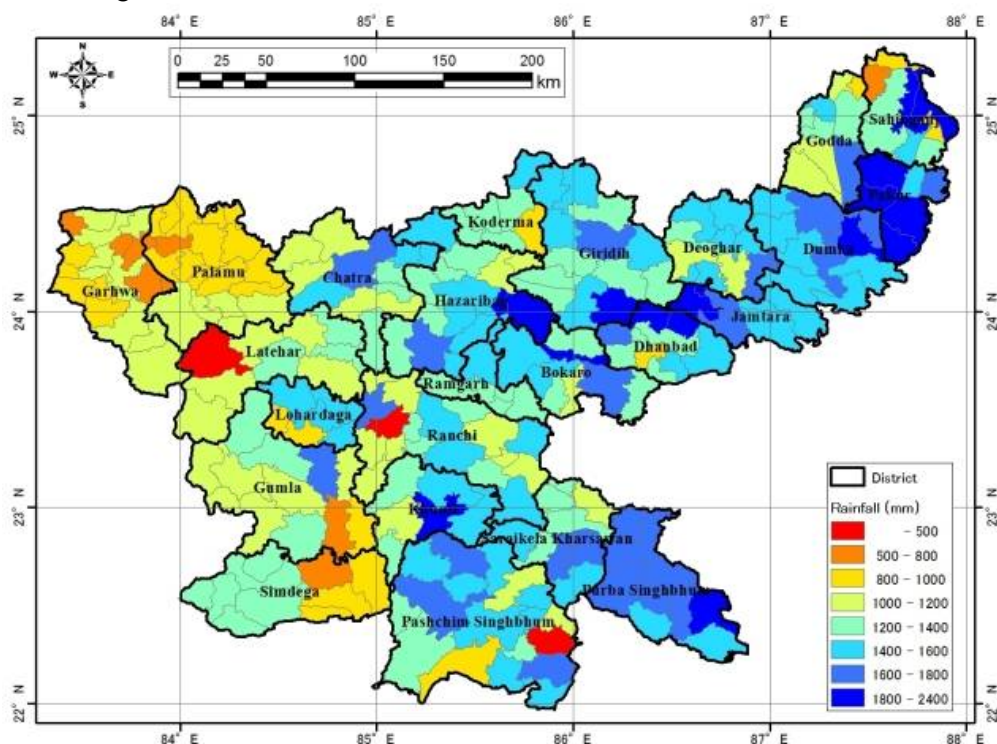
District	Average Well Depth (m)	Average Water Level (m)	Average Pre-monsoon WL (m)	Average Post-monsoon WL (m)	Average Fluctuation (m)
Chatra	8.71	6.21	7.28	4.84	2.44
Kodarma	9.18	5.06	6.61	3.55	3.06
Lohardaga	-	6.69	8.04	5.10	2.94
Purbi Singhbhum	10.29	5.94	7.53	4.16	3.37
Palamu	10.33	6.15	7.26	4.61	2.65
Hazaribagh	10.87	7.19	8.66	5.65	3.01
Ramgarh	7.72	6.36	7.89	4.81	3.07
Ranchi	9.93	6.05	7.59	4.33	3.26
Khunti	8.94	5.60	7.15	3.96	3.20
Gumla	9.79	5.56	6.82	3.91	2.91
Pashchimi Singhbhum	10.11	5.72	7.27	4.09	3.18
Average	9.89	5.90	7.37	4.26	3.11

Source: Directorate of Ground Water, Department of Water Resources, GoJ

(3) Evaluation of Groundwater Recharge

Shallow groundwater potential was evaluated by the Directorate of Ground Water, the GoJ, and Central Ground Water Board, Government of India (GoI). The result was published as the "Dynamic Ground Water Resources of Jharkhand State on 31 March 2009, (2011)"¹. This report was elaborated with a lot of data.

Figure 3.6.6 shows block-wise annual rainfall distribution. Rainfall is an income of water balance. The eastern side of Jharkhand has much rainfall. Blue colour shows much rainfall and red colour shows less rainfall. The average annual rainfall of the whole state is 1,363.3 mm.



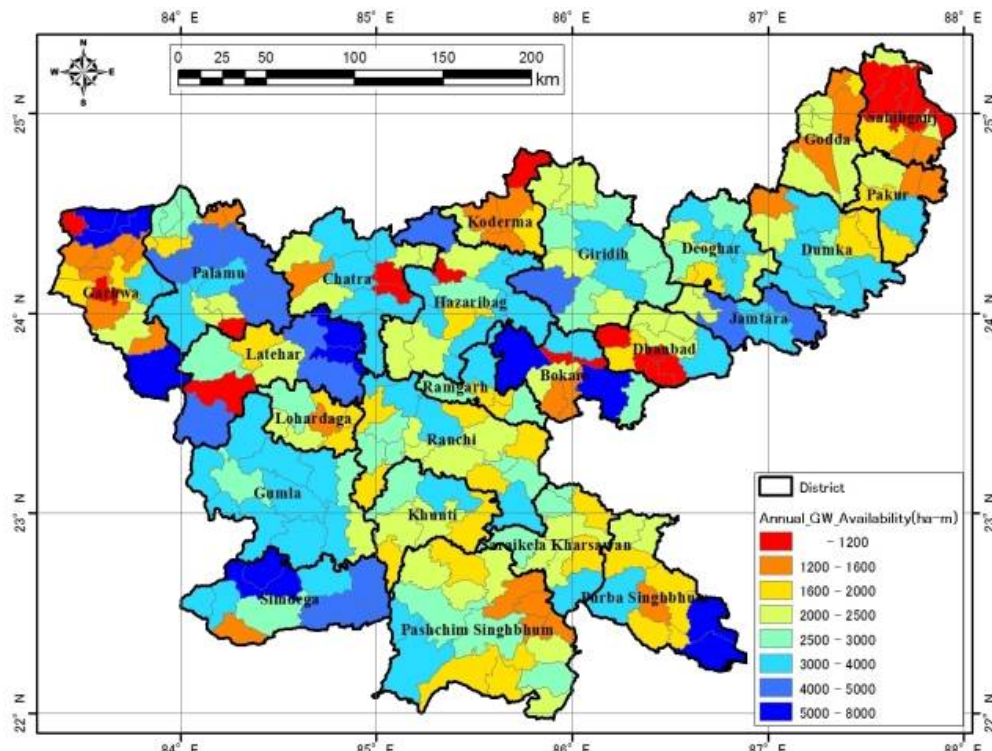
Source: *Dynamic Ground Water Resources of Jharkhand State (2011)*

Figure 3.6.6 Block-wise Rainfall Distribution

Available groundwater amount by block were calculated from the groundwater recharge. The methodology is recommended by the Ground Water Resources Estimation Committee, Ministry of Water Resources known as "GEC-97".² In this method, the groundwater recharge is calculated from the difference of groundwater levels between monsoon season and non-monsoon season, the specific yield of geology, and area of geology. Available groundwater amount is calculated by subtracting the natural discharge from this recharge. Figure 3.6.7 shows the block-wise available groundwater amount. The details are given in Attachment 3.6.1.

¹ Dynamic Ground Water Resources of Jharkhand State as on 31 March 2009, (2011): Ground Water Directorate, Water Resources Department, GoJ and Central Ground Water Board, Ministry of Water Resources, Government of India

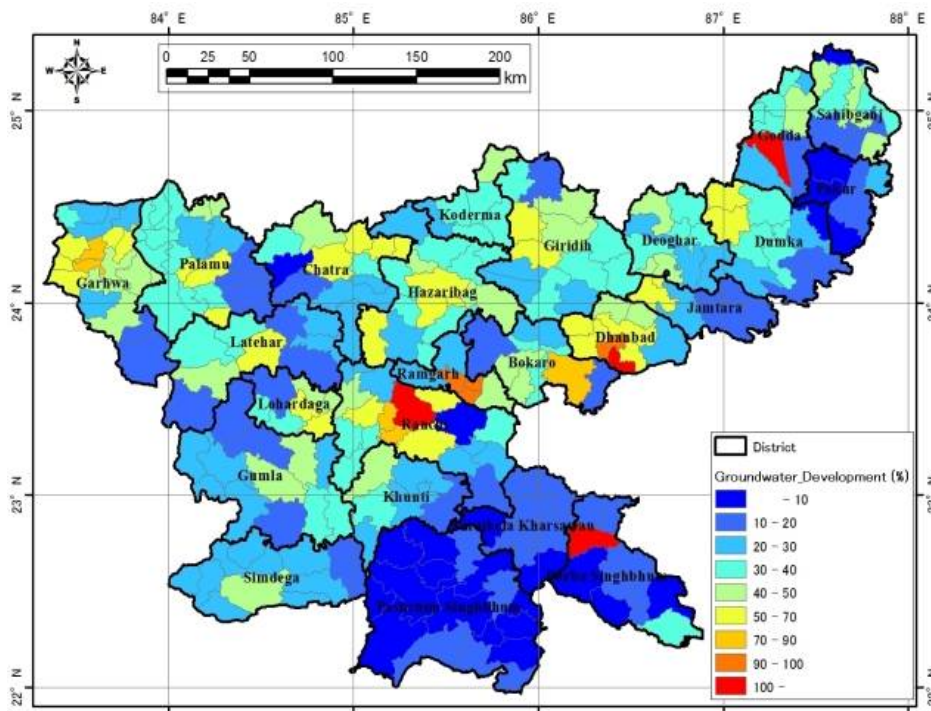
² Ground Water Resource Estimation Methodology, Report of the Ground Water Resources Estimation Committee, Ministry of Water Resources, Government of India, 2009



Source: Dynamic Ground Water Resources of Jharkhand State (2011)

Figure 3.6.7 Block-wise Available Groundwater Amount (ha-m)

Additionally, groundwater development status was estimated in this report. This status is calculated by the ratio between the artificial groundwater draft, i.e., irrigation, domestic and industrial draft of groundwater, and the available groundwater amount. The report shows that eight blocks are using more than 70% of available groundwater amount on 31 March 2009. These blocks are shown in orange and red colours in Figure 3.6.8.



Source: Dynamic Ground Water Resources of Jharkhand State (2011)"

Figure 3.6.8 Block-wise Groundwater Development Status

(4) Water Quality

Groundwater quality is analysed by the District Laboratory of Drinking Water and Sanitation Department, GoJ. The data are available in the homepage of the Ministry of Drinking Water and Sanitation³. The water sources of these analyses are mostly deep tube wells.

Table 3.6.5 shows the average water quality data by district. Figure 3.6.9 shows the distribution of water quality, namely, fluoride, arsenic, pH, and total dissolved solids (TDS). But, the number of data is biased by district. Sahibganj District and Purbi Singhbhum District have more than 20,000 data; on the other hand, other districts mostly have less than 1,000 data. Data for arsenic are biased in Sahibganj District. The areas indicated in white colour in Figure 3.6.9 mean there is no data available.

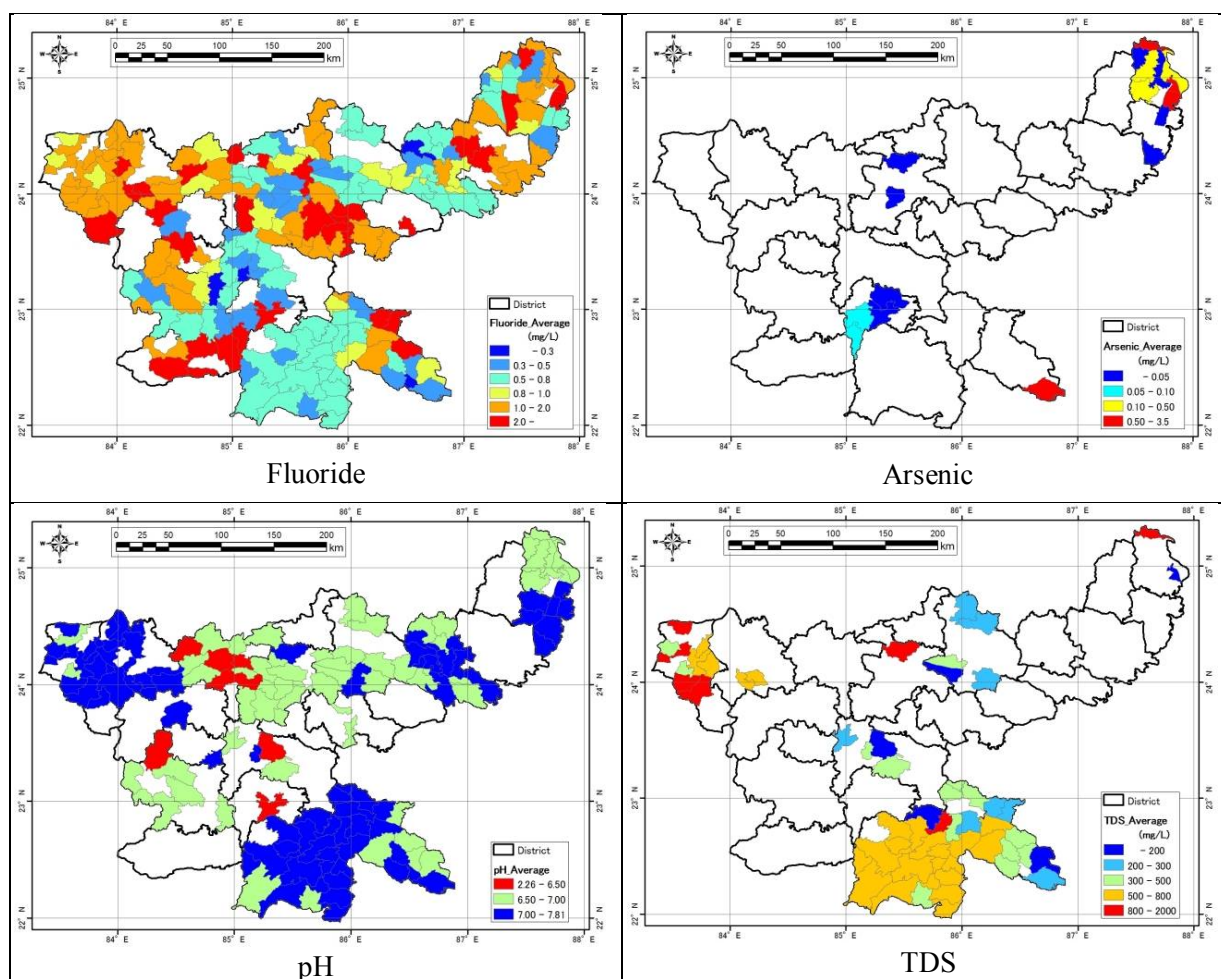
Fluoride is detected widely in Jharkhand. Orange and red collared areas in Figure 3.6.9 show the areas which is exceeding 1.0 mg/L limitation of the Food and Agriculture Organization (FAO) standard (refer to Attachment 3.6.2). Arsenic is detected in many samples in Sahibganj District; however, the number of data which was analysed is very few in other districts. TDS has high correlation with salinity; it is used as an index of salinity. In this result, Pashchimi Singhbhum District, Garhwa District, Hazaribagh District, and Sahibganj District have higher average value. In these districts, salt damage of field by groundwater irrigation may happen.

Table 3.6.5 Summary of District-wise Water Quality of Deep Tube Wells

District Name	Iron		Fluoride		pH		TDS		Arsenic	
	Data No.	(mg/L)	Data No.	(mg/L)	Data No.	-	Data No.	(mg/L)	Data No.	(mg/L)
Garhwa	1,068	0.67	1645	1.00	1536	7.28	1386	725.7	0	-
Chatra	351	0.67	336	1.32	295	6.47	0	-	0	-
Kodarma	90	1.55	218	0.94	0	-	0	-	0	-
Giridih	248	2.86	194	0.68	194	6.87	60	229.2	0	-
Deoghar	101	5.03	101	0.84	101	7.10	0	-	0	-
Godda	83	7.00	99	1.62	0	-	0	-	0	-
Sahibganj	26,059	14.87	26,286	1.97	25979	6.82	3	662.0	24,360	1.124
Pakur	122	3.94	122	0.76	122	7.14	0	-	4	0.010
Dhanbad	142	3.86	5	2.88	0	-	0	-	0	-
Bokaro	146	6.01	68	2.50	2	6.99	0	-	0	-
Lohardaga	120	1.67	7	1.86	1	7.50	0	-	0	-
Purbi Singhbhum	20,256	0.98	21,126	1.84	21,587	7.03	1184	383.6	1	3.250
Palamu	548	0.79	1120	1.63	1104	7.29	342	579.3	0	-
Latehar	384	0.23	390	0.44	375	7.17	0	-	0	-
Hazaribagh	365	0.66	362	0.80	305	6.85	1	2,000.0	5	0.034
Ramgarh	237	1.65	263	1.32	0	-	0	-	0	-
Dumka	32	5.57	22	2.49	0	-	0	-	0	-
Jamtara	69	9.87	69	0.77	69	6.92	0	-	0	-
Ranchi	494	3.39	498	0.49	31	6.75	31	301.2	0	-
Khunti	140	7.27	140	2.91	0	-	0	-	121	0.050
Gumla	103	1.14	97	0.93	61	6.87	0	-	0	-
Simdega	64	1.50	10	2.28	0	-	0	-	0	-
Pashchimi Singhbhum	1305	1.87	1125	0.63	1174	7.25	1188	594.4	0	-
Saraikela -Kharsawan	113	0.94	86	0.66	102	7.24	38	449.7	0	-

Source: Central Ground Water Board

³ National Rural Drinking Water Program, Ministry of Drinking Water and Sanitation
<http://indiawater.gov.in/imisreports/nrdwpmain.aspx>



Source: Central Ground Water Board

Figure 3.6.9 Block-wise Distribution of Water Quality of Groundwater

The Drinking Water and Sanitation Department had conducted water quality test of dug wells in ten districts during the first field survey period. The summary of the results of water quality of shallow aquifer as shown in Table 3.6.6 (the details in Attachment 3.6.3) is better than the quality of water as shown in Table 3.6.5, which is water quality of deeper aquifer. This is because of the fact that water in deeper aquifers gets contaminated by minerals of host rock.

Table 3.6.6 Water Quality of Shallow Wells Summarised by District

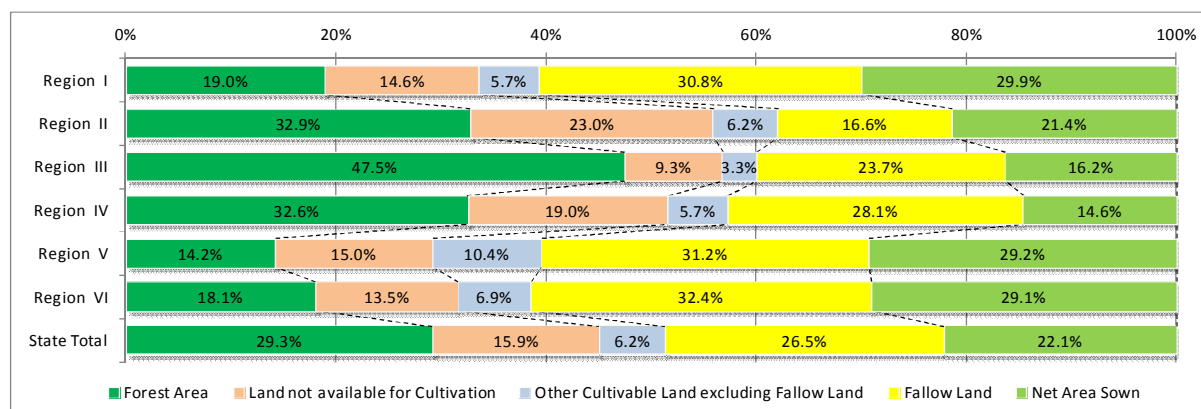
District	Data Number	pH	TDS (mg/L)	Turbidity (NTU)	Arsenic (mg/L)	Fluoride (mg/L)	Nitrate (mg/L)	Iron (mg/L)
Godda	9	7.46	292.89	2.43	0.00	0.65	11.10	0.34
Pakur	6	7.47	248.33	3.03	0.00	0.15	5.92	0.34
Lohardaga	7	7.24	150.00	1.24	0.00	0.00	7.71	0.12
Palamu	20	7.20	297.75	1.81	0.00	0.17	16.85	0.18
Hazaribagh	14	7.01	413.57	1.11	0.00	0.52	8.15	0.33
Dumka	10	7.43	294.00	3.89	0.00	0.31	9.86	0.31
Ranchi	17	7.35	401.18	3.76	0.00	0.18	10.20	0.19
Khunti	6	7.50	233.67	1.50	0.00	0.34	3.36	0.24
Gumla	12	7.30	182.50	1.35	0.00	0.20	15.75	0.18
West Singhbhum	17	7.87	366.47	3.74	0.00	0.21	5.59	0.26
Average	118	7.24	235.77	1.57	0.00	0.15	14.87	0.17

Source: Department of Drinking Water Supply and Sanitation

3.7 Horticulture Production

3.7.1 Agricultural Land Use

As described in Section 3.4, Jharkhand State is mainly categorised into three agro-climatic sub-zones, which can be further divided in six regions on the basis of suitability of horticulture crops. Land use distributions in each agro-climatic region is shown in Figure 3.7.1 below.



Source: Directorate of Statistics and Evaluation, GoJ

Figure 3.7.1 Land Use Distribution in Agro-climatic Regions in Jharkhand in 2004-05 (%)

According to the above figure, Agro-climatic Region I (Ranchi, Hazaribagh, Ramgarh, and Simdega), Region V (Deoghar, Jamtara, Dumka, Godda, Sahibganj, and Pakur), and Region VI (Gumla and Lohardaga) show the highest ratio of approximately 30% in net area sown. Region IV (Kodarma, Giridih, Dhanbad, Bokaro, and Hazaribagh) shows the lowest ratio of approximately 15% in net area sown followed by Region III (Garhwa, Palamu, Chatra, and Latehar) and Region II (Pashchimi Singhbhum, Purbi Singhbhum, and Saraikela Kharsawan). Region II, Region III, and Region IV are mainly dominated by forest areas. The ratio of net area sown in the state total is 22.1%.

District-wise detailed data of land use in Jharkhand is shown in the following Table 3.7.1.

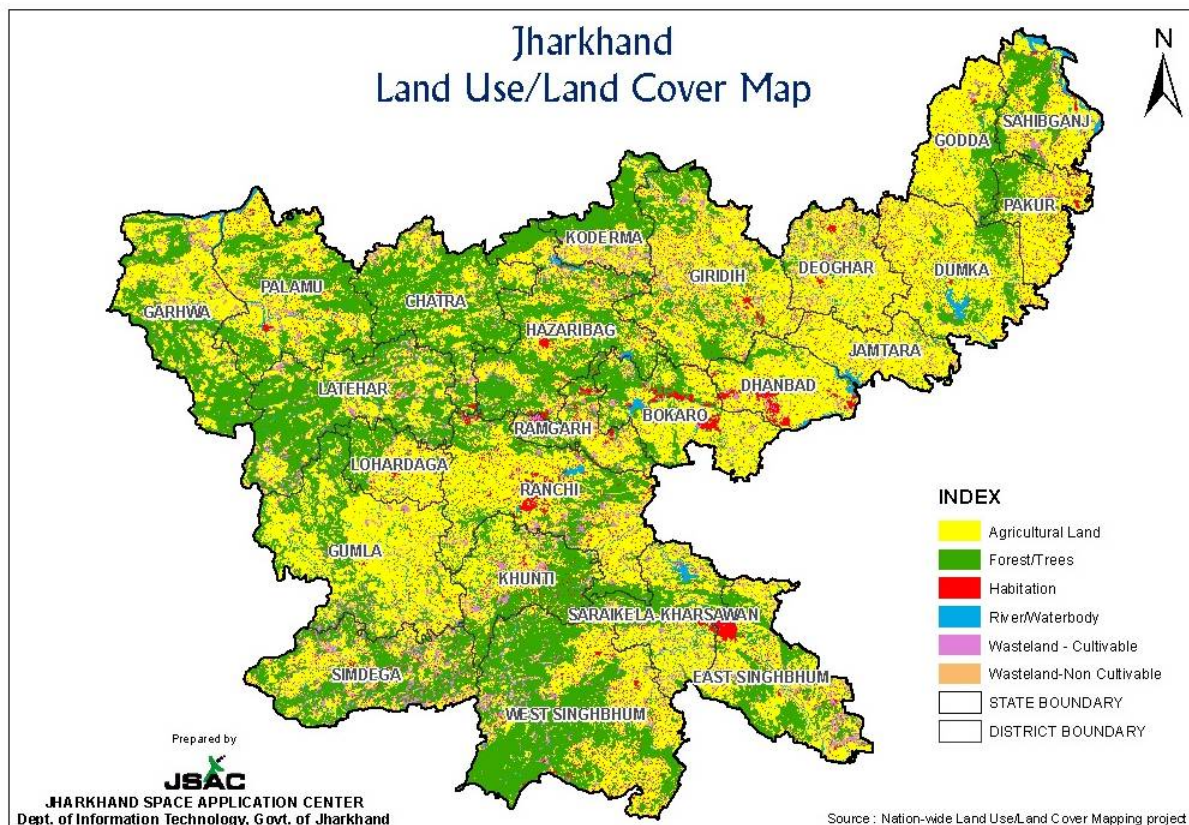
Table 3.7.1 District-wise Land Use Statement of Jharkhand in 2004-05 ('000 ha)

Agro-climatic Region	District	Forest Area	Not Available for Cultivation	Other Cultivable Land excluding Fallow Land	Fallow Land	Net Area Sown	% of Net Area Sown in TGA
1	Ranchi and Khunti	159.14	114.00	39.05	190.21	255.85	33.7
1	Simdega	55.94	51.29	25.18	157.55	81.67	22.0
2	Purbi Singhbhum	122.82	197.60	33.33	119.66	83.28	15.0
2	Pashchimi Singhbhum	227.54	79.54	35.10	74.53	145.99	25.9
2	Saraikela-Kharsawan	95.96	35.13	15.28	30.44	60.42	25.5
3	Chatra	226.82	30.40	11.26	61.97	45.07	12.0
3	Palamu	226.85	51.60	19.36	129.13	97.75	18.6
3	Garhwa	191.15	39.85	11.71	121.34	64.77	15.1
3	Latehar	137.97	31.53	11.53	78.39	59.77	18.7
1&4	Ramgarh and Hazaribagh	256.66	91.77	20.88	129.18	106.14	17.6
4	Kodarma	55.23	23.95	6.32	27.66	17.04	13.1
4	Giridih	158.42	64.04	41.41	151.76	77.59	15.7
4	Bokaro	72.23	71.03	14.63	115.57	15.51	5.4
4	Dhanbad	18.93	75.74	15.17	59.72	34.60	16.9
5	Dumka	42.71	65.99	49.48	101.75	119.10	31.4
5	Deoghar	34.63	32.71	28.55	88.58	63.68	25.7
5	Godda	31.32	26.79	16.04	79.48	78.21	33.7
5	Pakur	20.79	27.17	18.47	57.43	57.84	31.8

Agro-climatic Region	District	Forest Area	Not Available for Cultivation	Other Cultivable Land excluding Fallow Land	Fallow Land	Net Area Sown	% of Net Area Sown in TGA
5	Sahibganj	42.74	30.11	12.31	75.13	41.46	20.6
5	Jamtara	30.20	30.19	22.40	41.04	55.34	30.9
6	Lohardaga	44.36	18.88	11.26	39.48	39.64	25.8
6	Gumla	81.14	74.74	36.63	184.66	161.75	30.0
Total		2,333.55	1,264.05	495.35	2,114.66	1,762.47	22.1

Source: Directorate of Statistics and Evaluation, GoJ

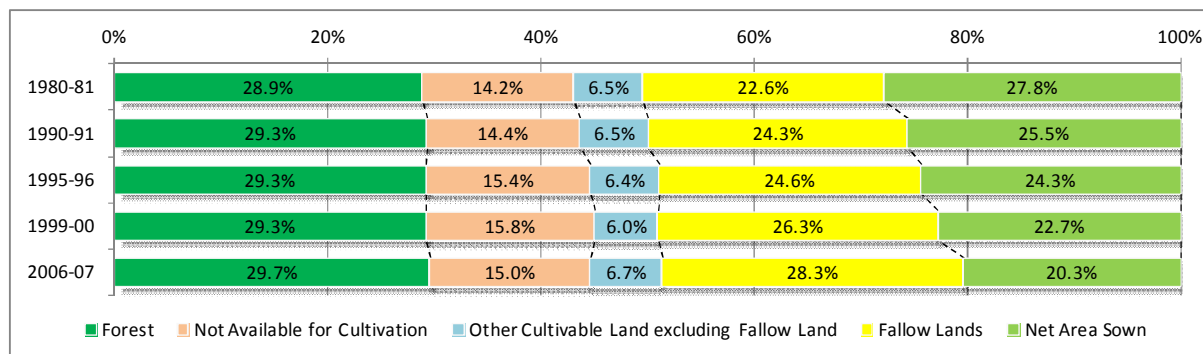
The following map shows the land use/land cover of Jharkhand.



Source: JSAC, prepared by the data of Nationwide Land Use/Land Cover Mapping Project

Figure 3.7.2 Land Use/Land Cover Map of Jharkhand

The following Figure 3.7.3 shows the historical trend of agricultural land distribution by use in Jharkhand. The figure shows gradual decrease in net area sown and increase in fallow land from 1980-81 to 2006-07. As of 2006-07, the ratio of net area sown was 20.3%.



Sources: Directorate of Statistics and Evaluation, PDD, GoJ and Bihar

Figure 3.7.3 Historical Trend of Agricultural Land Distribution by Use in Jharkhand (%)

The detailed historical land use in Jharkhand is shown in Table 3.7.2 below. Cropping intensity in Jharkhand in 2006-07 was 110.58%.

Table 3.7.2 Historical Trend of Land Distribution by Use in Jharkhand (ha)

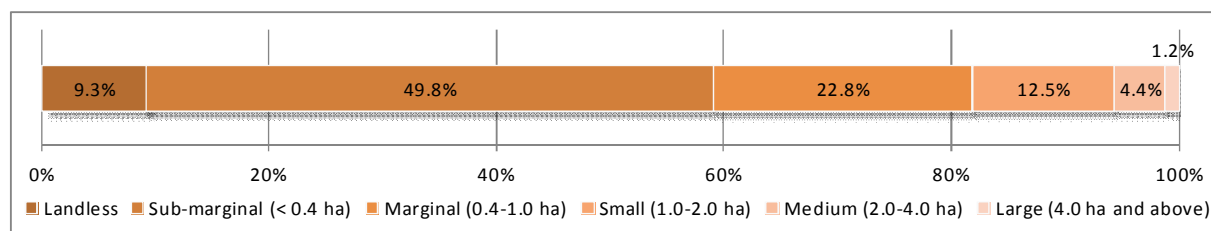
No.	Classification		1980-81	1990-91	1995-96	1999-00	2006-07
1	Geographical Area	Geographical Area	7,970.08	7,970.08	7,970.08	7,970.08	7,970.08
2	Forest	Forest	2,277.50	2,314.00	2,332.56	2,332.55	2,360.55
3	Not Available for Cultivation	Area under Non-Agricultural Uses	552.50	524.00	656.59	682.88	627.10
		Barren and Un-cultivable Land	569.50	609.00	573.12	573.09	564.11
4	Other Cultivable Land excluding Fallow Land	Permanent Pastures and Other Grazing Land	106.34	105.00	93.03	87.76	109.70
		Lands under Misc. Trees and Crops and Groves	63.27	77.00	105.91	113.44	93.20
		Cultivable Wasteland	342.00	328.00	311.64	274.46	334.04
5	Fallow Lands	Fallow Land Other than Current Fallow	777.40	875.00	804.05	779.36	935.50
		Current Fallow	1,008.00	1,046.00	1,154.25	1,315.94	1,318.02
6	Net Area Sown	Net Area Sown	2,191.50	2,016.00	1,938.93	1,807.90	1,618.63
7	Total Cropped Area (Gross Cropped Area)	Total Cropped Area (Gross Cropped Area)	2,484.00	2,245.00	2,180.39	2,068.48	1,789.83
8	Area Sown more than Once	Area Sown more than Once	292.50	229.00	241.46	260.58	171.20
9	Cropping Intensity*	Cropping Intensity (%)	113.37	111.35	113.19	114.00	110.58

Note: *Cropping Intensity is % of the gross cropped area to the net area sown.

Sources: Directorate of Statistics and Evaluation, PDD, GoJ

3.7.2 Land Holding and Land Tenure

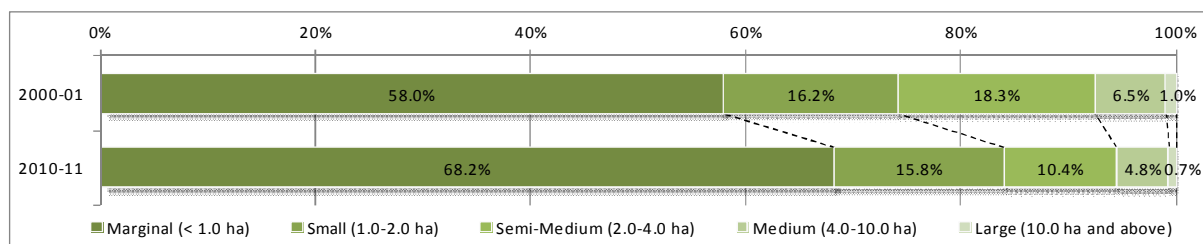
The following Figure 3.7.4 shows the typology of land holding in Jharkhand. According to the figure, sub-marginal farmers (less than 0.4 ha) show the highest ratio at 49.8% followed by marginal farmers (0.4 ha -1.0 ha) at 22.8%. Ratio of landless farmers is 9.3%.



Source: Agricultural Resource Database of Jharkhand 2011-12, SAMETI

Figure 3.7.4 Typology of Land Holding in Jharkhand (% of Population)

The following Figure 3.7.5 shows the comparison of distribution of operational land holding between 2000-01 and 2010-11. According to the figure, the ratio of marginal farmers (less than 1.0 ha) show an increase from 58.0% to 68.2%. On the other hand, small (1.0-2.0 ha), semi-medium (2.0-4.0 ha), and medium (4.0-10.0 ha) show a decrease. Specifically, the ratio of small land holding farmers shows the largest decrease from 16.2% to 15.8%. It shows that an average land holding size had decreased in the last decade and suggests that an effective land use in individual land holding might be important in agricultural production in Jharkhand.



Source: Agriculture Census 2010-11

Figure 3.7.5 Distribution of Operational Land Holdings in Jharkhand in 2000-01 and 2010-2011

The following Tables 3.7.3 and 3.7.4 show detailed data of the distribution of operational land holding in Jharkhand in 2000-01 and 2010-11. According to the tables, the average size of an operational land holding in 2010-11 was 1.17 ha which has decreased from 1.45 ha in 2000-01. It also suggests an effective land use in individual farm land might be necessary in uplifting agricultural production in Jharkhand.

Table 3.7.3 Distribution of Operational Land Holdings in Jharkhand in 2000-01

Category	No. of Operational Holdings ('000)		Area Operated ('000 ha)		Average Size of Operational Holding (ha) (B) / (A)
	Number (A)	%	ha (B)	%	
Marginal (< 1.0 ha)	1,544.85	58.0%	752.01	19.5%	0.49
Small (1.0-2.0 ha)	431.95	16.2%	655.50	17.0%	1.52
Semi-Medium (2.0-4.0 ha)	488.92	18.3%	993.94	25.8%	2.03
Medium (4.0-10.0 ha)	173.10	6.5%	1,006.60	26.1%	5.82
Large (10.0 ha and above)	26.32	1.0%	445.98	11.6%	16.94
All Holdings	2,665.14	100.0%	3,854.03	100.0%	1.45

Source: Agriculture Census 2010-11

Table 3.7.4 Distribution of Operational Land Holdings in Jharkhand in 2010-11

Category	No. of Operational Holdings ('000)		Area Operated ('000 ha)		Average Size of Operational Holding (ha) (B) / (A)
	Number (A)	%	ha (B)	%	
Marginal (< 1.0 ha)	1,848.00	68.2%	764.00	24.1%	0.41
Small (1.0-2.0 ha)	429.00	15.8%	591.00	18.7%	1.38
Semi-Medium (2.0-4.0 ha)	283.00	10.4%	775.00	24.5%	2.74
Medium (4.0-10.0 ha)	129.00	4.8%	725.00	22.9%	5.62
Large (10.0 ha and above)	20.00	0.7%	311.00	9.8%	15.55
All Holdings	2,709.00	100.0%	3,166.00	100.0%	1.17

Source: Agriculture Census 2010-11

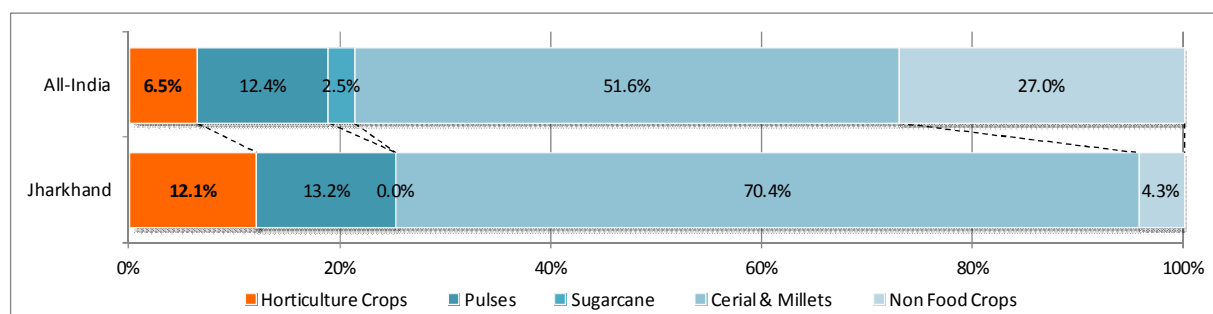
3.7.3 Cropped Area and Horticulture Production

In general, horticulture is one of the important crops in Jharkhand. The following Table 3.7.5 shows the distribution of gross cropped area across different crops of Jharkhand in 2004-05 as compared with all-India. As a result of comparison, % share of total cropped area of horticulture is 10.59% in Jharkhand and 2.86% in all-India. It shows that horticulture is relatively important crops in agriculture in Jharkhand.

Table 3.7.5 Distribution of Gross Cropped Area across Different Crops of Jharkhand in 2004-05 as compared with India

Crops		% Share of Total Cropped Area		Difference (A)-(B)
		Jharkhand (A)	All-India (B)	
Cereals and Millets	Rice	57.74	22.33	+35.41
	Maize	8.64	3.94	+4.70
	Wheat	2.94	13.89	-10.95
	Ragi	0.79	0.87	-0.08
	Other Cereals	0.06	10.54	-10.48
Pulses	Gram	1.52	3.52	-2.00
	Tur	4.02	1.84	+2.18
	Other Pulses	7.68	7.07	+0.61
Horticulture Crops	Fruit	1.51	2.04	-0.53
	Vegetables	10.59	2.86	+7.73
	Condiments and Spices	0.03	1.60	-1.57
Sugarcane		0.00	2.50	-2.50
Non Food Crops	Oil Seeds	4.28	15.89	-11.61
	Fibres	0.00	4.92	-4.92
	Fodder Crops	0.00	5.07	-5.07
	Other Non Food Crops	0.00	1.12	-1.12
Total		100.00	100.00	-

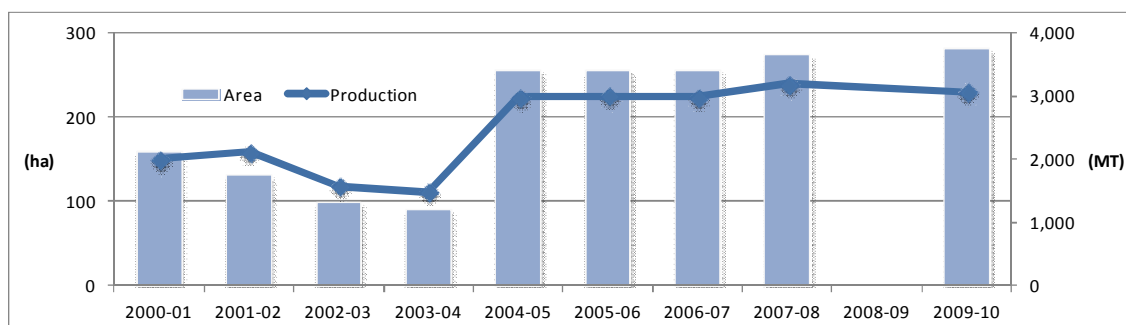
Source: Agricultural Research Data Book and Directorate of Agriculture, GoJ



Source: Agricultural Research Data Book and Directorate of Agriculture, Jharkhand

Figure 3.7.6 Summary of Gross Cropped Area Jharkhand and India in 2004-05

The following Figure 3.7.7 shows the year-wise area and production of vegetables in Jharkhand.



Sources: Economic Survey of Jharkhand, 2008-09 and Directorate of Horticulture, Department of Agriculture and Cane Development, GoJ, and Agriculture Research Data Book, 2009 (IASRI)

Note: Data of 2008-09 was not available.

Figure 3.7.7 Year-wise Area and Production of Vegetables in Jharkhand

In Jharkhand, vegetable production and cropped area have increased since 2003-04. The following Table 3.7.6 shows historical change of cropped area, production, and yield of vegetables by year in Jharkhand and all-India. The table suggests that vegetable yield in Jharkhand is almost the same as that of all-India.

Table 3.7.6 Year-wise Area, Production, and Yield of Vegetables in Jharkhand and All-India

Year	Jharkhand			All-India		
	Area ('000 ha)	Production ('000 MT)	Yield (MT/ha)	Area ('000 ha)	Production ('000 MT)	Yield (MT/ha)
2000-01	150	2,110	14.00	6,250	93,850	15.02
2001-02	159	1,736	10.95	6,156	88,622	14.40
2002-03	118	1,300	11.00	6,092	84,815	13.92
2003-04	111	1,197	10.82	6,309	93,165	14.77
2004-05	224	3,395	15.18	6,744	101,246	15.01
2005-06	224	3,401	15.17	7,213	111,399	15.44
2006-07	224	3,395	15.18	7,584	115,011	15.16
2007-08	239	3,640	15.24	7,803	125,887	16.13
2008-09	No data	No data	No data	No data	No data	No data
2009-10	230	3,727	16.23	No data	No data	No data

Sources: *Economic Survey of Jharkhand, 2008-09* and *Directorate of Horticulture, Department of Agriculture and Cane Development, GoJ, and Agriculture Research Data Book, 2009 (IASRI)*

(1) Crop-wise Production

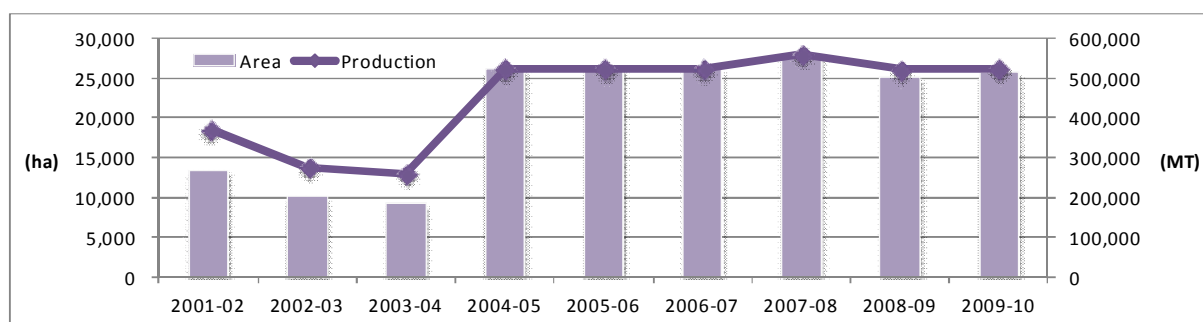
(a) Brinjal

Brinjal (eggplant) production in Jharkhand has increased in the last decade mainly due to the availability of high-yielding and bacterial wilt-resistant cultivars, and in turn enabling area-increase in July transplanted (rainy season) crop. Brinjals can be grown practically on all soils from light sandy to heavy clay. Light soils are good for early crops whilst clay loam and silt loam are well suited for high yield. Brinjal is a warm season crop and is susceptible to severe frost. A long and warm growing season is desirable for successful brinjal production. In cool season, growth is slow and fruit quality is poor both in size and in colour. In Jharkhand, the benefit of micro drip irrigation (MDI) will come mainly through preponement of transplanting time from July (rainy season crop) to March-April (summer crop) and water savings as crop water requirement is low.



Brinjals transacted Retail Market (Ranchi District)

Source: JICA Survey Team



Source: *Economic Survey of Jharkhand, 2008-09* and *Directorate of Horticulture, Department of Agriculture and Cane Development, GoJ*

Figure 3.7.8 Area and Production of Brinjal (Eggplant) in Jharkhand

State	Month												Area ('000 ha)	Production ('000 MT)	Productivity (MT/ha)	Population ('000)
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.				
Jharkhand													24.2	297	12.3	32,966
West Bengal													161.0	2,966	18.4	91,348
Odisha													130.1	2,194	16.9	41,947
Chhattisgarh													31.2	546	17.5	25,540
Bihar													56.2	1,292	23.0	103,805
Uttar Pradesh													SA	SA	SA	199,581

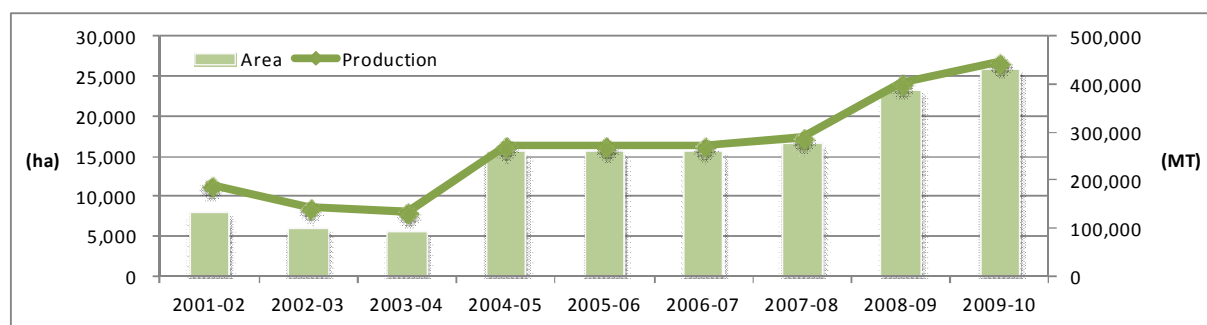
Legend: ■ :Peak Season ■ :Lean Season ■ :Round the year SA: Small Amount

Source: Director of Horticulture, Agriculture of respective State, UT's

Figure 3.7.9 Harvest Season of Brinjal in Jharkhand and Neighbouring States in 2012-13

(b) Cabbage

Early (tropical/summer) cabbage is best grown on light soil (alfisols of Jharkhand) with good irrigation, unlike late (temperate/winter) crop which thrives better on heavier soil. The favourable soil pH range of 6.0-6.5 (light acidic) is generally available in vegetable fields and the tropical cultivars are repeatedly sown and continuously harvested in not-so-hot (28-36 °C) summer and rainy season. Due to this reason, cabbage is grown year-round in Jharkhand. Farmers of Region I, where well water is available in summer, have acquired the farming skills needed for cultivation of cole crops. MDI will open up vast potential of cole crop production in Region VI, which is climatically more suitable for this crop but at present have very limited production due to inadequacy of irrigation during summer.



Source: Economic Survey of Jharkhand, 2008-09 and Directorate of Horticulture, Department of Agriculture and Cane Development, GoJ

Figure 3.7.10 Area and Production of Cabbage in Jharkhand

State	Month												Area ('000 ha)	Production ('000 MT)	Productivity (MT/ha)	Population ('000)
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.				
Jharkhand													31.1	480	15.4	32,966
West Bengal													77.8	2,179	28.0	91,348
Odisha													41.0	1,148	28.0	41,947
Chhattisgarh													16.6	296	17.9	25,540
Bihar													39.7	779	19.6	103,805
Uttar Pradesh													SA	SA	SA	199,581

Legend: ■ :Peak Season ■ :Lean Season SA: Small Amount

Source: Director of Horticulture, Agriculture of respective State, UT's

Figure 3.7.11 Harvest Season of Cabbage in Jharkhand and Neighbouring States in 2012-13

(c) Cauliflower

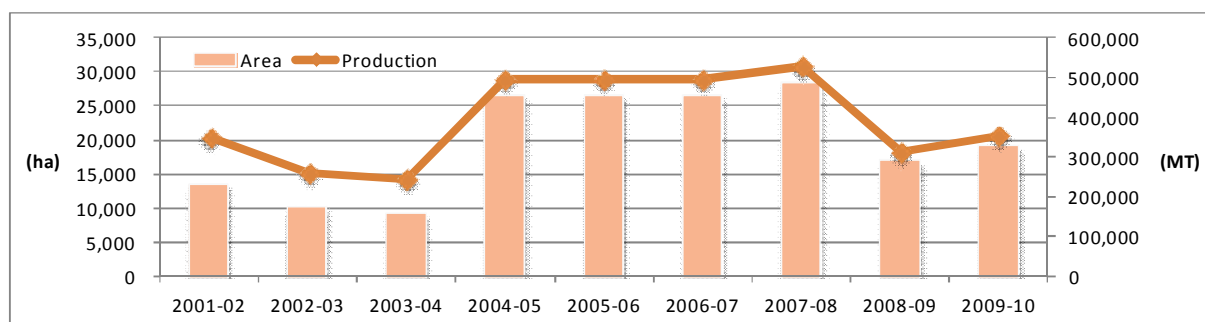
Light to medium light soil (like alfisols) effecting quick drainage in rainy season is preferable for tropical cauliflower. Early (tropical/summer) and mid-season cauliflowers have adopted themselves to higher temperature unlike the latter (temperate/winter) group and set curd at temperature 20 °C and above. The subtropical and sub- humid climate available in parts of Region I offer excellent agro-climatic situations for cultivation of



Cauliflowers transported to Assembly Market (Ranchi District)

Source: JICA Survey Team

temperate cauliflower and therefore, summer cauliflower is being cultivated in this region for nearly 75 years. In this crop also, MDI will open up vast potential of summer season production in Region VI which is climatically more suitable for this crop but at present have very limited production due to low moisture retention in soil.



Source: *Economic Survey of Jharkhand, 2008-09 and Directorate of Horticulture, Department of Agriculture and Cane Development, GoJ*

Figure 3.7.12 Area and Production of Cauliflower in Jharkhand

State	Month												Area ('000 ha)	Production ('000 MT)	Productivity (MT/ha)	Population ('000)
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.				
Jharkhand													24.7	381	15.4	32,966
West Bengal													73.0	1,863	25.5	91,348
Odisha													44.7	675	15.1	41,947
Chhattisgarh													19.6	342	17.5	25,540
Bihar													63.1	1,194	18.9	103,805
Uttar Pradesh													10.7	241	22.5	199,581

Legend: ■ :Peak Season ■ :Lean Season

Source: *Director of Horticulture/Agriculture of respective State /UT's*

Figure 3.7.13 Harvest Season of Cauliflower in Jharkhand and Neighbouring States in 2012-13

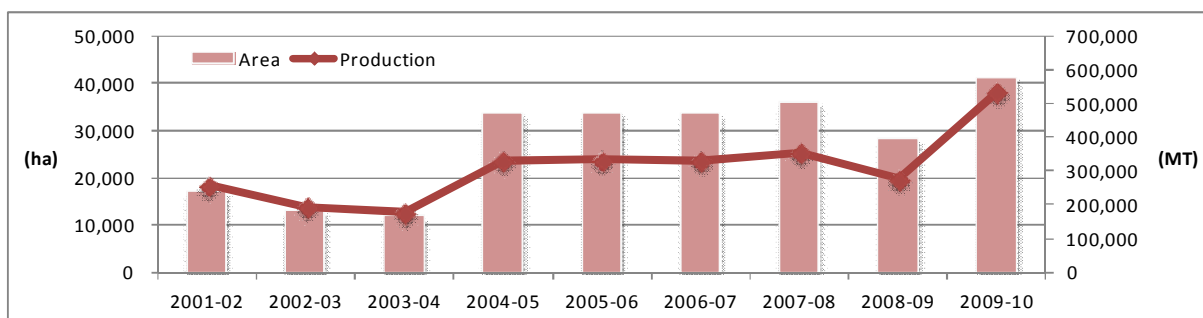
(d) Tomato

Tomato production in Jharkhand has increased in the last decade mainly due to the availability of high-yielding bacterial wilt-resistant cultivars and in turn enabling area-increase in August transplanted (rainy season) crop. This crop has market advantage too. A well-drained, fairly light, fertile loam soil with a fair moisture holding capacity is ideal for growing a good crop of tomato. Soil pH of 6.0-7.0 is preferred. It is a warm season crop, and requires a long season to produce good crop. This condition is available in some parts of Jharkhand during summer. Day temperature of 26.5 °C and night temperature of 16-22 °C result in development of heavy root system, branching, inflorescence, flowering and fruit set. However, the ill effect of high fluctuation of moisture regime in soil due to furrow irrigation in summer causes fruit drop and fruit cracking and farmers do not prefer summer cultivation. Provision of MDI will mitigate this constraint and farmers will be encouraged to take summer and early rainy season cultivation making tomato availability possible for an extended period.



Tomato Production with Furrow Irrigation (Ranchi District)

Source: *JICA Survey Team*



Source: *Economic Survey of Jharkhand, 2008-09 and Directorate of Horticulture, Department of Agriculture and Cane Development, GoJ*

Figure 3.7.14 Area and Production of Tomato in Jharkhand

State	Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Area ('000 ha)	Production ('000 MT)	Productivity (MT/ha)	Population ('000)
Jharkhand			Peak	Lean	Lean						Lean	Lean	Peak	SA	SA	SA	32,966
West Bengal		Peak	Peak	Peak	Lean								Peak	56.0	1,126	20.1	91,348
Odisha		Peak	Peak	Peak	Lean		Lean	Lean	Lean	Lean	Lean	Lean	Peak	96.6	1,383	14.3	41,947
Chhattisgarh		Peak	Peak	Peak	Lean		Lean	Lean	Lean	Lean	Lean	Lean	Peak	48.0	762	15.9	25,540
Bihar		Peak	Peak	Lean	Lean								Peak	47.8	1,126	23.6	103,805
Uttar Pradesh			Peak											SA	SA	SA	199,581

Legend: ■ :Peak Season ■ :Lean Season

SA: Small Amount

Source: *Director of Horticulture, Agriculture of respective State, UT's*

Figure 3.7.15 Harvest Season of Tomato in Jharkhand and Neighbouring States in 2012-13

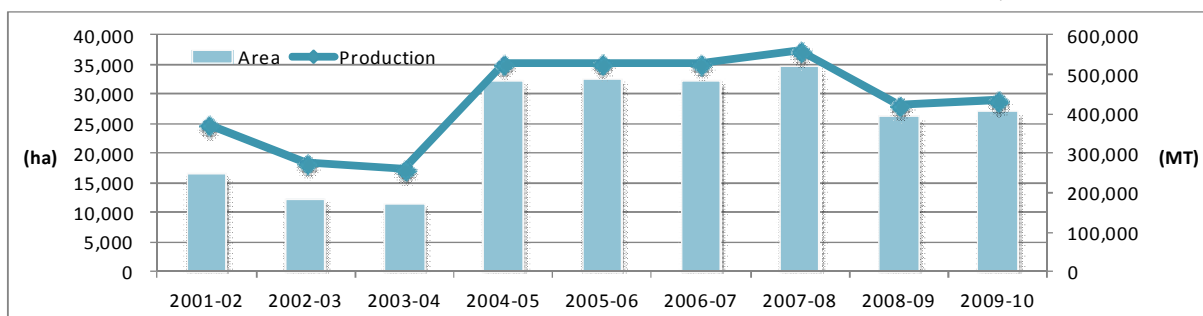
(e) Okra

Sandy to clay soils is fit for okra cultivation as long as those are well supplied with enough organic matter and with good drainage. However, loose, friable, and well-manured loam soils are the best for best yield. Soil pH should range between 6.0 and 6.8. Being a warm season crop, it is susceptible to frost. It thrives best during warm and moist season although it grows fairly well in hottest summer. MDI will benefit okra by helping preponement of crops and minimising soil compaction.



Okras transacted at Wholesale Market (Purbi Singhbhum District)

Source: *JICA Survey Team*



Source: *Economic Survey of Jharkhand, 2008-09 and Directorate of Horticulture, Department of Agriculture and Cane Development, GoJ*

Figure 3.7.16 Area and Production of Okra in Jharkhand

State	Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Area ('000 ha)	Production ('000 MT)	Productivity (MT/ha)	Population
Jharkhand														32.5	447	13.8	32,966
West Bengal														74.6	869	11.7	91,348
Odisha														67.0	594	8.9	41,947
Chhattisgarh														26.5	269	10.2	25,540
Bihar														59.2	854	14.4	103,805
Uttar Pradesh														12.4	159	12.8	199,581

Legend: ■ :Peak Season ■ :Lean Season ■ :Round the year

Source: Director of Horticulture, Agriculture of respective State, UT's

Figure 3.7.17 Harvest Season of Okra in Jharkhand and Neighbouring States in 2012-13

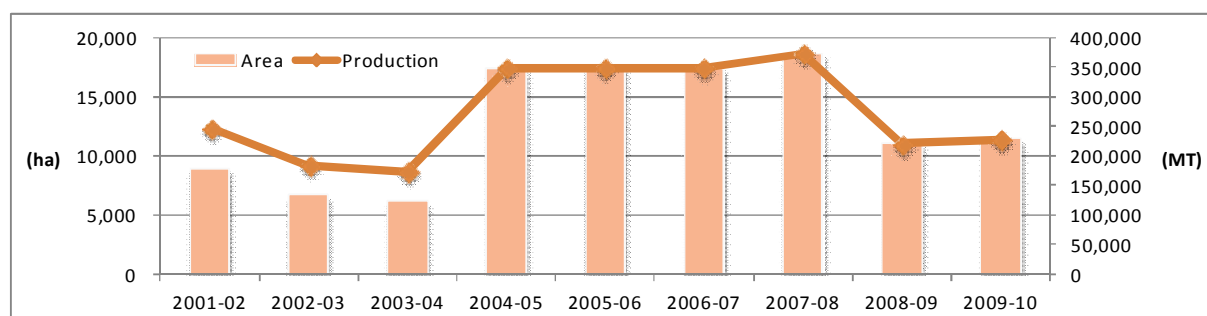
(f) Onion

Bulb production in onion is governed by many factors like photoperiod, temperature, light quality and intensity, plant size, nutrition, and growth substances. Onion is grown on all types of soils but sandy loam and silt loam are more suitable for bulb development. Transplanting on ridge or raised bed is better. The root system is normally restricted to 8 cm and roots seldom penetrate deeper than 15 cm. The water requirement of the crop at the initial growth period is less. The most critical stage for water need is in the periods of bulb formation and enlargement. Significant increase in yield and water use efficiency in drip irrigation has been recorded (Abrol and Dixit, 1972) more than the conventional method.



Onion Production with Mulching (Ranchi District)

Source: JICA Survey Team



Source: Economic Survey of Jharkhand, 2008-09 and Directorate of Horticulture, Department of Agriculture and Cane Development, GoJ

Figure 3.7.18 Area and Production of Onion in Jharkhand

State	Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Area ('000 ha)	Production ('000 MT)	Productivity (MT/ha)	Population ('000)
Jharkhand														SA	SA	SA	32,966
West Bengal														SA	SA	SA	91,348
Odisha														34.9	419	12.0	41,947
Chhattisgarh														SA	SA	SA	25,540
Bihar														53.0	1,108	20.9	103,805
Uttar Pradesh														26.6	474	17.8	199,581

Legend: ■ :Peak Season ■ :Lean Season SA: Small Amount

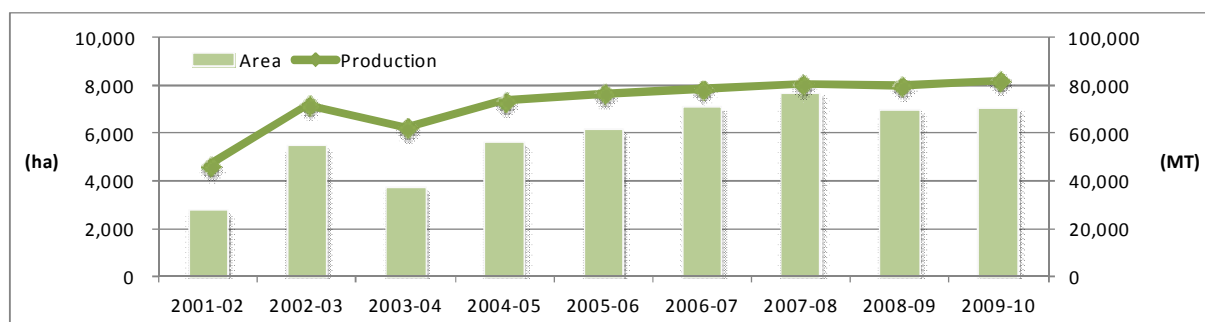
Source: Director of Horticulture/Agriculture of respective State /UT's

Figure 3.7.19 Harvest Season of Onion in Jharkhand and Neighbouring States in 2012-13

(g) Green Chili

An ideal medium for growing chili is a light loamy soil rich in lime. It can be grown in a variety of soils provided they are well drained and rich in organic matter. Chili is grown in a temperature range between 20 °C and 25 °C. A warm and humid climate favours growth, and dry weather enhances fruit

maturity. Light irrigation is required which can be better provided with MDI.



Source: *Economic Survey of Jharkhand, 2008-09 and Directorate of Horticulture, Department of Agriculture and Cane Development, GoJ*

Figure 3.7.20 Area and Production of Green Chili in Jharkhand

(h) Peas

Garden Pea (vegetable pea) is grown as winter vegetable in plains and summer vegetables in hills. Pea straw is a nutritious fodder. Pea is very rich in protein and therefore, very valuable for vegetarians. The root system is not strongly developed except tap root. There should be optimum moisture at the time of sowing to facilitate seed germination. Application of irrigation after sowing affects the germination and subsequent growth. Deficiency of moisture affects germination. Soil compaction after sowing reduces the yield as a result of poor plant emergence and growth of individual plants. The water requirement of pea crop is very low. The weight of green pod is directly related to optimum water regime in soil. Water logging has adverse effect on root nodulation. Thus, use of MDI will help provide optimum moisture at all stages and improve productivity.

State	Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Area ('000 ha)	Production ('000 MT)	Productivity (MT/ha)	Population ('000)
Jharkhand		Peak	Peak	Peak										24.1	358	14.8	32,966
West Bengal		Peak	Peak	Peak										21.8	132	6.1	91,348
Odisha		Peak	Peak	Peak										5.9	53	9.0	41,947
Chhattisgarh		Peak	Peak	Peak	Lean									SA	SA	SA	25,540
Bihar		Peak	Peak	Peak	Lean									10.0	89	8.9	103,805
Uttar Pradesh		Peak	Peak	Peak	Lean									175.0	1,878	10.7	199,581

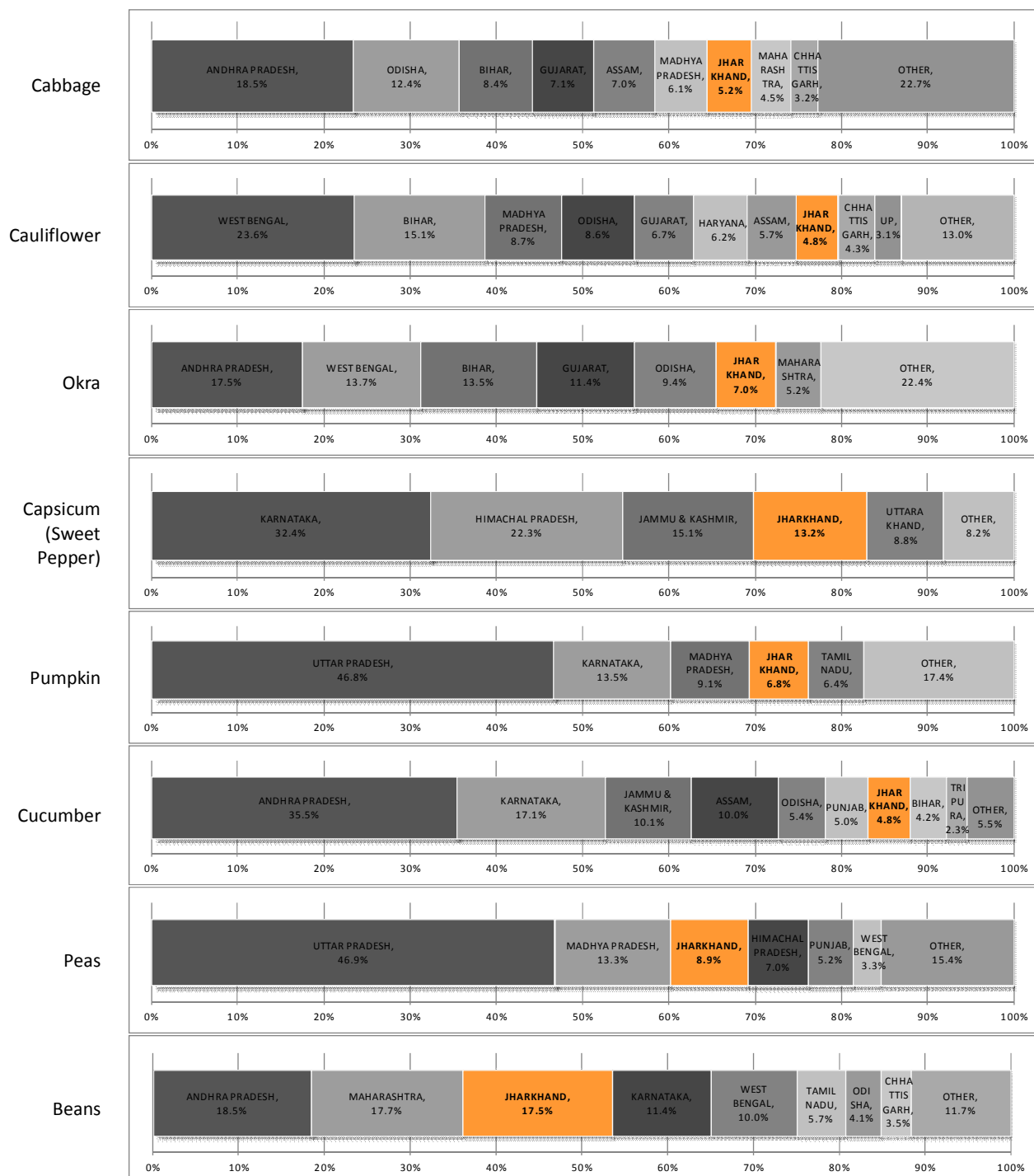
Legend: ■ :Peak Season ■ :Lean Season SA: Small Amount

Source: *Director of Horticulture, Agriculture of respective State, UT's*

Figure 3.7.21 Harvest Season of Peas in Jharkhand and Neighbouring States in 2012-13

(2) Occupation of Jharkhand in Horticulture Production in India

As described in Section 3.7.3, horticulture production is one of the major farming practices in Jharkhand. Farmers are utilising its characteristic climatic condition to produce horticulture crops and sell to internal and external markets of Jharkhand. The series of charts in Figure 3.7.22 shows the position of Jharkhand in some major horticulture crop productions of India. The figure shows the importance of Jharkhand State in horticulture crop production in the entire India despite its small geographical area of 2.4% in the total country area.



Source: State Directorates of Horticulture, Government of India

Figure 3.7.22 State-wise Distribution of Several Horticulture Crops in India in 2012-13

3.7.4 Cost and Profit per Crop

Crop budget of some typical horticulture crops are shown in the following Table 3.7.7. In the surveyed area, chili shows the highest net income followed by brinjal and cucumber.

Table 3.7.7 Average Crop Budget of Horticulture Crops per Season

No.	Crop	Input Cost (Rs./1000 m ²)	Labour Cost (Rs./1000 m ²)	Total Cost (Rs./1000 m ²)	Yield (kg/1000 m ²)	Price (Rs./kg)	Gross Income (Rs./1000 m ²)	Net Income (Rs./1000 m ²)
1	Pea	2,581	4,600	7,181	700	12	8,400	1,219
2	Tomato	3,134	5,670	8,804	2,500	6	15,000	6,196
3	Chili	3,661	13,430	17,091	2,499	20	49,980	32,889
4	Cucumber	2,746	6,690	9,436	4,520	7	31,640	22,204
5	Bitter Gourd	6,364	8,410	14,774	2,250	12	27,000	12,226
6	Muskmelon	4,901	9,290	14,191	1,319	18	23,742	9,551
7	Cauliflower	4,395	6,860	11,255	3,957	5	19,785	8,530
8	French Bean	3,973	4,810	8,783	1,624	10	16,240	7,457
9	Potato	7,401	4,650	12,051	2,110	12	25,320	13,269
10	Brinjal	4,019	14,490	18,509	5,332	8	42,656	24,147

Source: the India Council of Agricultural Research (ICAR), The Jharkhand State Livelihood Promotion Society (JSLPS), and the JICA Survey Team

3.8 Agricultural Processing and Marketing

3.8.1 Overview of Policies and Schemes

(1) Policy Environment

In India, the state governments are empowered to make policies and laws related to agricultural marketing. In Jharkhand, agricultural marketing is regulated by the Jharkhand Agriculture Produce Markets Act 2000, and the Jharkhand Panchayat Raj Act 2001.

As agricultural marketing has emerged as a key issue in India, the Planning Commission constituted a Working Group on Agricultural Marketing. The Working Group has highlighted issues related to marketing of horticulture produce, which include the presence of intermediaries; inadequate infrastructure for storage, sorting, grading, and post harvest management; and inadequate access to market information (see Attachment 3.8.1 for details).

(2) Initiatives of the Government of Jharkhand related to Agricultural Marketing

Marketing-related schemes are initiated and funded by both GoI and GoJ. The sharing portion of budgets between them varies in each scheme. This section overviews the major schemes which GoJ has been conducting, followed by other important initiatives (the scheme-framework initiated by GoI are compiled in Attachment 3.8.1).

(a) Jharkhand State Agricultural Marketing Board

It is a prime objective to provide better marketing facilities to the marginal farmers of the state, especially those involved in horticulture. It is developing provisions for storage, processing, grading, and packaging in Agriculture Produce Markets Committee market yards and subyards. Recently, under *Samekit Vikas Yojna* (Integrated Development Scheme), it has taken up integrated development of 603 *haats* (local retail markets) in Jharkhand which includes developing covered and open platforms. There is also thrust on developing terminal market yards. In recent years, the Marketing Board focuses on information technology in the marketing of agriculture produce. It has provided foldable plastic crates at 50% subsidy.

Meanwhile, the Department of Cooperation of GoJ has set up the Jharkhand State Adivasi Cooperative Vegetable Marketing Federation Ltd. (VEGFED), an apex cooperative institution of the state doing procurement, processing, value addition, and marketing of vegetables.

With the assistance of the National Cooperative Development Corporation (NCDC), under the Integrated Cooperative Projects, the Department of Cooperation is strengthening the existing primary agricultural credit societies and large area multi-purpose cooperative societies. There is also support to strengthen infrastructure of such societies related to agricultural marketing. In the Twelfth Five-Year Plan, it is proposed to strengthen processing units in these cooperatives. The Integrated Cooperative Development Projects are also being implemented in different districts with the assistance of NCDC.

(b) State Horticulture Mission

The Integrated Post Harvest Management is one of the components under NHM. As part of this component, the State Horticulture Mission is popularising on farm collection and storage units, low energy cool chambers, and also Pusa zero energy cool chambers. At a limited scale, cold storage and ripening chamber is also promoted. The mission also focuses on developing marketing infrastructure like rural markets, retail outlets, and functional infrastructure like those related to collection, sorting, grading, and packing.

(3) Mega Food Park

During the Eleventh Five-Year Plan (2007-12), the Ministry of Food Processing Industries of GoI launched the Mega Food Parks Scheme. The objective of this scheme is to provide modern infrastructure facilities for food processing along the value chain from farm to market. In addition to the establishment of high quality processing infrastructure, the scheme is expected to contribute to reduction in wastage, capacity building of farmers and processors, enhancing efficiency in supply chains, creation of employment opportunities, and increase in income of farmers. The Mega Food Parks are expected to come up in different production clusters in India. It is implemented in a demand driven approach and envisages that with reference to bidding process through Expression of Interest, the 'Anchor Promoting Organization' would promote a Special Purpose Vehicle company to set up specific Mega Food Park. The Ministry of Food Processing Industries provides a subsidy of up to 50% of eligible capital cost, maximum being Rs.500 million.

As of the present, 40 mega food parks were approved, including the Jharkhand Mega Food Park Pvt. Limited at Getalsud Industrial Area, about 35 km from Ranchi City. Jharkhand Mega Food Park Pvt. Limited has been promoted by Mumbai based GenX Venture Capital, other partners being Patanjali Ayurveda Ltd, Lunar General Trading, and the state government through Ranchi Industrial Area Development Authority. The Mega Food Park has a land provision for 33 processing units, and a provision for common facilities including dry warehousing, cold storage, flour mills, and packaging units. Currently, the park is under construction and is yet to be operational.

The expected increase in domestic demand for processed foods, combined with a capital subsidy support from the government, has led to setting up the mega food parks across the country. However, considering the present low demand for processed foods, and other constraints related to marketing and logistics, there is inadequate interest from major domestic companies and international companies to invest in mega food parks in India. The scenario is likely to change, with rising consumer demands and reforms related to agricultural marketing. It may be important to note that GoI considers food processing as a 'priority sector' and encourages 100% foreign direct investment for setting up food processing units including the promotion of mega food parks. (see Attachment 3.8.2 for details).

(4) VEGFED

VEGFED is a state level federation, currently having 357 primary cooperatives as its members. The primary cooperatives include 110 Primary Agricultural Credit Cooperative Societies Limited (PACS) and Large Area Multi Purpose Cooperative Societies Limited (LAMPS); and 257 Vegetable Growers Cooperative Societies Limited (VGCS). Both primary cooperatives and federation are registered under the Jharkhand Cooperative Societies Act 1935. All the primary cooperatives cover cluster of villages, and have about 100 members, most of them being male members. These primary cooperatives are spread across 20 districts in Jharkhand, majority being in Ranchi District. As implementing agency of the National Vegetable Initiatives for Urban Clusters (NVIUC) under *Rashtriya Krishi Vikas Yojna* (RKVY), VEGFED has also promoted about 100 cluster-level primary cooperatives registered under the Jharkhand Self-Supporting Co-operative Societies Act 1996. However, these cooperatives are not affiliated with VEGFED. Some of these cooperatives function in operational areas, where its member primary cooperatives already operate. (see Attachment 3.8.3 for details).

(5) Other Institutional Initiatives

Safal, owned by Mother Dairy, a subsidiary of the National Dairy Development Board is one of the largest retail networks of fruits and vegetables in metro cities. Besides dealing with fresh fruits and vegetables, it takes up processing which includes production of pulp and concentrates. Similarly, Namdhari Fruits and Vegetables get fruits and vegetables cultivated through contract farming. In Odisha, in collaboration with the State Horticulture Department, Udyan Fresh tries to make a direct linkage between farmers and consumers. Vegetable is procured from farmers and graded based on quality. Consumers are able to buy vegetables through city-based outlets, mobile vegetable carts, and internet. Similar initiatives including retail chains linking with farmers are being attempted across the country.

3.8.2 Processing and Marketing of Horticultural Products

(1) Overview of Horticultural Products

Marketing of horticultural products in Jharkhand especially that of vegetables is no longer sellers' market and it has been competitive not only in the state but also in neighbouring states.

According to a report of the India Council of Agricultural Research (ICAR), the state is presently sufficient in vegetable requirement for domestic consumption, but surplus will be 2.08 million tons per year or even more by 2022 (see Table 3.8.1). On the contrary, the production of fruits is still insufficient for the state's consumption and even in 2022 deficit will be 0.55 million tons. Under the circumstance, vegetable marketing needs to explore broader supply chains including other states whilst fruits can still prioritise inner distribution of the state.

In respect to food processing, the industry is still immature in the state and most of the players are either household or micro-enterprise level. This is mainly because consumers tend to prefer fresh vegetables and fruits in Jharkhand. The demand side is, therefore, not sufficient to invite the investment in the sector (*GoJ, 2012 "Investment Opportunities to Agro-Food Processing Industry"*).

Table 3.8.1 Demand and Supply of Horticulture Crops in Jharkhand

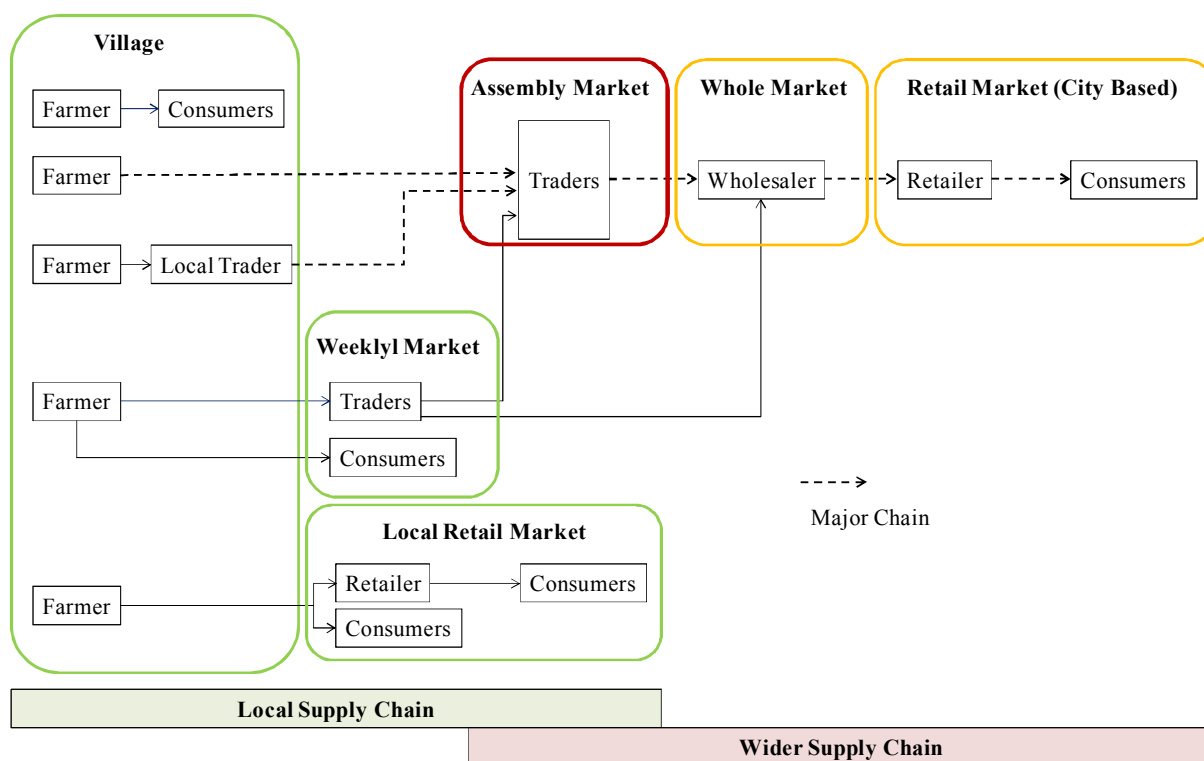
Year	Demand (MT in millions)		Supply at Existing Rate of Growth (MT in millions)		Deficient or Surplus (MT in millions)	
	Fruits	Vegetables*	Fruits	Vegetables	Fruits	Vegetables
2013	1.52	3.50	0.85	3.90	-0.67	0.40
2017	1.61	4.10	0.93	5.57	-0.69	1.47
2022	1.71	4.73	1.15	6.81	-0.55	2.08

Note:* Vegetable demand was estimated from the World Health Organization's desirable consumption rate. In reality, the demand would be lower and in accordance with it, the deficient amount of vegetables would be increased.

Source: ICAR. Draft of Jharkhand Agriculture Development Vision

(2) Type of Markets and Supply Chain of Horticultural Products

Figure 3.8.1 shows a map of supply chain of horticultural products in Jharkhand. The JICA Survey Team observed 19 vegetables/fruits markets and found that the so-called assembly market is a key node, which connects farmers with major consumption cities in and out of Jharkhand. Assembly markets are located in production areas, normally on road side without any infrastructure, and primarily serve as a meeting arena where farmers can transact mainly with long-distance traders. The emergence of the assembly markets seems to be recent phenomena according to the survey. Other types of markets can be evolved to an assembly market if supply and demand meets to do so. As Table 3.8.2 indicates, some local markets and weekly markets have already been functioned as an assembly market partly or seasonally. Besides, wholesale and retail markets seem to be combined at one place, especially in major cities.



Source: JICA Survey Team

Figure 3.8.1 Supply Chain Map in Jharkhand

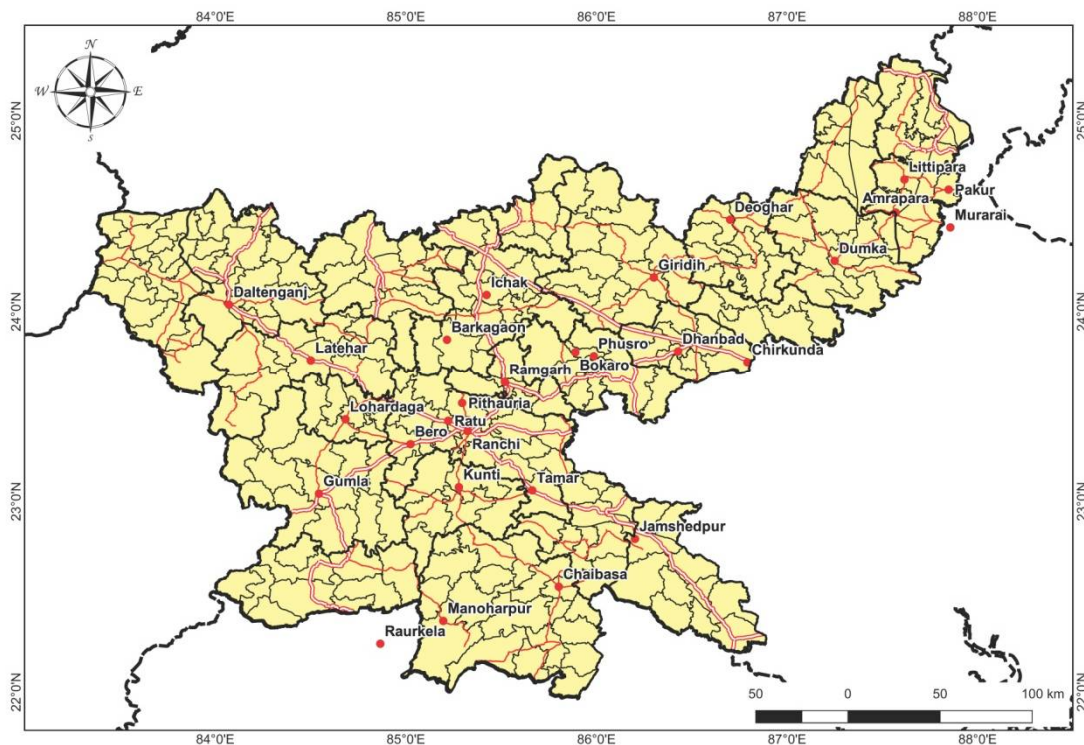
Table 3.8.2 Market Accessibility in the Targeted Districts

Markets Type		Frequency of Operation	Source of Vegetables	Range of Supply Chain	Main Transaction
1	Village/ Farm based Sale	Varies	Local village	Varies	Farmer → Trader
2	Weekly Market (<i>haat</i>)	Once or Twice a Week	Local Villages	Mainly Local	Farmer → Trader Farmer → Consumer
3	Assembly Market	Daily	Local Villages (major production area)	Broad	Farmers → Trader Local Trader → Trader
4	Wholesale Market	Daily	Distant Assembly Markets, Local Markets, Weekly Markets	Broad	Trader → Wholesaler Wholesaler → Retailer
5	Retail Market (City Based)	Daily	Wholesale Markets, Assembly Markets	Mainly Local Occasionally with Assembly Function	Retailer → Consumer
6	Local Retail Market (<i>Bazaar</i>)	Weekly/ Daily	Local Villages	Mainly Local	Farmer → Consumer Farmer → Retailer Retailer → Consumer

Source: JICA Survey Team

(3) Accessibility of Major Markets

Since vegetable production is already at the surplus level in Jharkhand, accessibility of major consumption areas seems to be a key to increase farmers' marketability and income in a mid-/long-term run. Figure 3.8.2 shows the locations of main consumption cities and assembly markets which the JICA Survey Team identified. In terms of logistics, the National Highway 2, National Highway 23, and National Highway 33 are significantly connected to major cities and other states so most of those key markets are on those highways or along with improved roads.



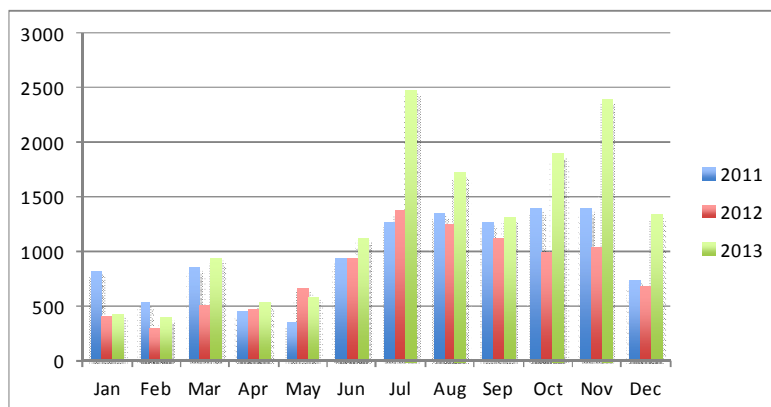
Source: JICA Survey Team

Figure 3.8.2 Location of Main Consumption Cities and Assembly Markets

3.8.3 Price Advantage of Selected Vegetables in Jharkhand

(1) Tomato

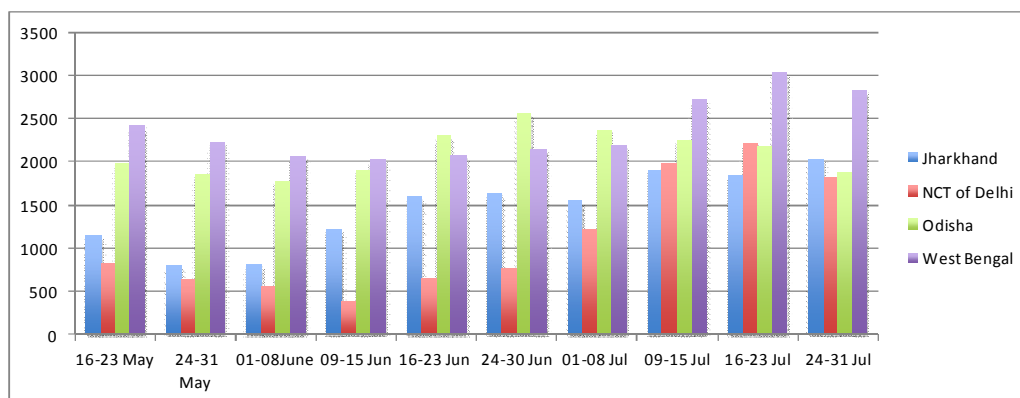
In Jharkhand, there are two major harvest seasons: from November to January and from March to April. Off-season tomato, on the other hand, is harvested between May and July in the state and accordingly, the price shows an increase during the period (Figure 3.8.3). Compared with Odisha and West Bengal, tomato price in Jharkhand tends to be cheaper most of the year. Observing price fluctuations closely between the end of May and the beginning of June, the gap between Jharkhand and Odisha/West Bengal, doubles (Figure 3.8.4). MDI beneficiaries can take advantage of the gap if they have market-linkage with those markets.



*Rs./100 kg

Source: Jharkhand State Horticulture Mission

Figure 3.8.3 Wholesale Price of Tomato in Jharkhand (2011-13)



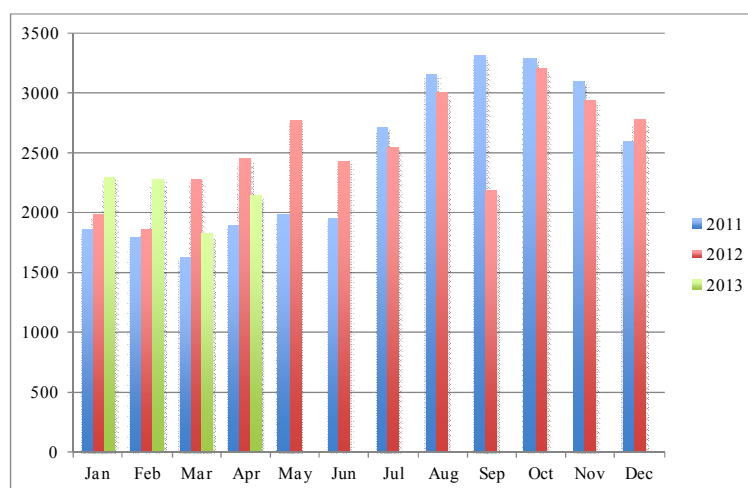
*Rs./100 kg

Source: Jharkhand State Horticulture Mission

Figure 3.8.4 Wholesale Price of Off-season Tomato in Four States (2012)

(2) Capsicum (Sweet Pepper)

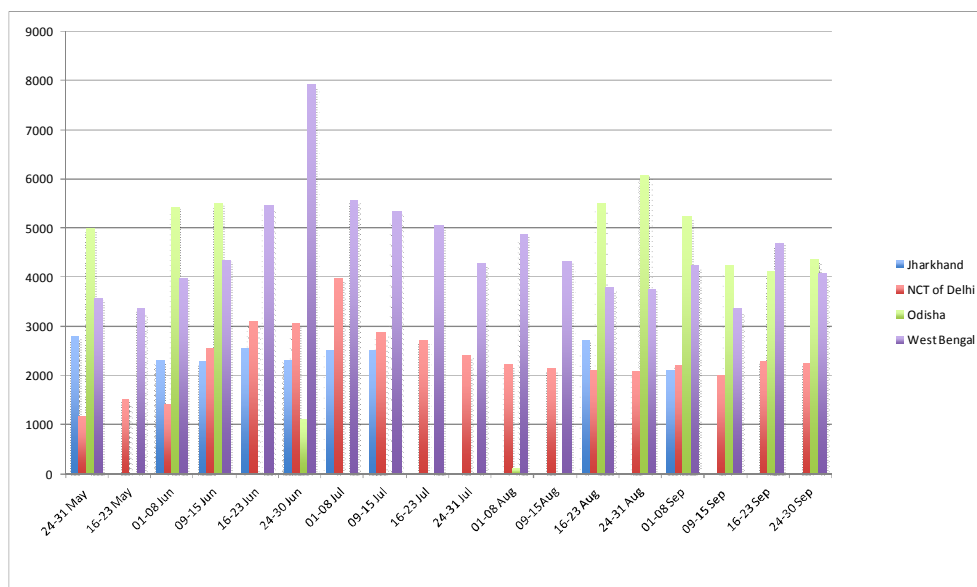
The harvest season of capsicum in Jharkhand is between February and May and the off-season capsicum is from August to October whose price records a peak. Moreover, cultivators of off-season capsicum can increase their sales by linking with the markets of West Bengal, where the price occasionally shows triple as high as that of Jharkhand (see Figure 3.8.5 and Figure 3.8.6).



*Rs/100 kg

Source: Jharkhand State Horticulture Mission

Figure 3.8.5 Wholesale Price of Capsicum in Jharkhand (2011-13)



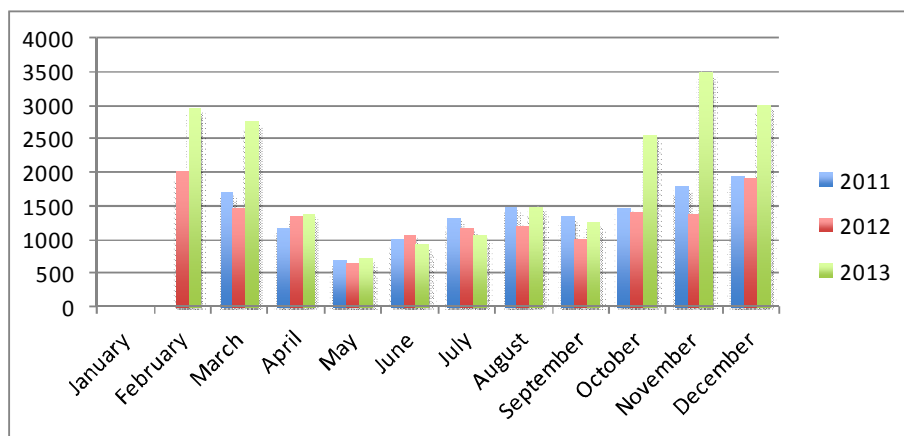
*Rs/100 kg

Source: Jharkhand State Horticulture Mission

Figure 3.8.6 Wholesale Price of Off-season Capsicum in Four States (2012)

(3) Okra

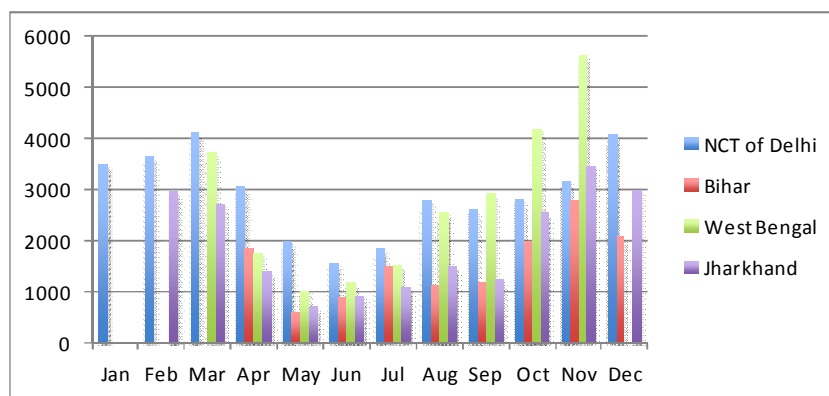
The main harvest time of okra in Jharkhand is from March to May and off-season of okra is between October and December. The price shows higher in the early of peak season, in March, and during off-season, from October to December (see Figure 3.8.7). MDI will offer new opportunity for farmers to sow okra from early September to early October so they will be able to take advantage of the market from October to December. Additionally, Okra producers can increase their profit if they will be effectively linked with the markets of other states as shown in Figure 3.8.8.



*Rs/100 kg

Source: Jharkhand State Horticulture Mission

Figure 3.8.7 Wholesale Price of Okra in Jharkhand (2011-13)



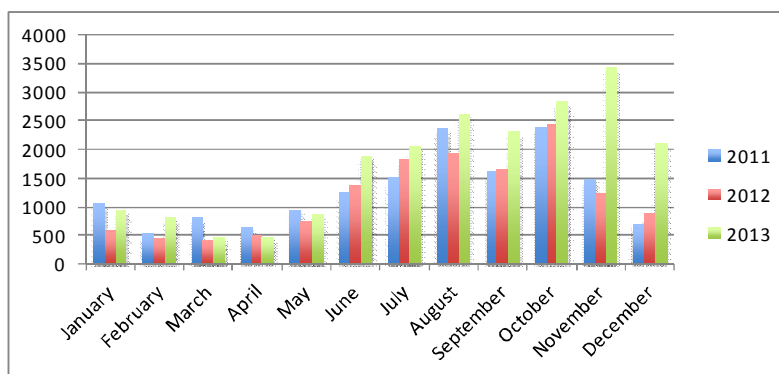
*Rs/100 kg

Source: Jharkhand State Horticulture Mission

Figure 3.8.8 Wholesale Price of Okra in Four States (2013)

(4) Cauliflower

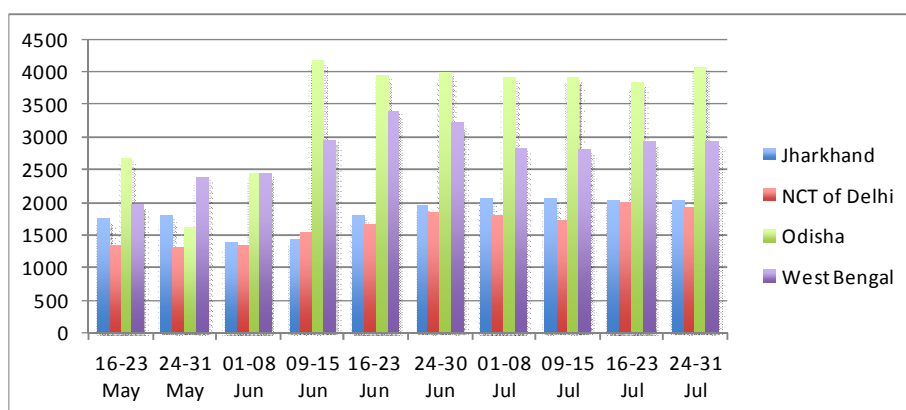
In Jharkhand, cauliflower can be harvested throughout the year within two peak seasons: between March and May, and between October and December. Its price fluctuates day to day affected by that of neighbouring states and other factors (see Figure 3.8.9). It tends to be cheaper than that of Odisha and West Bengal, especially, the price of Odisha seems to be twice as high as Jharkhand in the end of June. For MDI holders, therefore, it is highly profitable to delay its harvesting season to June and to link with Odisha markets (see Figure 3.8.10).



*Rs/100 kg

Source: Jharkhand State Horticulture Mission

Figure 3.8.9 Wholesale Price of Cauliflower in Jharkhand (2011-13)



*Rs/100 kg

Source: Jharkhand State Horticulture Mission

Figure 3.8.10 Wholesale Price of Off-season Cauliflower in Four States (2012)

3.9 Irrigation and Rural Infrastructure

3.9.1 Major and Minor Irrigation Schemes

(1) Irrigation Status of Jharkhand in India

Irrigation schemes in India are categorised as follows:

- Major Irrigation Scheme: Cultivable Command Area (CCA) is larger than 10,000 ha
- Medium Irrigation Scheme: CCA is between 10,000 ha and 2,000 ha
- Minor Irrigation Scheme: CCA is less than 2,000 ha

As shown in Table 3.9.1 below, the irrigation area is estimated at 63 million ha (irrigation rate of 45%) by all India and 0.1 million ha (irrigation rate of 8.2%) by Jharkhand. Thus, Jharkhand is far behind in irrigation development in India. For details, refer to Attachment 3.9.1.

Table 3.9.1 Irrigation Area in India and Jharkhand

Region	Total Lands (‘000 km ²)	Farmlands (‘000 ha)	Irrigation Area (‘000 ha)	Irrigation Rate (%)
India	3,287	140,022	63,256	45.2
Jharkhand	80	1,250	102	8.2

Source: Comparative Statistics (States) 2009-2010, Directorate of Economics and Statistics, Ministry of Agriculture, GoI, New Delhi

In the national Twelfth Five-Year Plan (2012-2017), the emphasis is placed in the completion of ongoing irrigation projects rather than new projects.

The Ministry of Water Resources conducts every several years the Minor Irrigation Census at the national level, of which the latest version 4th Minor Irrigation Census (2006-2007) is summarised in Table 3.9.2 and detailed in Attachment 3.9.2.

Table 3.9.2 Minor Irrigation Schemes

Area	Total Land (km ²)	Surface Irrigation Area (ha)	Groundwater Irrigation Area (ha)	Total (ha)
India	3,287,240	10,060,756	47,163,791	57,224,547
Jharkhand	79,714	299,340	169,907	469,248

Source: 4th Minor Irrigation Census (2006-2007)

(2) Irrigation Development in Jharkhand

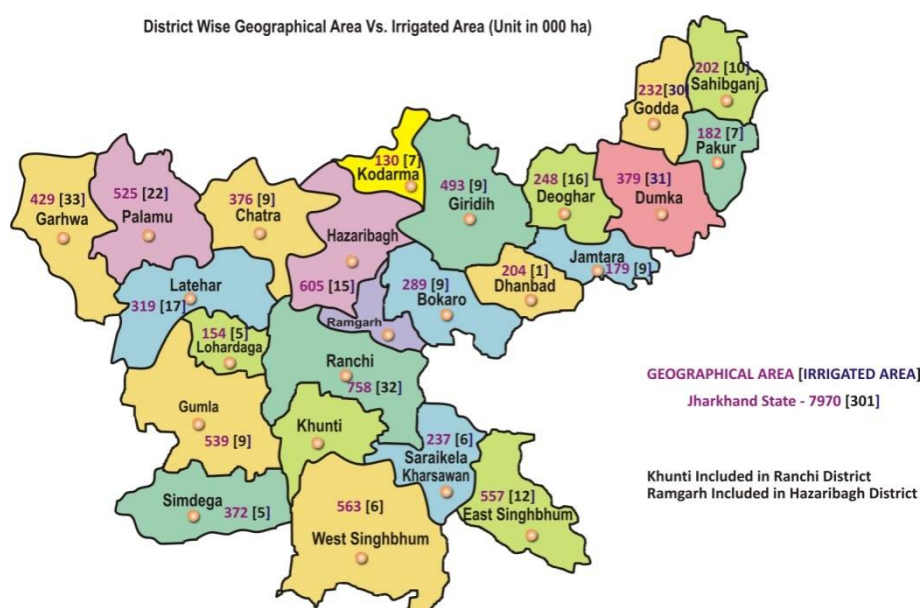
Looking into water sources for irrigation in Jharkhand, groundwater shares relatively large portion as shown in Table 3.9.3 below.

Table 3.9.3 Water Sources for Irrigation in Jharkhand

Water Source	Share
Canal	17.35%
Pond	19.07%
Tube-well	8.25%
Dug-well	29.38%
Others	25.77%

Source: Final Report (Version II), Survey for Horticulture Intensification by Micro Drip Irrigation (MDI), Indian Society of Agribusiness Professionals

District-wise irrigation area data of Jharkhand State is available in SAMETI site, and the 4th Minor Irrigation Census, which are shown in Figure 3.9.1 and Attachment 3.9.3.



Source: <http://www.sameti.org/Mapping/Geog%20Area%20Vs%20Irrigated%20Area.jpg>

Figure 3.9.1 Irrigated Area in Jharkhand

Jharkhand Major and Medium Irrigation

The main strategies and targets stipulated in the Twelfth Five-Year Plan 2012-2017 (Draft) elaborated by the GoJare listed below.

- To complete the ongoing projects which are leftover from the previous periods;
- To improve the project execution system through electronic tendering and procurement;
- To prepare necessary information such as aquifer map;
- To set up the legality related to irrigation such as setting up a Water Regulatory Authority and enacting the Groundwater Law and Water Framework Law; and
- To create 347,900 ha of irrigable area under the ongoing major and medium irrigation projects and 457,570 ha under new projects in the Twelfth Plan period, totaling to 805,470 ha.

Jharkhand Minor Irrigation

As Jharkhand has undulated topography in a plateau, irrigation schemes are limited to small scale. The major water sources for minor irrigation schemes in Jharkhand are lift (pump), check dam, and groundwater.

The Accelerated Irrigation Benefits Programme (AIBP) was conceived in 1996 by GoI in order to provide financial assistance to the states to complete various ongoing projects so that envisaged irrigation potential of the projects could be created and thereby irrigation areas could be expanded.

By utilising this programme, Jharkhand State is planning to develop minor irrigation schemes through execution of ongoing projects, restoration of old projects, capacity building in survey and design, enforcement of administration, farmers' organisation enforcement, and so on.

It is targeted to create an irrigation area of 575,900 ha under ongoing minor irrigation projects and 250,000 ha under new projects in the Twelfth Plan period, totaling to 825,900 ha.

3.9.2 MDI Schemes

Due to geographical and climatic characteristics, Jharkhand has no perennial river. Therefore, crop cultivation by surface water irrigation from October to May is limited. However, there are many wells to utilise groundwater not only for domestic use but also for agricultural production. In Jharkhand there are 142,547 wells in total⁴, and water-saving irrigation for valuable cash crops are considered promising.

In Jharkhand State, several institutes have been or are executing MDI systems. The main programmes are listed below and in Table 3.9.4.

- (1) Under the *Swarnajayanti Gram Swarojgar Yojana* (SGSY) Programme, gravity MDI has been introduced for 1,000 m² farmlands in five districts.
- (2) JSLPS has installed 180 MDI systems in five districts in cooperation with the United Nations Development Programme (UNDP).
- (3) The National Rural Livelihoods Mission (NRLM) pilot MDI schemes have been executed for 200 m², 500 m², and 750 m² farmlands.
- (4) DoA is promoting MDI with pressure-based irrigation for farmland size of 2,000 m²-50,000 m².

Table 3.9.4 Major MDI Programmes in Jharkhand

Programme	Promoter	MDI Plot Size (m ²)	Drip Method	Target District	Period	No. of Installed MDI	Subsidy for MDI	Remarks
UNDP (State Level Support to Livelihood Promotion Strategy)	Rural Development Department (RDD)/JSLPS	1,000	Gravity	5	2009-2012	180	100%	In cooperation with UNDP
SGSY	RDD/JSLPS	1,000	Gravity	All	1999-2012	477	50%	N/A
NRLM	RDD/JSLPS	200 - 750	Pressure	1	2012-	16	0%	N/A
National Mission for Micro Irrigation (NMMI)	DoA/SMIC	2,000 - 50,000	Pressure	All	2007-2013	N/A	90%	Under NHM

Source: JICA Survey Team

3.9.3 Roads, Water Supply, and Electrification

(1) Roads

The roads in India are categorised into the following four classes:

- i) National highway (NH),
- ii) State highway (SH),
- iii) Major district roads (MDR), and
- iv) Rural roads including other district roads and village roads.

National highways are the property of the Ministry of Road Transport and Highways of the central government, and constructed by the Road Construction Department (RCD) of the state government as its agency.

⁴ 4th Minor Irrigation Census, 139,917 dug wells, 2,067 shallow tube wells and 563 deep tube wells

On the other hand, the state highways and major district roads are the property of RCD of the state and their maintenance and upgrading are responsibility of the same department. Other rural roads are constructed and maintained by the Rural Works Department.

National Plan

In the Twelfth Five-Year Plan (2012-2017) elaborated by GoI, the major targets to be achieved during the period are as follows:

- Completion and continuity of ongoing programmes such as the National Highways Development Programme,
- Upgrading and improvement of the national highways and state highways to minimum two-lane standard,
- Connection of all villages with the all-weather roads, and
- Development of a 10,000 km expressway.

Jharkhand State Plan

As for the road density including rural and urban roads, Jharkhand remains at extremely low level. Jharkhand is ranked 26th out of 28 states with regard to the density by area, and at the second poorest with regard to the density by population as summarised in Table 3.9.5 and Attachment 3.9.4.

Table 3.9.5 Road Density of Jharkhand

	Road Density	
	(km/100 km ²)	(km/1,000 persons)
National Average	115.30	3.13
Jharkhand	29.98	0.72

Source: Pradhan Mantri Gram Sadak Yojana website

The following works are taken up in the state Twelfth Five-Year Plan period up to 2017:

- Road strengthening (3,000 km),
- Road widening from two-lane to four-lane (400 km),
- Road widening and strengthening from single to two-lane (2,500 km),
- Widening of bridges (300 nos.),
- Reconstruction and strengthening of 100 old bridges,
- Construction of missing link bridges (54 nos.),
- Bypass construction (10 nos.),
- New road-over bridges (25 nos.),
- Widening of state highways near towns, interstate borders (40 nos.),
- Feeder roads to improve railway routes (5 nos.), and
- Wayside amenities (10 nos.).

(2) Water Supply

The percentages of households having safe drinking water facilities in whole India are 91.4% in urban areas and 85.5% in rural areas. In Jharkhand, these indicators show rather lower figures, i.e., 78.4% in urban and 54.3% in rural, as detailed in Attachment 3.9.5.

The competent institute for water supply in Jharkhand is the Department of Drinking Water and Sanitation, under the Ministry of Drinking Water and Sanitation of the central government.

In the rural population of Jharkhand State, only 7% are covered through pipe water supply system. As Jharkhand State has no perennial river, other rural people obtain water for domestic use mainly by hand pumps. The number of piped water schemes in Jharkhand is only 400, which is far behind the national level, comparing with 50,000 in Gujarat, 61,000 in Karnataka, 27,000 in Maharashtra, and 64,000 in Tamil Nadu. Jharkhand State is planning to increase this ratio up to 12% in 2013, and 25% until 2017. As water sources, 20 abandoned mines, 48 big reservoirs, and 76 large dams are taken into consideration.



Hand Pump in Karketta Village, Namkum Block, Ranchi District
Source: JICA Survey Team

(3) Electrification

The Ministry of Power of the central government and the Department of Energy of Jharkhand State are competent for electrification. As a national programme for rural electrification, the *Rajiv Gandhi Grameen Vidhyutikaran Yojana* (RGGVY) Project started in 2005 aiming at 100% rural electrification in five years under the Rural Electrification Corporation. However, due to poor power generation infrastructures and transmission systems, the electrification rate still remains low as shown in Table 3.9.6.

India is investing in power generation, transmission, and distribution systems to increase the electrification ratio. In 2012 thermal generation (coal and gas) occupies 77% of the total power generation. On the other hand, clean energies are in low rate such as hydropower 14%, renewable energy (wind, solar, biomass, etc.) 6%, and nuclear 3%. The GoI aims at increasing clean energy power generation percentage in the future as shown in Table 3.9.7.

Table 3.9.6 Electrification in India (2009-10)

Rural	Urban	Total
67.3%	93.9%	75.5%

Source: Twelfth Five Year Plan (2012-2017)

Table 3.9.7 Power Generation

	2012	2017	2030
Coal	70%	69%	58%
Oil	0%	0%	0%
Gas	7%	5%	3%
Hydro	14%	12%	11%
Renewable	6%	9%	16%
Nuclear	3%	5%	12%

Source: Twelfth Five-Year Plan (2012-2017)

The RGGVY programme was launched in 2005 to provide access to electricity to all rural households. The 90% of the cost is subsidised by the central government and the balance of 10% as loan. Since the commencement of RGGVY, 104,496 villages in India have gained electrification.

In Jharkhand, only 9,119 villages have been provided with access to electricity out of 29,354, i.e., only 31% achievement. According to the 2008 statistics, Jharkhand shows by far the lowest rural electrification rate as summarised in Table 3.9.8 and detailed in Attachment 3.9.6.

Table 3.9.8 Rural Electrification Ratio as of March 2008

	Total No. of Villages	No. of Villages Electrified	Percentage Electrified
India	593,732	497,236	83.7%
Jharkhand	29,354	9,119	31.1%

Source: Statistical Year Book, India 2013 (http://mospi.nic.in/mospi_new/upload/SYB2013/)

3.10 Government Agencies, Societies, and NGOs concerned with Rural Development

3.10.1 Government Organisations

Amongst the various departments under the GoJ, the following two departments are mainly dealing with rural development. Aside from the state government departments, there is also a national bank that implements various support programmes to contribute to the rural and agricultural development. The general descriptions of these organisations are given below.

(1) RDD

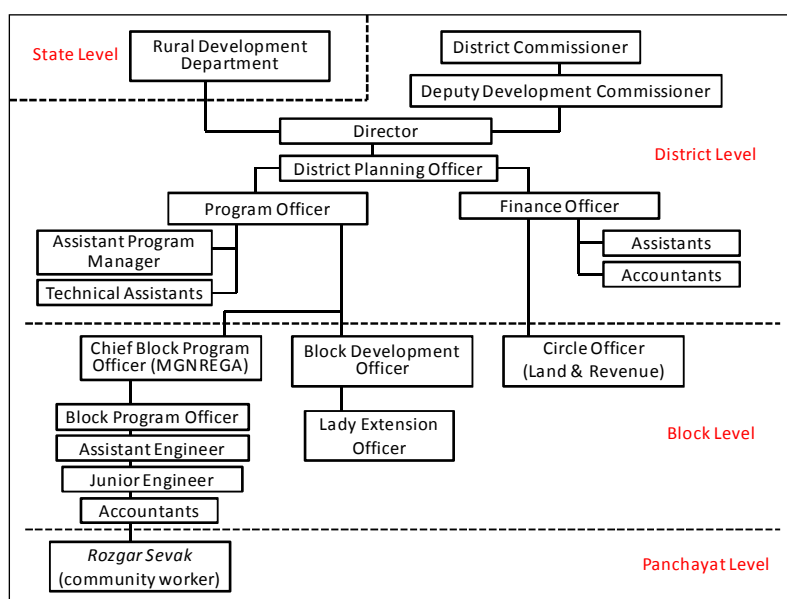
The RDD of GoJ implements several programmes that aim at alleviating rural poverty through creation of infrastructure, by generating sustainable employment opportunities for the rural poor. It provides subsidies for acquiring employment generating assets in order to generate self-employment opportunities for the families living below poverty line. Table 3.10.1 below indicates some of the major programmes currently executed by RDD.

Table 3.10.1 Major Programmes/Projects of RDD

No.	Name of the Programme/Project	Themes of the Programmes	Budget for FY 2013/14 (Rs. in Millions)	Remarks
1	Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA)	Employment creation	1,300	Centrally sponsored scheme (CSS) with 90% fund from the central government
2	SGSY/ NRLM	Rural livelihood promotion	800	CSS with 75% from the central government
3	Indra Awas Yojna (IAY)	Provision of rural housing	1,650	CSS with 75% from the central government
4	Integrated Watershed Management Programme (IWMP)	Watershed management	120	CSS with 90% from the central government
5	District Rural Development Agency (DRDA) Administration	Setting up of the administrative facilities at the district levels	200	CSS with 75% from the central government
6	SHG	Credit scheme for rural women groups	80	
7	Block Building Minor Construction and Renovation	Setting up of the facilities	100	
8	Block Administration	Setting up of the facilities	120	
9	Special Division Establishment	Setting up of the facilities	620	
10	Mukhya Mantri Gram Setu Yojana (MMGSY)	Construction of bridges and culverts	3,055	
11	Adarsha Gram Yojna (AGY)	Model village programme	400	
12	Legislature Scheme	Development projects recommended by the Members of Legislative Assembly (MLA)	1,640	
13	Mukhyamantri Vikas Yojana (MMVY)	Setting up of community assets recommended by MLA	820	
14	Strengthening of Block Offices	Provision of materials, supplies, tools, and machineries to block offices	100	

Source: PDD, GoJ, *Annual Plan 2012-13*.

Actual implementation of these programmes is mostly through DRDAs and other partner institutions including designated societies and NGOs in the localities. The organisational structure of DRDA is shown in Figure 3.10.1.



Source: Interview with the SRC, JSLPS

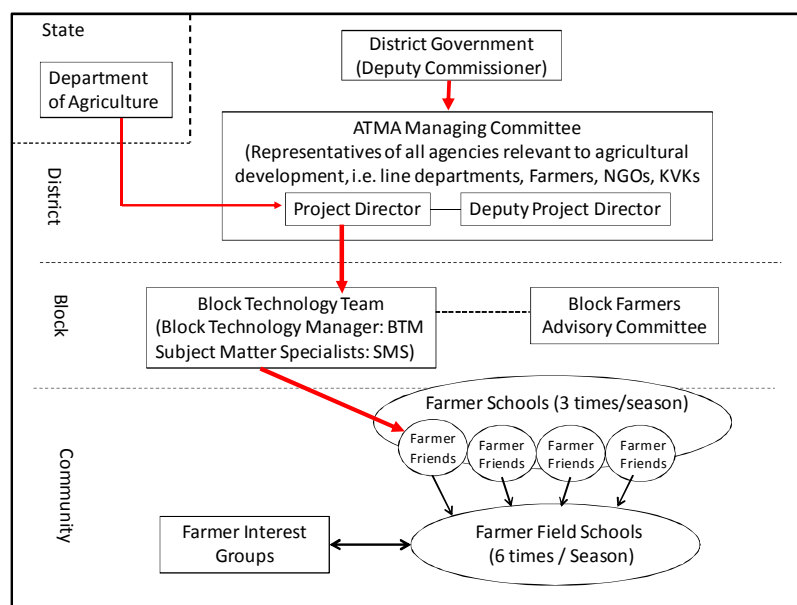
Figure 3.10.1 Structure of DRDA at the District Level and Below

(2) DoA

As agriculture is the main sector that provides employment and primary income for about 80% of the rural population of the state, various programmes and projects are implemented to address the sundry challenges in the sector through the efforts of DoA. The department has three directorates, i.e., agriculture, horticulture, and soil conservation. The following section focuses on extension, research, and training activities currently undertaken by DoA.

(a) Extension

In the current setting of the department, agricultural extension services are provided through the Agricultural Technology Management Agency (ATMA). It is a society of key stakeholders involved in agricultural activities and development in the district. It is a focal point for integrating research and extension activities and decentralising day-to-day management of the public agricultural technology system. It is a registered society responsible for technology dissemination at the district level. As a society, it would be able to receive and expand funds, entering into contracts and agreements and maintaining revolving accounts that can be used to collect fees and thereby recovering operating costs. The activities are implemented through the organisational structures at the district levels as shown in Figure 3.10.2.



Source: Website of DoA, GoJ (<http://agri.jharkhand.gov.in/?ulink=inst/atme.asp>), and interview with field officers of SUPPORT, the NGO visited by the JICA Survey Team in Hazaribagh.

Figure 3.10.2 Organisational Structure of ATMA

It should be noted that ATMA mobilises the innovative farmers from the communities as Farmer Friends, who are to play roles of frontline extension agents. Currently, there are about 14,600 Farmer Friends enlisted under ATMA all over the state. They are provided various trainings on agricultural technologies by *Krishi Vigyan Kendra* (KVK) and other programmes of DoA, and expected to disseminate their learning to the farmers in their respective communities.

(b) Research and Training

KVK

The KVK is a district level farm science centre established by ICAR for speedy transfer of technology to the farmers fields. It is to undertake the activities of technology assessment, refinement, and dissemination through on farm testing, frontline demonstration, vocational training of farmers, rural youth, farm women, and extension functionaries. The aim of KVK is to reduce the time lag between generation of technology at the research institutions and their transfer to the farmer's field to increase production, productivity, and income from the agriculture and allied sectors on a sustained basis. In order to achieve this goal, the following four mandates have been envisaged in the design of the KVK:

- Conduct “on-farm testing” for identifying technologies in terms of location-specific sustainable land use systems through technology assessment and refinement;
- Organise frontline demonstrations on various crops to generate production data and feedback information;
- Organise short- and long-term vocational training courses in agriculture and allied vocations for the farmers and rural youth with emphasis on “learning by doing” for higher production on farms and generation of self employment; and
- Organise training to update the extension personnel with emerging advances in agricultural research on a regular basis.

Apart from these mandate mentioned above, KVK also acts as knowledge and resource centre for the advancement of agriculture in the district, extending services like online advisory and consultancy

services. Currently, there are KVKs in 22 districts in Jharkhand, a list of which is attached as Attachment 3.10.1. As a prototype of human resource allocation at KVK in general, there will be six specialists assigned in each KVK, with different fields of expertise. They will respond to the conditions and needs of the areas of jurisdiction under the particular KVK to conduct adaptive research and verification experiments on the location specific conditions of the localities.

SAMETI

To meet the requirement of capacity building, a large number of training activities are needed in the areas of technical as well as human resource management in agriculture. There is another institution dealing with agricultural training, i.e., SAMETI, which is to act as nodal agency for the organisation of management and extension training for officers and employees of the departments of agriculture, animal husbandry, horticulture, fishery, sericulture, and other allied departments for capacity building. SAMETI is a state level institution which is autonomous with greater flexibility in structure and functions. It is responsible for organising need-based training programmes for the project implementation functionaries of different line departments as well as the farming community. The major roles that SAMETI plays are as follows:

- To encourage greater extension research linkage through participation of scientists from KVK and zonal research stations (ZRS) within the jurisdiction of the state.
- To strengthen linkage amongst state, national, and international institutions in the field of natural resource management, dry land agriculture, integrated pest management (IPM), post harvest techniques, and crop management.
- To provide need based and location specific training for the ATMA districts in the state.
- To provide consultancy services in the field of agriculture.
- To conduct applied research in frontier areas.
- To publish relevant agro-techniques and develop audio-visuals related to success stories.
- To organise state and national level seminars and workshops on the Innovations in Technology Dissemination (ITD) components of the National Agricultural Technology Project (NATP).

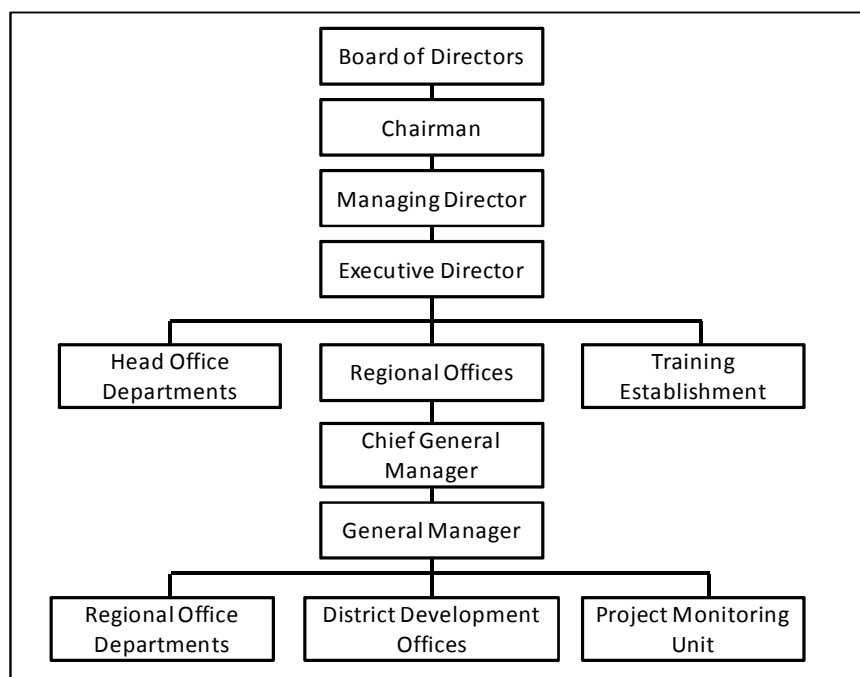
National Bank for Agriculture and Rural Development (NABARD)

The NABARD came into existence on 12 July 1982 by transferring the agricultural credit functions of the Reserve Bank of India (RBI) and refinance functions of the Agricultural Refinance and Development Corporation. The bank was established with the mission to promote sustainable and equitable agriculture and rural prosperity through effective credit support, related services, institution development, and other innovative initiatives.

Currently, NABARD's operations encompass a wide range of schemes, including microfinance, financial inclusion, non-farm sectors, production credit support, rural infrastructure development, village development plans, institutional development, and so forth. Aside from these own schemes of the bank, NABARD also implements various sponsored schemes of GoI (the details of the bank's schemes are given in the subsequent Section 3.11). The bank raises its funds from deposits and bonds/debentures, and the total amount of funds and liabilities as of 31 March 2013 was about Rs.2,131 billion.

The central office of NABARD is in Mumbai and there is one regional office in every state. The Jharkhand Regional Office is located in Ranchi, which supervises the district development offices in

all of the 24 districts in the state, with a total of 101 staff members. The following Figure 3.10.3 shows the organisational structure of NABARD.



Source: NABARD Website (https://www.nabard.org/english/organization_setup.aspx), and interview with Regional Office in Ranchi

Figure 3.10.3 Organisational Structure of NABARD

3.10.2 Societies

(1) Jharkhand State Horticulture Mission Society (JSHMS)

The NHM has been launched as a centrally sponsored scheme to promote holistic growth of the horticulture sector through an area based regionally differentiated strategies. The launching of NHM has come as an opportunity for the state to develop concentrated pockets of plantation and creation of post-harvest and marketing infrastructure.

The NHM in the Jharkhand State was initially launched in late 2005-06 in ten districts⁵ with main focus on the production of planting materials, vegetable seed production, establishment of new gardens, creation of water resources, etc. Establishment of new gardens include perennial and non-perennial fruits, spices, floriculture, aromatic, and medicinal plants. This scheme was 100% sponsored by the central government during the period of the Tenth Five-Year Plan, however, during 2007-08 and onwards, this scheme has been implemented in 17 districts⁶ with the pattern of assistance as 85:15 by the central government and state government, respectively.

For implementing the mission's programmes in the state, a special purpose vehicle has been created as the Jharkhand State Horticulture Development Society (JSHDS), which has been registered under the Society Registration Act of 1860 by the Department of Agriculture and Cane Development, Jharkhand. The JSHDS has a General Body headed by the Minister of Agriculture and an Executive Committee headed by the Chief Secretary. The society has branches in every district for implementation of the

⁵ Ranchi, Hazaribagh, Chatra, Latehar, Lohardaga, Saraikela, Palamu, Purbi Singhbhum, Deoghar, and Dumka

⁶ Ranchi, Hazaribagh, Chatra, Latehar, Lohardaga, Saraikela, Palamu, Purbi Singhbhum, Deoghar, Dumka, Jamtara, Pakur, Gumla, Simdega, and Pashchimi Singhbhum, Khunti, and Ramgarh

programmes. The Director of the Horticulture Department who is the Member-Secretary of JSHDS is the Principal Coordinator for all activities of the mission. The agencies identified for the implementation of various programmes under NHM will prepare their respective detailed programmes and submit to the Executive Committee for approval and release of funds. The Executive Committee whilst sanctioning the programmes within the approved budgets will issue guidelines to be followed for carrying out activities and implementation of the programmes. The Executive Committee will also make periodic review of the activities and monitor the progress of programmes and projects taken up under the mission.

In 2013-14, there are 11 NHM programmes planned to be implemented in Jharkhand with a total financial outlay of Rs.800 million, as summarised in the following Table 3.10.2.

Table 3.10.2 JSHMS Programme Components during 2013-14

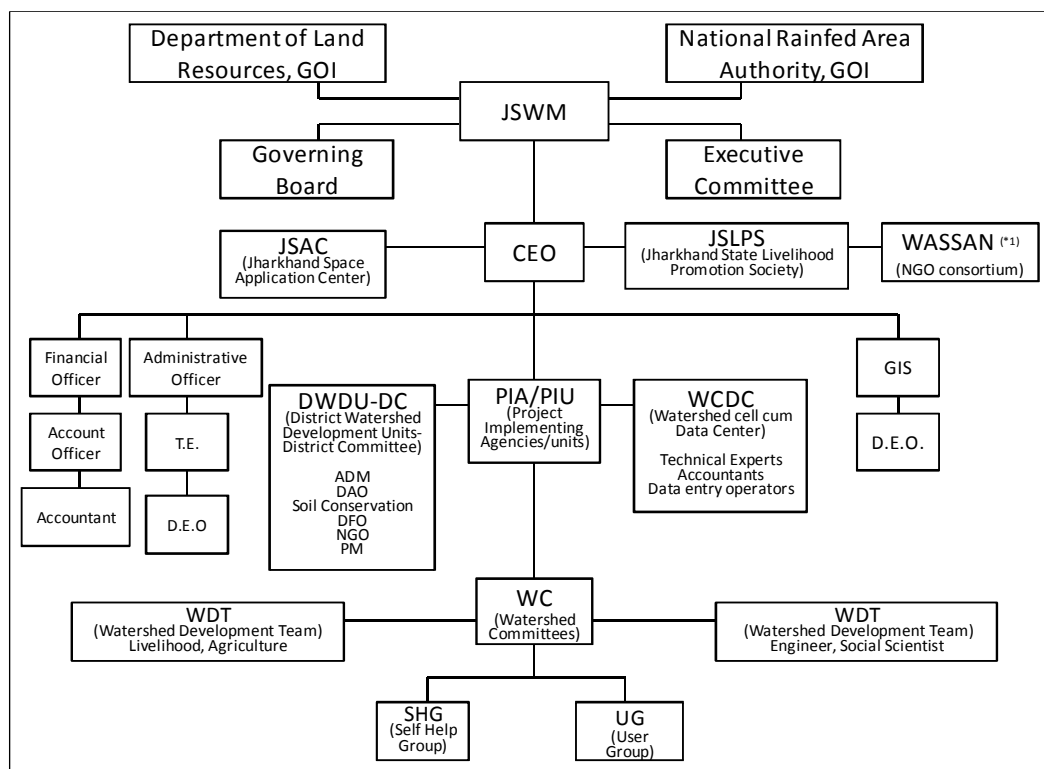
Sl.	Programme	Financial Outlay (Rs. in Millions)	Remarks
1	Plantation infrastructure development	34.375	
2	Establishment of new gardens/Area expansion	184.434	
3	Rejuvenation/Replacement of senile plantation	0.750	
4	Creation of water resources	86.164	Community tanks and water harvesting systems
5	Protected cultivation	162.610	Green house, shade net house, INM and IPM, etc.
6	Organic farming	67.16	
7	Vermin compost units/organic input production unit	71.835	
8	Pollination support through beekeeping	1.46	
9	Human resource development	7.80	Training, exposure visits for farmers and technical staff
10	Integrated post harvest management	198.416	
11	Mission management	45.406	
	Total	800.00	

Source: JSHMS, "Component wise details for Physical Target and Financial Outlay approved for implementation of NHM Programmes during 2013-14 in Jharkhand: Action Plan 2013-14"

(2) Jharkhand State Watershed Mission (JSWM)

GoJunder RDD has registered a State Level Nodal Agency as JSWM on 17 July 2009 under the Society Registration Act 21, 1860 for implementation of IWMP under the Common Guidelines for Watershed Development Projects, GoI, 2008.

The mission is in operation through an organisational structure shown in Figure 3.10.4 below. The governing body of JSWM is chaired by the development commissioner of the state, and the Ministry of Rural Development and National Rainfed Area Authority of GoI are represented as nominated members, as well as the representatives of relevant departments of GoJas ex-officio members.



Note 1: Currently WASSAN is not associated with JSWM as consortium leader neither the consortium is working for it.

Source: JSWM website (http://jswm.nic.in/File/Left_Box/org.%20sture/Oraganisation%20Structure.pdf)

Figure 3.10.4 Organisational Structure of JSWM

Since its official inauguration in 2009, JSWM has worked with various project implementing agencies (PIAs), including government line departments and NGOs who have implemented a total of 117 IWMP projects, covering more than 710,000 ha of watershed, comprising 928 micro-watersheds.

(3) Research Institutions under the Indian Council of Agricultural Research

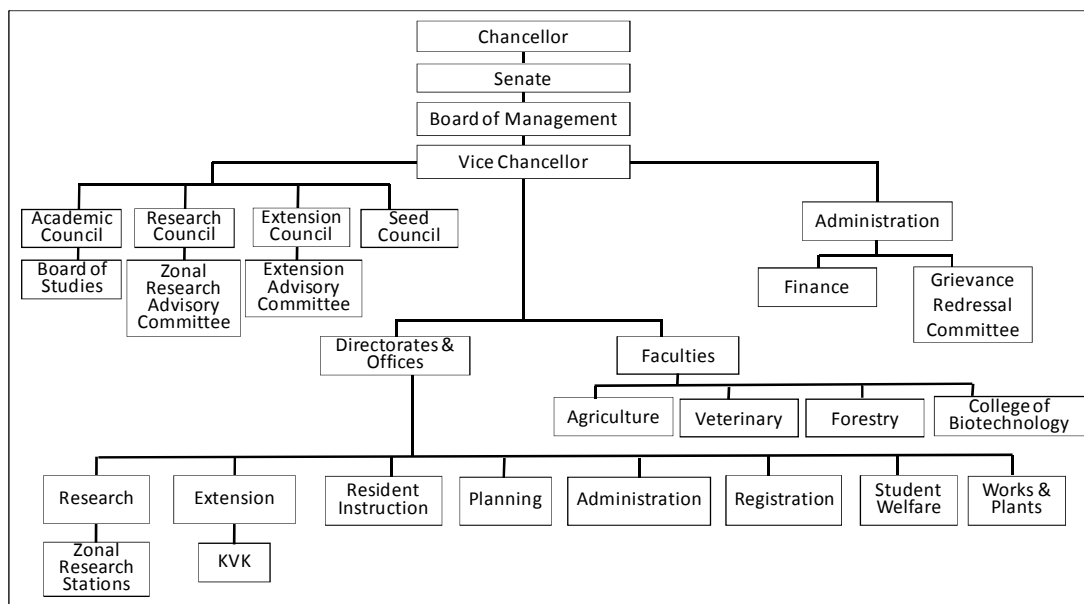
The Indian National Agricultural Research System is one of the largest in the world with respect to human resource engagement and infrastructure, and ICAR is an apex body of the National Agricultural Research System, coordinating, guiding, and managing research, education, and extension in agriculture, including horticulture, fisheries, and animal sciences in the country. It has a vast network with 97 ICAR institutes, 46 state agricultural universities; five deemed universities and one Central Agricultural University, and 589 KVKs spread across the country. In Jharkhand, the five ICAR institutions are as follows:

- Indian Institute of Agricultural Biotechnology;
- Indian Institute of Natural Resins and Gums;
- Central Rainfed Upland Rice Research Station;
- ICAR Research Centre, Ranchi⁷; and
- Base Centre of the National Bureau of Plant and Genetic Resource.

⁷ This institute was previously known as Horticulture and Agro-forestry Research Program before it was renamed in 2011, and it is still more popularly known with the previous name to relevant stakeholders.

3.10.3 Agricultural University

BAU is the only State Agricultural University (SAU) in Jharkhand. It was founded in 1981 by congregating several colleges specialising in relevant fields of expertise that already existed. It has three faculties, i.e., Faculty of Agriculture, Faculty of Veterinary Science and Animal Husbandry, and Faculty of Forestry. A College of Biotechnology has been established in 1997, where the tissue culture plantlets production is a major activity besides postgraduate programme in biotechnology. More recently, a new course on Agribusiness Management has been started in the Centre of Agribusiness Management established in the Faculty of Agriculture in 2007. The organisational structure of the university is summarised in Figure 3.10.5 below.



Source: BAU, *BAU at a Glance* (2012)

Figure 3.10.5 Organisational Structure of BAU

SAU is supposed to provide education, research, and extension in agricultural sector as well as allied activities. Accordingly, BAU manages three ZRS created under the National Agricultural Research Programmes, i.e., ZRS Chianki, Daltonganj (Medininagar), ZRS Dumka, and ZRS Darisai (Purbi Singhbhum), as well as 16 KVKs spread in 16 districts of the state where 10 ha each of the experimental and demonstration plots are attached. The university has a total of 850 ha of land for seed production farm in Gauriakarma, Hazaribagh which is the centre for mega seed production programme. BAU produces breeder and foundation seeds in these seed farms, KVKs, and ZRSs: the total production in 2010-11, for example, was about 283 MT.

Currently, the university has 219 teaching and 730 non-teaching employees working in its colleges, research and extension units spread all over the state.

Although the BAU is the only SAU currently existing in Jharkhand, there are also plans to establish the following agriculture-related colleges in the state in the coming years:

- Agricultural College, Garhwa
- Rabindranath Tagor Agriculture College, Deoghar
- Horticulture College, Pashchimi Singhbhum
- Engineering College, under BAU
- Dairy Technology College, Dumka

3.10.4 NGOs

Voluntary organisation can play a crucial role in rural development by supplementing government efforts. With the SHG linkages programme introduced in 1989, the NGO sector has been recognised as a crucial partner. The roles of NGOs in social mobilisation under SHG Programmes have persistently been on the agenda of the government. The SGSY poverty alleviation programme has been in operation since 1 April 1999 and various NGOs are involved to serve as the frontline agents of agriculture and rural development.

According to an NGO directory compiled by an NGO information organisation, there are more than 700 NGOs in Jharkhand, providing their services to the communities in various sectors. There are 116 NGOs listed as the resources by DoA (refer to Attachment 3.10.2), who work together with or are entrusted to implement various programmes of the department. Similarly, RDD mobilises NGOs in the implementation of its rural livelihood programmes.

3.10.5 Jharkhand State Livelihood Promotion Society

According to the proposed outline of I-HIMDI, JSLPS is nominated to be the implementing agency. The society was established by RDD of GoJ initially in 2009 as the Project Implementing Unit of the GoI-UNDP Project on the “State Level Support to Livelihood Promotion Strategies-Jharkhand (2009-12),” that aimed to enhance capacities of the state government in addressing poverty concerns and enhancing livelihoods in partnership with civil society organisations and technical resource agencies. In July 2010, the society was duly registered under the Society Registration Act of 1860 as a separate and autonomous society that works as a nodal agency for livelihood promotion in the state in collaboration with various government departments, NGOs/ community-based organisations (CBOs), technical institutions, and private sector with the following objectives:

- To alleviate poverty in the state, especially amongst the disadvantaged groups.
- To contribute to the lives of the rural poor throughout the state through empowerment and fostering strong self-managed grass root institutions and support investments for groups of the poor.
- To bring in convergence amongst various poverty reduction and empowerment programmes/schemes.
- To evolve strategies and approaches for the empowerment of the poor through social mobilisation and institution building for community participation.
- To build support and service structures for providing social and technical guidance to the poor in their overall social progress and livelihood development.
- Establish models for participatory social and economic development of the rural poor in conformity with all these objectives and prove their relevance, sustainability, and suitability of replication.
- To facilitate knowledge and experience sharing amongst stakeholders including government departments, technical institutions, relevant autonomous agencies of the government, civil society organisations, non-governmental organisations, private sectors, community-based organization, and research agencies.
- To strengthen and form producer cooperatives/groups/companies around key commodities non-farm products and services and expanding poor people’s participation in existing commodity cooperatives and producer groups/companies.
- Support development of new ideas and innovative programmes.

- Foster collaboration between relevant departments at the state and district levels for poverty alleviation of disadvantaged groups in the state and partnership with civil societies, NGOs, and/or any other resource agencies.
- Provide technical and other advisory support to the government and stakeholders.

Currently, the society under the aegis of RDD is working towards promoting livelihood for the disadvantaged section in the rural community of the state. Being committed to promote women empowerment and livelihood in the state, JSLPS serves as the nodal agency for implementation of NRLM Projects in the state of Jharkhand. In addition to these national flagship programmes, JSLPS also serves as the implementing agency of the following programmes of RDD in the state as listed in Table 3.10.3. (The details of the programmes executed by JSLPS are described in Sections 2.5 and 3.10.)

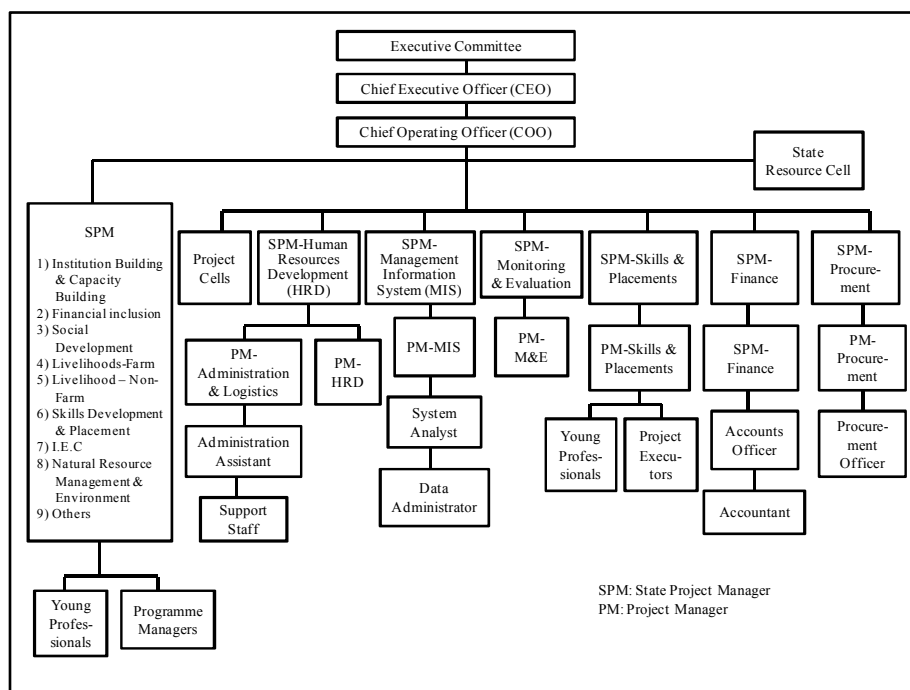
Table 3.10.3 Programmes of RDD implemented by JSLPS

Sl.	Name of the Programme	Theme of the Programme	Grant aid (2012-13) (Rs. thousands)	Remarks
1	National Rural Livelihoods Mission (NRLM)	Rural livelihood promotion	54,351	National Programme
2	National Rural Livelihood Promotion (NRLP)		115,199	
3	Special SGSY	Rural livelihood promotion	11,731	National Programme
4	Socioeconomic and Caster Census (SECC) Project	Census survey to prepare the list of families living BPL	367,961	National Programme
5	Sanjeevani	Rural women's empowerment	8,953	State Programme
6	Adarsh Gram Yojana	Integrated development to create model village	7,770	State Programme

Source: K.C. Tac & Co., Chartered Accountants, *Audit Report of Jharkhand State Livelihood Promotion Society Financial Year 2012-13 (September 2013)*

During the fiscal year 2012-13, JSLPS has implemented its programmes/projects in Jharkhand with a turnover of about Rs.1,027 million. The funds from the government agencies are given in the form of grants-in-aid, the amounts of which are proposed in the budget plans together with the annual action plans (AAP) of the particular programmes to be initially approved by the Executive Committee of JSLPS, then by the respective authorities of the state government, and finally by the authorities of GoI. Once approved, 50% of the budget is automatically disbursed at the beginning of the fiscal year. Upon utilisation of 60% of the disbursed amount, JSLPS would submit the disbursement request for the remaining 50% of the budget with expenditure records and utilisation certificate. At the end of the fiscal year, the annual audit report with audited utilisation certificate is to be submitted. In case of the donor programmes and projects, JSLPS receives funds from donor agencies, which are directly transferred to the accounts of the society.

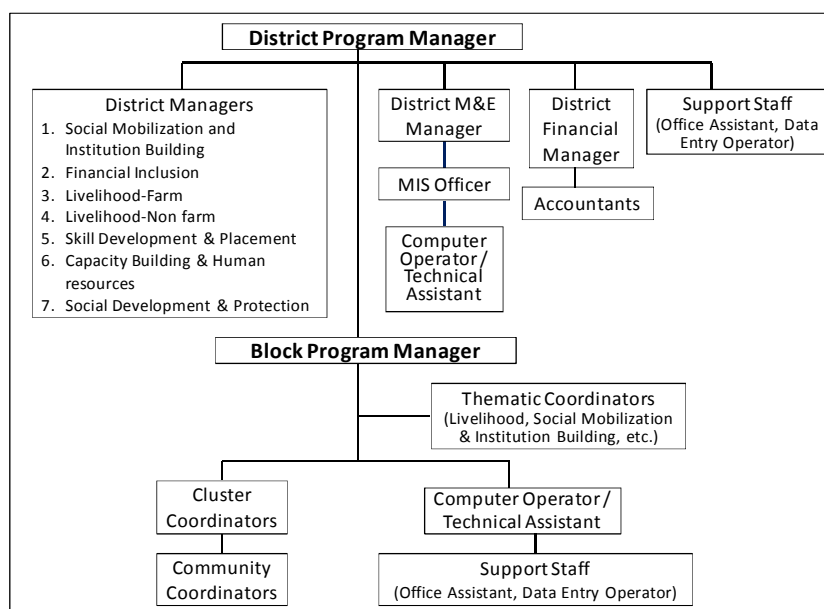
The society is headed by the Chief Executive Officer (CEO) and at present, field operations are carried out by 307 staff under the guidance of the Chief Operating Officer (COO). Figure 3.10.6 below indicates the organisational structure of JSLPS at the state level. It should be noted, however, that the structure has primarily been created to implement NRLM and other ongoing programmes of RDD, and that the Executive Committee may create new positions when and as new programmes would be implemented by JSLPS.



Source: JSLPS, *Annual Action Plan of Jharkhand State Rural Livelihood Mission: Financial Year 2014-15 (February 2014)*

Figure 3.10.6 Organisational Structure of JSLPS Head Office

To implement NRLM, the national flagship programme of poverty alleviation and rural livelihood, as well as the *Sanjeevani*, a state-led rural women empowerment project, JSLPS has developed the organisational structures at the field levels as shown in the following Figure 3.10.7.



Source: JSLPS, *Human Resources Development Manual (January 2013)*

Figure 3.10.7 Organisational Structure of JSLPS Field Offices

3.11 Community-based Organisations and Agricultural Credit

Under the consideration of “trickle-down effect”, the earlier programmes of GoI targeted individuals to take off. However, the effects on poverty alleviation were very much limited, instead, it caused to enlarge the income gap between the taken-off and others. NGOs introduced group approach into their community development activities in the 1980s, and succeeded to improve the livelihoods of the poor.

Thus, the GoI adopted the group approach to the SGSY programme which started in 1999. SGSY organised the poor into SHGs through social mobilisation process, and considered the SHGs as entrance points for poverty reduction. All services of SGSY to the poor were provided through SHGs. This feature of SGSY was transferred to NRLM, and it also focuses on promoting and strengthening SHGs’ functions in terms of poverty alleviation. According to NRLM, it is estimated that only 38% of India’s poor were organised into SHGs, producer groups, and other forms of economic collection in 2012.

Poverty reduction programmes in India have stressed upon incomes, assets, investments, skills, and linkages to the market of the poor. Credit and other financial services are essential to help poor smoothen their consumption, minimise shocks and vulnerability, and undertake investments for acquisition, renewal, and expansion of productive assets. However, the formal banking institutions had ignored the poor due to perceived high risks, high transaction costs involved in small-scale rural lending to a large number of poor households, and absence of collateral securities.

Hence, SGSY and NRLM prioritise the financial inclusion and skills trainings of the poor, as a result of it, SHGs are emerging as a primary source of credit for the rural poor, including the small and marginal farmers.

3.11.1 Self-Help Group

The Self-Help Group (SHG) is a voluntary homogenous group in a particular area, and aims to improve their livelihood by themselves. Each SHG will have 10-20 members. SHGs formed by JSLPS consist of all female members. NRLM would ensure adequate coverage of vulnerable sections of the society wherein at least 70% of members are from BPL households, 50% of the beneficiaries are SC/STs, 15% are minorities, and 3% are persons with disability.

(1) Present Condition of SHGs in Jharkhand

According to JSLPS, there were 291,276 potential SHGs in Jharkhand in March 2014. Amongst them, SHGs formulated by SGSY were 90,970. After the transformation from SGSY, the State Rural Livelihood Mission (SRLM) (JSLPS) has 7,872 newly promoted SHGs by 30 April 2014. SHGs in non-intensive were formulated by NGOs, banks, DRDAs, line ministries, and various programmes/projects.

Whilst SRLM (JSLPS) newly organises the poor into SHG, it revitalises and strengthens the existing SHGs formed by SGSY and others through the *Sangeevani* Programme.

Table 3.11.1 Number of SHGs in Jharkhand (District-wise) as of 30 April 2014

District	Non-intensive	Resource and Intensive (under NRLM)	Partnership Home Grown (NRLM)	Sanjeevani (JSLPS)
Garhwa	3,145	0	0	0
Chatra	2,002	0	0	490
Kodarma	1,958	0	0	0
Giridih	2,303	0	0	443
Deoghar	3,982	0	0	0
Godda	4,782	0	725	0
Sahibganj	4,262	0	0	0
Pakur	2,878	1,103	0	0
Dhanbad	1,007	0	0	0
Bokaro	3,096	0	0	692
Lohardaga	1,269	0	614	0
Purbi Singhbhum	3,634	0	0	776
Palamu	3,802	0	0	0
Latehar	3,151	0	0	956
Hazaribagh	4,320	0	0	570
Ramgarh	3,037	0	0	524
Dumka	8,394	0	499	589
Jamtara	2,480	0	0	0
Ranchi	6,927	1,054	0	4,882
Khunti	2,179	0	595	0
Gumla	3,060	0	1657	555
Simdega	1,910	0	0	0
Pashchimi Singhbhum	2,185	1,625	0	326
Saraikela-Kharsawan	3,265	0	0	390
Total	79,028*	3,782	4090	11,193

Note: * Some SHGs are overlapped with Sanjeevani

Source: JSLPS

Several evaluation studies have shown that the SGSY scheme has been relatively successful in alleviating rural poverty wherever systematic mobilisation of the poor into SHGs, their capacity building and skills development had been conducted well. However, Jharkhand like some other states had not obtained significant impacts. Also they claimed that SHGs in Jharkhand were formed just to avail of the loan and subsidy facility; and the result was high mortality of SHGs formed.

Therefore, NRLM has established dedicated and sensitive support structures at various levels and the “Community Operational Manual (COM)” based on the good experiences of SGSY. The COM guides SHGs on how to develop themselves, and the staff on how to facilitate the members of SHGs. The following shows the development milestones of SHGs:

- (i) Pre-formation (2-3 months): profiling and vulnerability assessment and interactions;
- (ii) Formation (6 months): organising, developing norms, practicing “*Panchasutra*”, developing Micro-Investment Plan (MIP), and leadership development;
- (iii) Linkages (6-24 months): capacity building, MIP, linkages with banks, and setting up primary federations (Village Organisation and so on); and
- (iv) Beyond (2nd year onwards): visioning/planning, livelihoods, new products, and social capital.

The “*Panchasutra*” means five basic disciplines to build an institution, such as regular meeting, regular saving, regular internal lending, regular and timely repayment, and regular bookkeeping. Then, the members will take an oath to participate in group meetings and decision-making, participate in every activity of the group, contribute regular minimum agreed thrift amount to the group, take loans

from the pooled corpus funds of the group, get individual passbook updated on regular basis, take collective decisions and adhering to the decisions, take joint or collective initiatives, and participate in supervision of group finances/businesses/assets.

In promoting SHGs, JSLPS has four types of strategies/operational modalities: resource blocks, intensive blocks, partnership blocks, and non-intensive blocks, as shown in Table 3.11.2.

Table 3.11.2 Four Operational Modalities

Blocks	Number of Blocks		Responsible Agency	Features
	District	Blocks		
Resource Block	7	16	JSLPS	SRLM (JSLPS) invites matured community resource persons (CRPs) from the Society for Elimination of Rural Poverty (SERP) (Uttar Pradesh) and Bihar Rural Livelihoods Promotion Society (BRLPS) (Bihar). The professional resource person and CRPs (e-CRPs) conduct 40 days training for candidate CRPs in Jharkhand. The trained CRPs (i-CRP) organise SHGs in cooperation with JSLPS field staff.
Intensive Block	7	10	JSLPS	Based on the experiences in resource block, i-CRPs expand SHG activities to the other blocks. JSLPS (District Mission Management Unit (DMMU) and Block Mission Management Unit (BMMU)) gives full support in developing them.
Partnership Block	5	14	NGOs	PRADAN is the only NGO in charge of service provision in partnership blocks. Three parties (JSLPS, PRADAN, and Women SHG Federations) made an agreement (Tripartite Agreement) to upscale the NRLM programme under the Home Grown Model. There are 3,923 SHGs organised under 15 SHG federations. They are empowered and matured enough to manage their annual plans and implementation properly.
Non-intensive Block	12	219	DRDA (JSLPS)	DRDAs conduct the NRLM service delivery in non-intensive blocks. The State Resource Cell of JSLPS is in charge of human resource development. In the future, SHGs under non-intensive block will be merged into intensive blocks.

Note: As of 30 April 2014

Source: JICA Survey Team

The SRLM (JSLPS) concentrates their limited human resources into the “Resource Block” and “Intensive Block”. As of 30 April 2014, these blocks are established only in seven districts (Ranchi, Pashchimi Singhbhum, Pakur, Palamu, Giridih, Latehar and Simdega). Table 3.11.3 shows the human resource allocation of SRLM (JSLPS) in the intensive blocks.

Table 3.11.3 Human Resource Allocation of SRLM (JSLPS) in the Intensive Blocks

Position	Ranchi	Pashchimi Singhbhum	Pakur
DMMU	11	15	13
BMMU	43	46	71

Position		Ranchi	Pashchimi Singhbhum	Pakur
Community		1,725	2,162	670
	Community Facilitator	264	210	161
CRPs	Agriculture	26	21	24
	Drip	3	0	
	Goat Husbandry	12	25	
Active Women		264	354	150
Master Bookkeepers		132	40	CFs do
Bookkeepers		1,024	1,533	335
Total Number of Village Organisations (VOs)		16	40	28
Total Number of SHGs		1,054	1,625	1,103

Source: JSLPS (SMMU and DMMU)

It can be said that for the sake of pulling up the poor to live above poverty line (APL) through SHGs, many skillful and proactive human resources are necessary to give dedicated support and monitoring. JSLPS allocates professional staff of community development in DMMU and BMMU. NRLM made a phasing plan to increase the number of staff, and it has been recruiting and training new professional staff.

Community facilitators (CFs) and CRPs are local people. The professional staff of JSLPS gives them trainings for their specific field of work, and the community cadre transfers obtained knowledge and skills to SHG members. NRLM considers that the CFs and CRPs expand not only their learnings but also their own successful experiences to other communities in a sustainable manner.

Sanjeevani Programme is a state supported programme, and the implementation is conducted by JSLPS. They are female SHGs, and many of them were formulated under SGSY or by other initiatives. Since the SHGs had not reached the self-development level by withdrawals of external supports, they have suspended or weakened their activities. The *Sanjeevani* Programme aims to revitalise and merge them with NRLM-SHGs gradually.

(2) Financial Arrangement for SHGs under Poverty Alleviation Programmes

SHGs serve as a window for financial inclusion for all of the poor. The members conduct savings, inter-loaning, and borrowing bank loans through their SHGs.

Under SGSY, DRDA provided Rs.10,000 to each SHG as revolving fund, and banks provide cash credit of Rs.15,000 for Grade-1 SHGs. The subsidy under SGSY was uniform at 30% of the investment subject to a maximum of Rs.7,500/poor household (Rs.10,000 for ST/SC and the disabled). The National Sample Survey Organisation Report stated that all commercial banks in the country disbursed an amount of Rs.122,530 million as credit to 1.6 million SHGs during 2008-09. This translates into a per capita credit access of Rs.6,300 which is about 45% of the average expenditure of small and marginal farm households (Rs.14,300).

NRLM does not provide any subsidy to SHGs unlike SGSY. Instead of giving subsidy, NRLM aims to strengthen SHGs' bank linkages and their financial management skills through *Panchsutra*. Whilst SRLM monitors the progress of SHGs, the first dose of fund (community investment fund) to SHGs would be done by NRLM against SHGs' annual action plans and state perspective and implementation plans.

(a) Revolving Fund

The revolving fund (RF) would be provided to SHGs as an incentive to inculcate the habit of thrift and accumulate their own funds towards meeting their credit needs in the long run and immediate consumption needs in the short run. The RF would be a corpus and used for meeting the members' credit needs directly and as catalytic capital for leveraging repeat bank finance. In inter-lending their funds (saving and RF) as of 30 April 2014, the SHG gives the borrower monthly interest of 2% and the amount of revolving fund is Rs.15,000 per SHG in incentive blocks in Jharkhand. The monthly interest rate has been changed to 1.5% since October 2014.

The eligible conditions for SHG to receive revolving funds are as follows:

- SHG should be in active existence at least for the last six months;
- SHG should be practicing *Panchasutra*;
- Should have passed Grade-1 on the basis of practice of *Panchasutra*; and
- In intensive blocks, in addition to *Panchasutra*, the SHGs should have received training in preparing MIPs.

(b) Community Investment Fund (Rs.50,000/SHG)

The community investment fund would be disbursed to each SHG one time in its life by SRLM (JSLPS). In order to receive CIF, SHG has to make its MIP beforehand and to be approved by SRLM. MIP is a highly participatory process of planning and appraisal. SHG would go through the MIP process periodically, which consists of the following:

- Household plans prepared in consultation with the family members;
- Appraisal of the household plans by SHG;
- Priority on the basis of vulnerability of the member;
- Priority on the basis of urgency and/or seasonality of the need.

(c) External Bank Linkage and Provision of Interest Subsidy

To stabilise livelihood, each member of SHG will need about Rs.100,000 in repeat doses over the next 4-6 years. The SHGs, which continuously follow the *Panchasutra*, will reach Grade-3 SHGs. These SHGs can avail of the external bank loans. The SRLM staff will facilitate between the SHGs and banks.

The rural poor need credit at low interest rate and in multiple transactions to make their ventures economically viable. Eligibility of all SHGs, who have availed loans from mainstream financial institutions, will be based on prompt loan repayment. (This would not be applicable when an SHG avails of capital subsidy. Interest subsidy would be provided to this SHG when they avail of a fresh loan after repaying the capital subsidy linked loan). This subsidy would be available to SHGs, where at least 70% of the members are from BPL households, until a member access credit up to Rs.1.0 lakh per household, through repeat cumulative loan.

(3) Village Organisation

NRLM's mandate is to reach out to all the poor families, and to link them to sustainable livelihood opportunities and nurture them until they come out of poverty and enjoy a decent quality of life. In order to attain this, SHGs are expected to aggregate as VO and cluster level.

VO can be formed only if there are at least five SHGs in a village, and the SHGs must be at least

4-6 months of age. When the members feel the need to build a VO to achieve an objective which they alone are not capable to achieve, the SHG leaders with the help of CRP, community facilitators, NGOs, Panchayati Raj Institution (PRIs), and/or representatives of NRLM would form a VO.

Key Activities of VO

- To form new SHGs and inclusion of left out poor;
- To facilitate SHGs bank linkages through liaison and establishing coordination with bank branches, and timely repayment;
- To provide linkage with social security, food security, health schemes, and livelihood to its member;
- To create awareness of the SHG members on various social issues, their legal rights, and entitlements;
- To resolve the conflicts at SHGs and ensure smooth functioning;
- To improve quality of SHGs, monitor key activities (meeting, savings, bookkeeping, etc.), promote self-grading, and audit SHGs;
- To increase participation of SHG members in Gram Sabha and establish linkages with PRI;
- To identify and orient community facilitators and bookkeepers; and
- To mentor and strengthen (through orientation, training, exposure, information dissemination, on-site support, etc.) the capacity of member SHGs in different aspects (bookkeeping, accounting, advocacy, bank-linkage, accessing government schemes, etc.).

Source: NRLM COM

3.11.2 Farmers' Club

Farmers' Clubs (FCs) are grassroots level informal forums. Under the initiatives of GoI and NABARD, FC activities started as "*Vikas Volunteer Vahini (VVV) Programme*" in 1982; and then the VVV Program was reviewed and restructured as "Farmers' Club Programme" in 2005.

The number of FCs is 5,865 in Jharkhand State, and 3,366 FCs in the candidate districts⁸ of the JICA project (57.4% of total of the State). The eldest FCs (17 FCs) were established by KVK in Hazaribagh in FY2003/04. Most FCs in Jharkhand were established after FY2009-10.

NABARD expects that the formation of FC would lead to better banker-borrower relationship in the area. So the functions of the FCs would be to:

- Coordinate with banks to ensure credit flow amongst its members and forge better bank-borrower relationship;
- Organise a minimum of one meeting per month and depending upon the need, there would be 2-3 meetings per month. Non-members can also be invited to attend the meetings;
- Interface with subject matter specialists in the various fields of agriculture and allied activities, etc., extension personnel of agriculture universities, development departments, and other related agencies for technical know-how upgrading. For guest lectures, even experienced farmers who are non-members from the village/neighbouring villages could be invited;
- Liaise with corporate input suppliers to purchase bulk inputs on behalf of its members;
- Organise/facilitate joint activities like value addition, processing, and collective farm produce marketing, for the benefit of members. They can also sponsor/organise SHGs; and
- Undertake socioeconomic developmental activities like community works, education, health,

⁸ Ranchi, Dumka, Gumla, Giridih, Hazaribagh, Saraikela-Kharsawan, Palamu, Lohardaga, Pashchimi Singhbhum, Khunti, Pakur, and Latehar

environment, and natural resource management.

FCs are organised by rural branches of banks (commercial banks, regional rural banks, and/or cooperative banks) with the support and financial assistance of NABARD. The bank branch can promote the FCs directly or engage FC promoting agencies like KVK, NGOs, and others. In the target districts of the JICA project, they are NGOs (74.0%), KVK (2.4%), and private sector (0.6%). The balance of 23.0% of the FCs are promoted by banks directly.

Whilst FC should have a minimum of ten members, no upper limit in the membership is envisaged. Each FC elects one Chief Coordinator and one Associate Coordinator on a democratic basis for a term of two years. They are tasked to convene meetings, arrange meetings with experts, maintain books of accounts, coordinate with the bank and line departments of the state governments, and maintain proper liaison with the bank.

NABARD would provide financial support for the first three years and for the next two years the bank may provide support to FC, if necessary. The FC is expected to attain self-sustainability in a period of 3-5 years.

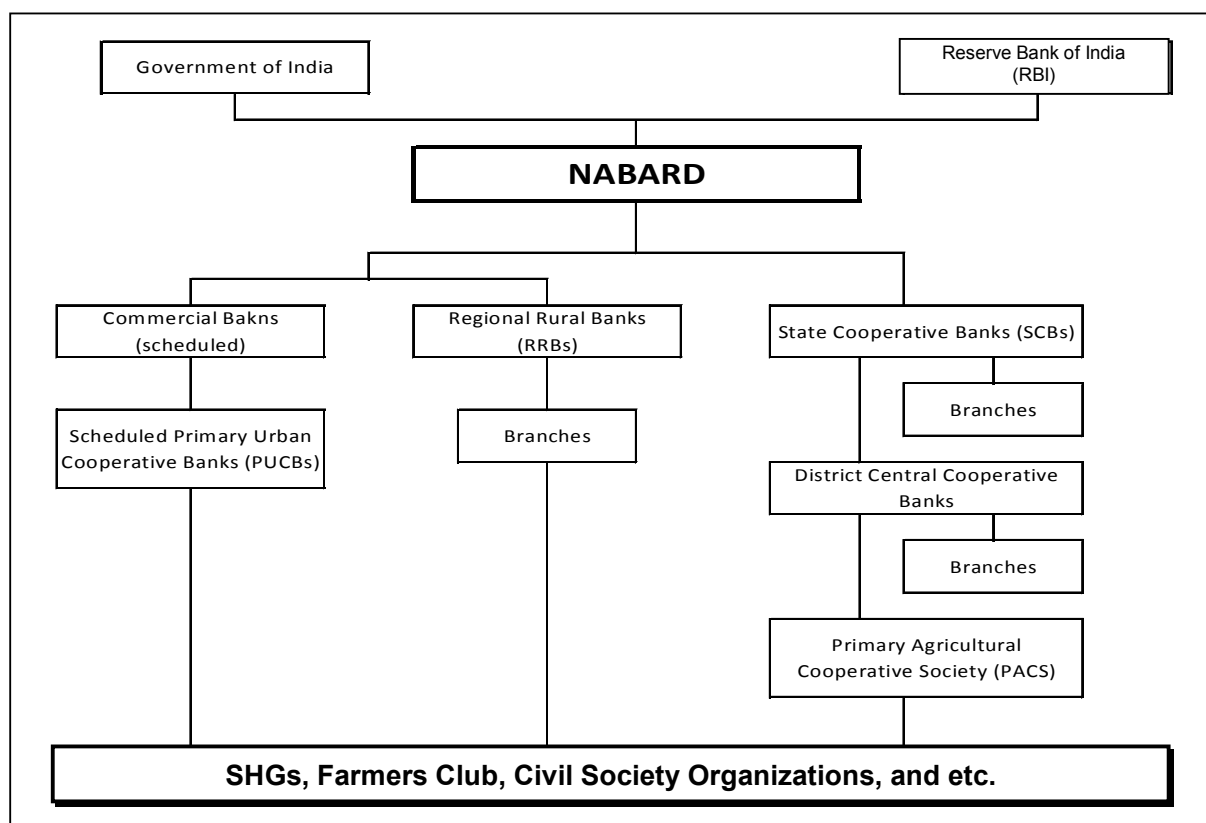
Table 3.11.4 Financial Support from NABARD

	Name of Programme	Maximum Eligible Grant other than the North Eastern Region
1	Annual Maintenance Contract of a Farmers' Club	Rs.3,000 per FC per year for 3 years
2	Grant if applicable in the case of KVKs, NGOs, Agriculture Universities, etc.	Rs.2,000 per FC per year for 3 years
3	Base Level Orientation Training Programmes (BLOTP)	Rs.5,000
4	"Meet with Experts" Programme	Rs.3,000 (Rs.1,500 x 2 programmes in a year)

Source: <http://www.nabard.org/english/home.aspx>

3.11.3 Formal Finance Sector

The Indian financial system can be broadly classified into a formal (organised) financial system and informal (unorganised) financial system. The formal financial system comes under the purview of the Ministry of Finance, RBI, the Securities and Exchange Board of India, and other regulatory bodies. The formal funds for agricultural and rural development flow from GoI and RBI to NABARD. The financial sector in India has seen robust growth in the last two decades. The commercial banking sector, together with NABARD, has proactively come forward to finance the poor through a variety of approaches, primary of which is the SHG-Bank linkage programme.



Source: JICA Survey Team

Figure 3.11.1 Financial Flow

NABARD's refinance is available to the State Co-operative Agriculture and Rural Development Banks, State Co-operative Banks (SCBs), Regional Rural Banks (RRBs), Commercial Banks (CBs) and other financial institutions approved by RBI. Whilst the ultimate beneficiaries of investment credit can be individuals, partnership concerns, companies, state-owned corporations or co-operative societies, production credit is generally given to individuals.

Besides SGSY and NRLM, banks have formed community-based organisations. The poor can open their bank account if more than ten people organise a community-based organisation including SHGs and FCs. These CBOs can utilise some of NABARD's schemes shown in Table 3.11.5.

Table 3.11.5 Applicable NABARD Schemes for Groups of Poor People

Microfinance	
1	Assistance to Self-Help Promoting Institutions (SHPIs) for promotion and linkage of SHGs
2	Microenterprise Development Programme
3	Scheme for Financing Matured SHGs for Farm and Investment Activities
4	Scheme for Providing Technological Support to NGOs
5	Scheme for Supporting Activity-based Groups
6	Incentive for Promotion of Joint Liability Groups of SF/MF/Tenant Farmers/Oral Lessons and Sharecroppers under the Farm Sector
Financial Inclusion	
1	Support under Financial Inclusion Fund
2	Support under Financial Inclusion Technology Fund
3	Farmers' Club as Business Facilitators (BFs)
4	Establishing Web-enabled Financial Services Call at RUDSETI
5	Support for Certificate Course for Business Correspondents (BCs)
6	Authorised Functionaries of Well-Run SHGs as BC/BF

Non-farm Sector	
1	Rural Entrepreneurship Development Programmes
2	Skills Development Programme/Skills Upgradation
3	Scheme for Strengthening Rural Haats – Financing through PRIs
4	Setting up of Marketing Outlets (Rural Marts)
5	NABARD's support for setting up of clusters
6	Capital Subsidy cum Refinances Scheme for installation of Solar Off-Grid (Photo Voltaic Thermal) and Decentralised application under the Jawaharalal Nehru National Solar Mission of the MNRE, GoI
7	Credit Linked Capital Subsidy Scheme for Technological Up-gradation of Medium and Small Enterprises – GoI Scheme
8	Solar Home Lighting System
Promotional Funds	
1	Farm Innovation Promotion Fund
2	Rural Innovation Fund
3	Farmers' Technology Transfer Fund (FTTF) – FC
4	Umbrella Programme for Natural Resource Management
5	Tribal Development Fund
6	Technology Transfer and Pilot Projects under FTTF
7	Watershed Development Fund
Village Development Programme	
1	Village Development Programme

Source: JICA Survey Team

Under its 'Assistance to SHPIs for promotion and linkage of SHGs', NABARD encourages Indian banks to lend to SHGs. NABARD has reported the performance of SHGs in Jharkhand as shown in Table 3.11.6.

Table 3.11.6 Coverage of SHGs in Jharkhand

Item		Achievement			
1	Total households in rural area ('000)	2,385			
2	Total households organised into SHGs ('000)	1,109			
3	Number of less organised districts into SHG (n<80%)	20/24			
4	Average amount of saving per SHG (Rs.)	9,012			
	National average amount of saving per SHG (Rs.)	11,230			
	Best performer (Rs.)	12,388			
5	Average amount of loan circulation per SHG (Rs.)	84,923			
	National average amount of loan circulation per SHG (Rs.)	168,757			
Item		2010-11	2011-12	2012-13	
6	1	Number of SHGs receiving loan	11,000	12,000	900
	2	Disbursed loan ('000)	14,333	12,741	7,536
7		Outstanding ('000)	32,197	35,956	37,748
8		Total number of non-performing SHGs	1,591	2,754	4,338
	1	SGSY SHGs	1,385	2,130	2,237
	2	Non-SGSY SHGs	206	624	2,101
9		Number of Districts having Women SHGs	N.A.	N.A.	18

Source: NABARD 'Status of Microfinance in India (2012-13)'

Table 3.11.6 does not include SHGs formulated under NRLM because they had not reached Grade-3 (external bank linkage level). It asserts that the performance of SHGs in Jharkhand in both the average amount of savings per SHG and the average amount of loan circulation per SHG lagged far behind from the national average. One reason is that Jharkhand State is one of the poorest states in India, but many points out that majority of the poor are not still organised into SHGs and have been left without any bank linkages.

3.11.4 Informal Finance Sector

The Programme Implementation Plan of NRLM has asserted that formal financial institutions were not able to meet huge credit needs in 2008-09. Especially in Jharkhand and some other states, the percentage of credit needs met through formal financial resources was only 1.57%. To bridge resource gap, the rural poor depends on informal sources, particularly money lenders who charge exorbitant interest rates (sometimes in excess of 5% per month) to meet both unforeseen consumption expenditure and to invest in productive activities.

The structure of informal financial market is extremely heterogeneous like share broking firms, loan brokers, NGOs, SHGs, share brokers and traders, *multani shroffs*, *pawnbrokers*, and *cattiaris*.

CHAPTER 4 REVIEW OF THE MICRO DRIP IRRIGATION INITIATIVES

Based on the experiences obtained through the United Nations Development Programme (UNDP) assisted Project, the Jharkhand State Livelihood Promotion Society (JSLPS) has implemented the initial upscaling trials on Micro Drip Irrigation (MDI) in the district of Ranchi, further replication of which are envisaged in the proposed Initiative for Horticulture Intensification by Micro Drip Irrigation (I-HIMDI). The operation and management system applied in these replication trails together with some of the shortcomings identified through the process are described in the following section.

4.1 Evolution of MDI Models by JSLPS

JSLPS has been involved in MDI activities since 2009 as the MDI was one of the livelihood options introduced under the Government of India-United Nations Development Programme (GoI-UNDP) supported project entitled “State Level Support to Livelihood Promotion Strategies-Jharkhand (2009-2012),” and the society was established as the project implementing agency of the project. During the implementation of the project with funding from UNDP, 180 farmers of 13 villages of six blocks in the four target districts were provided with the MDI systems for 0.1 ha of land. The eligible beneficiary farmers are as follows:

- Families living below poverty line (BPL);
- Those who are practicing farming with homestead farm land of at least 0.1 ha;
- Those who live in proximity to operational water source i.e., well, bore-well, pond, check dam, etc., and
- Those who are not defaulters of the banks.

The cost of the system installation was granted by the UNDP fund while mobilising beneficiaries’ contribution on the labour, which is equivalent to approximately Rs.5,000.

With appreciation of the successful implementation under the GoI-UNDP project above, initial replication of MDI was launched by using the *Swaranjayanti Gram Swarajgar Yojana* (SGSY) grant and loan from the banks. The support under this model comprised a 50% subsidy from SGSY fund and a 50% loan from the banks. The average cost per unit in the replication model was Rs.34,198 inclusive of the cost of MDI facilities, production inputs, and pump set. It required labour of about Rs.3,000 to Rs.5,000 as the beneficiary contribution. This model is also for the 0.1 ha of cultivable land and the criteria for this MDI model remained similar to those applied in MDI demonstration under the GoI-UNDP project. The main objectives of the vegetable and fruit cultivation under the MDI replication initiatives of JSLPS are:

- To demonstrate the gravity-based drip irrigation and efficacy of micro-irrigation based cultivation of cash crops;
- To enable the rural poor to overcome poverty through a small unit of land (25 decimal = 0.1 ha);
- To empower women at the forefront to help ease the adoption of agricultural technology by farmers and receive regular income source; and
- To develop a cadre of community resource person for escalation of off-season vegetable

cultivation.

The programme has been implemented in 2012-2013, originally aimed to cover 477 farmers of 121 villages from nine blocks and developed 138 poly nurseries managed by self-help groups (SHGs) in 18 blocks of Ranchi District, however, when the SGSY programme was restructured as the National Rural Livelihood Mission (NRLM), the installation of the new system was suspended, and only the technical and institutional supports were continuously extended to the existing MDI farmers. As a result, the programme covered 262 farmers of 112 villages in eight blocks in Ranchi District.

Since the latter part of 2013, JSLPS has been piloting new initiatives on MDI on a 100% loan basis, which is called as “recycling model,” as it is no longer possible to provide large amount of grant under the NRLM. Currently, there are 15 farmers’ clubs (FC) in Ranchi District preparing for the installation of the system. In the recycling model, an FC composed of 10 to 20 farmers (25 as the maximum) is provided with a fund to be utilised as seed money for inter-lending to install MDI system, while mobilising the contribution from the members of the FC.

Table 4.1.1 Summary of the MDI Initiatives by JSLPS

Project	Model	Project Duration	MDI Beneficiary Coverage	MDI Beneficiary	Funding Support	Remarks
UNDP Project	Initial Demonstration Model	2009-2012	180 farmers	SHG members and their family members	100% grant from UNDP fund (with labour contribution by the beneficiaries)	Poly nursery house (PNH) facilities were also provided to SHGs
SGSY	Replication Model	2012-2013	262 farmers	SHG members	50% bank loans (with 12% interest) and 50% SGSY subsidy	PNH facilities were also provided to the SHGs
NRLM	Recycling Model (Pilot)	2013-2015	15 FCs (approximately 300 farmers)	Members of FCs	Grant to the group from NRLM fund that should be revolved on 100% loan basis (with 2% of interest) among the FC members	FC members are from the families of the SHG members

Source: JSLPS GoI-UNDP Supported Livelihood Promotion Strategies Project, *Rural Development Department, Government of Jharkhand, Manual on Low Pressure Drip Irrigation and Poly Nursery Management (2011)*, JSLPS “Proposal on Initiative for Horticulture Intensification by Micro Drip Irrigation (I-HIMDI)” (PowerPoint presentation document, undated), and interview with JSLPS staff.

Table 4.1.2 Summary of Funding Arrangements in MDI Initiatives by JSLPS

Model	Average Cost of Installation per Unit (Rs.)				Loan	Subsidy	Beneficiaries’ Contribution
	Drip System and Allied Equipment	Pump for Water Lifting	Production Inputs	Total Cost			
Initial Demonstration Model	25,436		5,800	31,236	0	31,236	Labour cost for system installation equivalent to approximately Rs.5,000
Replication Model	23,898	4,500	5,800	34,198	17,099	17,099	Labour cost for system installation equivalent to approximately Rs.3,000-Rs.5,000
Recycling Model (Pilot)	Rs.25,000 (estimated)				Total amount of	0	Rs.50,000 per group is granted to a FC, while same matching

Model	Average Cost of Installation per Unit (Rs.)				Loan	Subsidy	Beneficiaries' Contribution
	Drip System and Allied Equipment	Pump for Water Lifting	Production Inputs	Total Cost			
					MDI installment		amount is mobilised from the members. The total amount is used as loans to members to install the MDI systems, and revolved among the members.* ¹

Note*1: This arrangement is the prototype that JSLPS suggests to the FCs: with participatory approach, FCs are allowed to modify the inter-loaning arrangement at their discretion based on their needs and agreements among their members.

Source: JSLPS GoI-UNDP Supported Livelihood Promotion Strategies Project, *Rural Development Department, Government of Jharkhand, Manual on Low Pressure Drip Irrigation and Poly Nursery Management (2011)*, JSLPS "Proposal on Initiative for Horticulture Intensification by Micro Drip Irrigation (I-HIMDI)" (PowerPoint presentation document, undated), and interview with JSLPS staff.

4.2 Organisational Structures

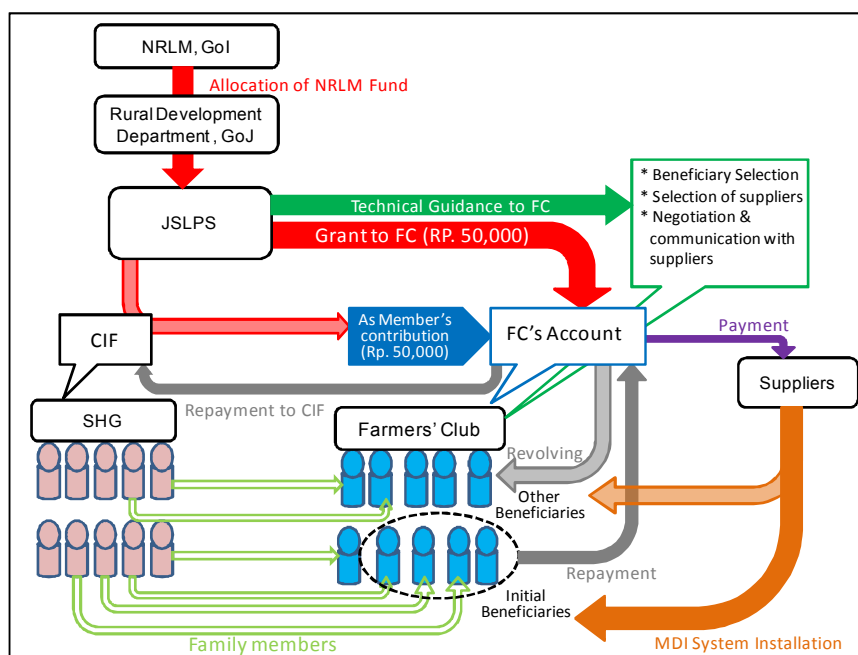
In all of the models, MDI is provided to and operated by individual farmers. However, the organisation and management structures are different among these models.

In the demonstration model, majority of the beneficiaries are members of the SHGs, but some male farmers from the families of the SHG members also benefitted. In this model, SHGs as groups operate PNH to produce seedlings to be sold to the MDI farmers, and the PNH is an integral part of the vegetable cultivation programme with MDI. Group activities such as meetings, savings, and so forth are also compulsory to the members. One district project manager/coordinator together with two block coordinators, three field organisers (FOs), and three community resource persons (CRPs) are assigned in each district to take care of the activities in the target communities, who are employed under the UNDP funds. The block coordinators helped SHG members in negotiating and handling procurement processes with the dealers, while the FOs helped SHG members in terms of production techniques as most of them are graduates from agricultural colleges.

In the replication model, the MDI beneficiaries are in principle SHG members as the SGSY programme focuses on supporting SHGs. Again in this model, the PNH is an integral part and SHGs manage seedling production as a business enterprise. As the replication model was regarded as the continuation and expansion of the initial demonstration model, similar human resources allocation was made at the field level, and the same personnel who had served in the demonstration model could continue their services in the replication model. It is to be noted that, in addition to the provision of the SGSY subsidies, the Ranchi District Rural Development Agency (DRDA) also provided certain fund to conduct technical training for the MDI beneficiaries during the implementation of replication model.

In the recycling model, the entire structure has been changed. MDI farmers are selected from the families of SHG members, but as a separate group, i.e., FC, is organised by these MDI farmers. The FC practices basic group activities such as regular meeting, regular saving, internal lending, timely repayment, and bookkeeping, similar to the *panchastutra* of the SHGs, for a period of six months before the fund on the installment of MDI would be provided. The actual procurement process of MDI including the selection of, negotiations, and coordination with the suppliers would be carried out directly by FC members themselves, while the field organisers may provide technical guidance as needs arise.

the SHGs in terms of increase of CIF. However, the FCs are given room to decide based on their internal discussion and agreement how to mobilise the matching amount and how to revolve the loan among their members, thus there are some variations in terms of fund operation and management in the field.



Source: Interview with JSLPS personnel

Figure 4.3.2 Prototype Fund Flow in the Recycling Model

4.4 Present Status of MDI Activities Observed

The present status related to MDI was observed in terms of various aspects during the field survey, the locations covered are listed in Table 4.4.1 below. The following sections describe major findings and insights obtained through these field observations.

Table 4.4.1 Locations Visited by the JICA Survey Team

District	Block	Panchayat	Village	MDI Model/Programme	Date Visited
Ranchi	Angara	Angara	Janum	JSLPS Demonstration	1 April 2014
Ranchi	Angara	Nawagarh	Rangamati	JSLPS Demonstration	1 April 2014
Ranchi	Burmu	Chaingarda	Sahargad	JSLPS Replication	4 April 2014
Ranchi	Burmu	Sarle	Mahudar	JSLPS Replication	4 April 2014
Ranchi	Namkum	Hurua	Nichitpur	JSLPS Demonstration	10 April 2014
Ranchi	Namkum	Hurua	Karkata	JSLPS Recycling	10 April 2014
Hazaribagh	Churchu	Chanaro	Chichikhu	National Horticulture Mission (NHM)	15 April 2014
Hazaribagh	Dari	Hemhemorha	Chainpur	NHM	15 April 2014
Lohardaga	Kuru	Sundru	Opa	NHM	23 April 2014
Lohardaga	Kuru	Kalsimri	Kolsimri	NHM	23 April 2014
Palamu	Satbarwa	Bari	Khoundih	JSLPS Demonstration	2 May 2014
Pakur	Maheshpur	n.a.	Lockhipur	n.a.	1 May 2014
Pakur	Pakuria	n.a.	Lagdum (Chirudih)	JSLPS Other programmes	1 May 2014

Source: JICA Survey Team

4.4.1 Present Status of Water Sources and Soil Conditions

(1) Results of the Field Survey

A total of 13 villages shown in Table 4.4.2 were visited in this survey period.

Table 4.4.2 List of Villages Visited by the JICA Survey Team

District	Block	Village	Date of Survey
Ranchi	Angara	Janum	1 April 2014
		Rangamati	1 April 2014
	Burmua	Chaingara	1 April 2014
		Kander	1 April 2014
	Namkum	Nichitpur	10 April 2014
		Karkata	10 April 2014
Hazaribagh	Churchu	Chichikhu	15 April 2014
	Dari	Chainpur	15 April 2014
Lohardaga	Kuru	Opa	23 April 2014
		Kolsimri	23 April 2014
Pakur	Maheshpur	Lockhipur	1 May 2014
		Lagdum (Chirudih)	1 May 2014
Palamu	Satbarwa	Khoundih	2 May 2014

Source: JICA Survey Team

Water sources in the visited villages of this field survey are shown in Table 4.4.3. Many farmers which were visited in this survey period have non-dry-up wells. However, in Junum Village, since the open dug wells are dried up in summer season, the deep tube wells are used for irrigation (No. 1 and No. 3 in Table 4.4.3). In Rangamati Village, one open dug well is drying up (No. 5), however, the open dug wells, which are 150 m away from the drying well, never dried up even in summer season. These wells are at lower altitude than the drying one.

In Khoundih Village, there are several kinds of open dug wells. One is a non-dry-up well, which is 7.6 m in depth (No. 21). Others are shallower or buried by sedimentation of soil, and these are dried up. But one of these wells has an extra-dug well at the bottom of the dried well (No. 22) and the other has a tube well pushed down by human power into 8 m in depth (No. 23). These wells can be used now for irrigation without drying up. The water level of the extra-dug well is 7.5 m, almost the same level as non-dry-up well.



Source: JICA Survey Team

In Pakur District, open dug wells are very few. It is considered that this is not due to the lack of groundwater but due to the geology of Pakur District hilly area, which has volcanic rocks underneath causing it hard to dig. In low land in Pakur District, the soil is sandy, which easily collapse when digging the well. Shallow tube wells can be appropriate in this area.

In the visited villages in this survey, measured pH, EC, and arsenic of sampled water are in the normal range. The pH level ranges from 6.5 to 7.5, and EC ranges from 0.1 to 0.4 mS/cm. while arsenic is not found in all samples.

Results of some soils shown a little bit of acidic material (cells are shown yellow in colour in Table 4.4.3).

Several wells which were constructed by the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) Project are seen in several villages (Nos. 10, 11, and 13 in Namkum Block in Ranchi District, No. 17 in Kuru Block in Lohardaga District). These wells were built several years ago.

Table 4.4.3 Field Survey Results of Water Sources and Soil Condition

No.	District	Block	Village	Latitude	Longitude	Altitude (m)	Type of Water Source	Well				Dry up Status (Dry up Period)	Water Quality			Soil Quality	
				decimal	decimal			Depth (m)	Water Table (m)	Diameter (m)	User of the Water Source		pH	EC (mS/cm)	Arsenic (mg/L)	pH	EC (mS/cm)
1	Ranchi	Angara	Janum	23.40569	85.50922	619	Tube well	95.0	-	0.1	1	No	6.5	0.4	0.0	6.9	0.4
2				23.40569	85.50922	619	Open well	8.0	5.0	2.0	1	February-June	6.5	0.4	0.0	-	-
3				23.40661	85.50625	614	Tube well	54.0	-	0.1	4	No	-	-	-	-	-
4				23.40661	85.50625	614	Open well	9.0	6.0	3.0	4	May-June	-	-	-	-	-
5			Rangamati Barawatoli	23.44706	85.60128	574	Open well	7.0	6.0	2.5	2	April-June	6.7	0.2	0.0	7.1	0.3
6				23.44736	85.61558	561	Open well	8.4	1.0	5.0	many	No	-	-	-	-	-
7				23.44831	85.61564	563	Open well	7.8	2.0	8.0	many	No	-	-	-	-	-
8				Burmum	Chaingara	23.59819	85.21414	682	Open well	9.0	1.0	8.5	1	No	6.9	0.3	0.0
9		Mahadar	23.63478		85.15625	640	Open well	10.5	3.5	4.8	4	May-June	7.3	0.2	0.0	7.0	0.3
10		Namkum	Nichitpur Raidih	23.19583	85.33131	586	Open well	9.0	3.0	6.0	1	No	6.7	0.2	0.0	6.9	0.1
11				23.19339	85.33361	575	Open well	7.5	3.7	6.0	1	No	6.6	0.1	0.0	6.4	4.3
12			Karkata	23.20311	85.35453	593	Open well	7.5	6.2	5.0	1	No	6.6	0.3	0.0	6.8	0.3
13	Hazaribag		Churchu	Chichikhu	23.90300	85.46803	594	Open well	9.0	5.8	3.5	10	No	7.4	0.2	0.0	6.4
14		Dari	Chainpur	23.76958	85.41578	454	Check Dam	-	-	-	30 - 40	May-June	8.3	0.3	0.0	-	-
15				23.76772	85.41975	456	Open well	10.8	1.8	6.0	1	No	8.4	0.3	0.0	6.1	0.3
16	Lohardaga	Kuru	Opa	23.56092	84.75597	683	Open well	7.0	4.4	6.0	1	No	7.2	0.2	0.0	6.5	0.3
17			Kolsimri	23.50178	84.79086	661	Open well	7.2	5.6	4.5	1	No	6.8	0.1	0.0	6.3	0.4
18	Pakur	Maheshpur	Lockhipur	24.46356	87.80433	40	Tube Well	27.0	-	0.2	1	No	7.0	0.4	0.0	7.4	0.3
19				24.47556	87.78028	39	Tube Well	25.0	-	0.2	-	No	6.7	0.6	0.0	6.8	0.5
20		Pakuria	Lagdum (Chirudih)	24.37814	87.68372	58	Tube Well	-	-	0.2	-	No	7.3	0.6	0.0	7.9	0.3
21	Palamu	Satbarwa	Khoundih	23.96156	84.22481	261	Open well	7.6	7.1	3.0	1	No	7.1	0.3	0.0	7.4	0.3
22				23.96128	84.22358	264	Open well	5.9	-	3.0	1	No	-	-	-	-	-
23				23.96083	84.22347	265	Open well	6.4	3.5	3.5	1	No	-	-	-	-	-
24				23.96650	84.21903	264	Tube well	56.0	-	0.1	-	No	7.9	0.5	0.0	-	-

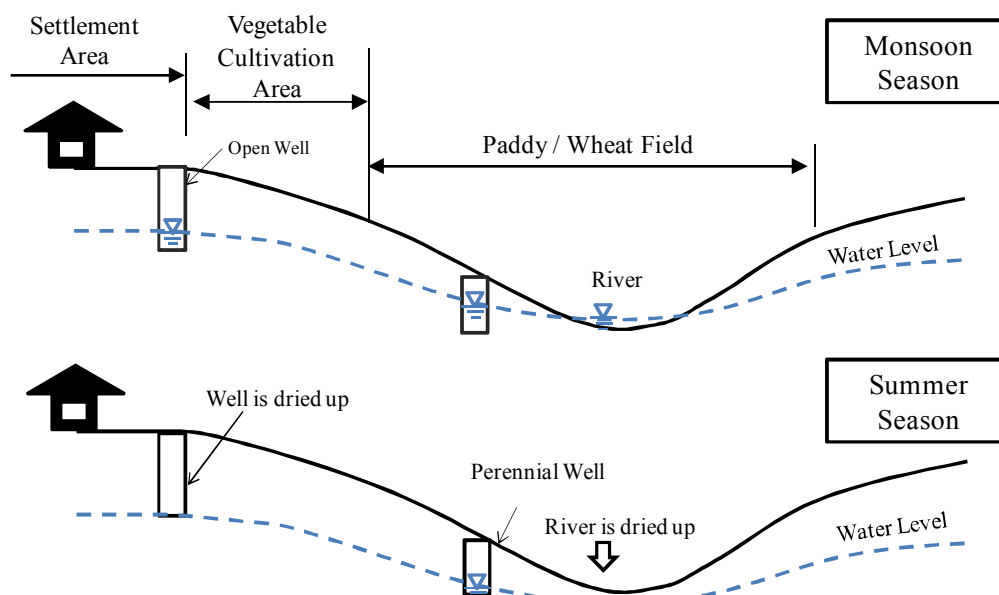
Note: “ - “: Data are not available.

Source: JICA Survey Team

(2) Maintenance of Well

Settlements are gathered at relatively higher altitude area. Because the water level rises up in the monsoon season, low-lying land around the settlement is used for paddy or wheat cultivation. On the other hand, the land for vegetable cultivation is usually located in higher altitude, which is generally near the settlement area. This is rational because such land has good drainage and is easily monitored from animal intrusion. However, since the groundwater level generally follows the topography of the land, the groundwater level is deeper in such high land, as shown in Figure 4.4.2.

There were some open dug wells, which became shallower than the original depth due to soil sedimentation. In fact, dried-up well does not mean that groundwater has disappeared, but only shows that the groundwater level gets deeper than the bottom of the well. Therefore, this may be solved by digging an extra meter from the bottom of the well. If the bottom of the well has rock formation, the non-dry-up well may be constructed by extra drilling at the bottom of the well. The revolving fund of the project can also be used for the maintenance of water sources.



Source: JICA Survey Team

Figure 4.4.1 Schematic Diagram of Land Use and Groundwater Level

(3) Checking of Water Quality and Soil Quality before Selecting MDI Farmers

The water quality (pH, EC, arsenic, and fluoride) and the soil quality (pH and EC) should be analysed, before selecting MDI farmers. Especially, arsenic is a toxic mineral. The standard of arsenic contamination for drinking water is 0.01 mg/L, which is stricter than irrigation water (0.1 mg/L). If arsenic is detected, this should be reported to the Department of Drinking Water and Sanitation and Department of Health as well.

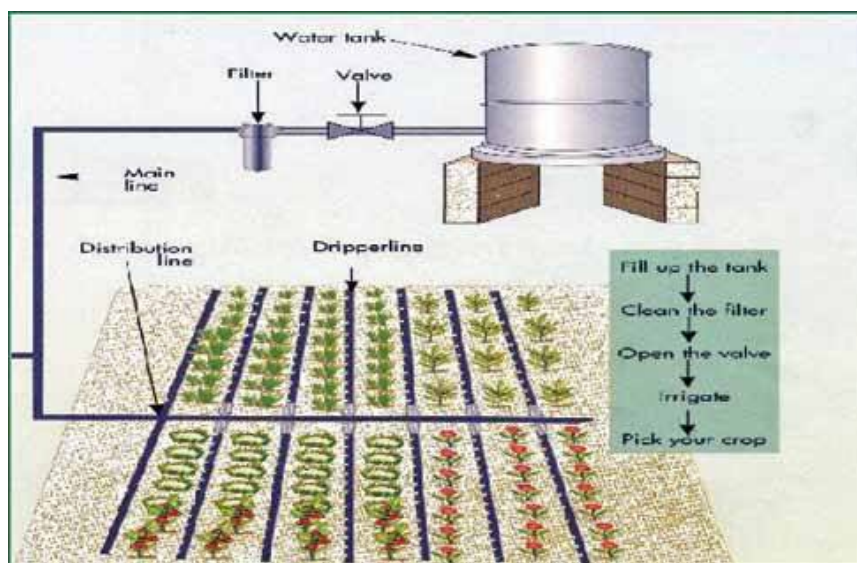
4.4.2 Present Status of Drip Irrigation Systems, Poly Nursery Houses, and Agricultural Infrastructures

(1) Micro Drip Irrigation (MDI) Systems

In Jharkhand, 477 MDI systems are registered under SGSY and 180 MDI under UNDP programme. The typical MDI system in Jharkhand promoted by JSLPS is described below.

- Irrigation water is pumped up from an open dug well. The pump is driven by kerosene, diesel, or electricity. The power requirement of pumps is usually between 0.5 HP and 1.5 HP.
- The pumped up water is stored in an overhead tank (UNDP and SGSY programmes). The capacity of the tank is 1,000 L, placed on a stand (wooden or brick) 2 or 3 m above the ground.
- Through PVC pipelines and plastic drip tube lines (laterals), the water is sent to drippers and emitted in the soil around the crop plant.
- The interval of laterals is from 1.0 to 1.2 m, and dripper spacing is from 30 to 45 cm.

A schematic layout of the MDI system is illustrated in Figure 4.4.3.



Source: *Manual on Low Pressure Drip Irrigation and Poly Nursery Management*, JSLPS

Figure 4.4.2 Schematic Layout of Drip Irrigation System

For MDI installed under the UNDP programme and SGSY programme promoted by JSLPS, gravity-based irrigation with an overhead tank is applied. On the other hand, the National Mission on Micro Irrigation (NMMI) Programme promoted by the Department of Agriculture and Sugarcane (DoA) executes a pressure-based direct irrigation method.

The information on present status of drip irrigation systems, poly nursery houses, and agricultural infrastructures have been collected through review of existing reports and documents, interview with JSLPS personnel, field visits to the MDI schemes, and interviews with the farmers.

The following field trips were made in the survey period:

29 March 2014	Indian Council of Agricultural Research (ICAR), Research Complex for Eastern Region, Ranchi Centre, Plandu, Ranchi
1 April 2014	Angara Block, Ranchi District
4 April 2014	Burmu Block, Ranchi District
10 April 2014	Namkum Block, Ranchi District
20 April 2014	Pithauria Assembly Market, Ranchi District
24 April 2014	Kuru Block, Lohardaga District and a banana plantation on a commercial scale in Ghaghra Block, Gumla District
27 April 2014	Angara Block, Ranchi District and a commercial floriculture farm in Nagri Block, Ranchi District
2 May 2014	Satabarwa Block, Palamu District
6 May 2014	KGVK and Ormanjhi Block, Ranchi District

Apart from the field visits to the existing MDI farmlands, an inventory survey on the existing MDI systems were conducted by JSLPS staff. In six districts of Bokaro, Khunti, Lohardaga, Palamu Ramgarh,¹ and Ranchi, 60 samples were collected. The survey mainly focused on the status and practices of water sources, pump operation practices, irrigation frequency and time, cropping patterns, input costs and sales amount, trainings given, and complaints and demands. The questionnaire sheet is attached in Attachment 4.4.1.

Major observations obtained from the field visits and sample surveys are listed as follows:

- a) Most MDI farmers use open dug well near their farmlands. The well is generally exclusive for domestic use.
- b) Water for MDI is available almost throughout the year, though some wells dry up in summer season. The pump is driven with electricity or kerosene. Some have difficulty in obtaining fuel.
- c) Vegetable crops are generally cultivated three times a year.
- d) In the summer season when irrigation water requirement is at its peak, MDI farmers irrigate two or three times a day to meet the crop water requirement in case of the overhead tank type.
- e) Irrigation time in the summer season is about 40 minutes each time.
- f) Overhead tanks are placed at 2.5-2.8 m above the ground. Some farmers built brick-made stands, but wooden stands assembled from tree branches are also practiced, which is not reliable and safe.
- g) Majority of the farmers are aware of MDI effects on the increase of production, product quality improvement, water saving, reduction of labour force, decrease in diseases, and thus are satisfied with the MDI introduction.
- h) Few MDI farmers use mulching. Only two cases were found in 60 surveyed farmers.
- i) Many MDI farmers have complaints regarding insufficient training and lack of knowledge and technique in proper crop farming under MDI such as how to fertilise the crops and how to manage routine maintenance.
- j) Failures in MDI systems are reported such as clogging in drippers and leakage in the distribution system, but not many.
- k) Some farmers suffer from nonavailability of fertilisers in the market nearby.
- l) Some farmers demand nursery houses and vermin compost units.



Tank and Brick Stand

Source: JICA Survey Team



Tank and Wooden Stand

Source: JICA Survey Team



Mulching in the muskmelon field

Source: JICA Survey Team

¹ Bokaro and Ramgarh are not beneficiary districts of I-HIMDI.

- m) Most of the farmers have witnessed that the production and income have increased. The average annual net income in 60 surveyed samples is reported at Rs.38,000.

(2) Poly Nursery Houses (PNH)

JSLPS has promoted PNH for group use with a size as big as 96 m² to be managed by SHGs. It aimed at creating a market for seedlings grown in PNH by selling it to farmers outside the villages as well as for internal consumption. Seeds are purchased and placed in plastic trays with soil mixed with cocopeat.

Under constant water supply, adequate temperature and humidity, as well as proper protection from strong sunlight, harmful animals and insects, the nursery trays are taken care of until the seedlings are grown enough for transplanting in MDI farmlands.



Standard nursery trays
Source: JICA Survey Team



Cocopeat available in the market
Source: JICA Survey Team

However, many PNHs are damaged, abandoned, or not in use as farmers obtained their seedlings from outside sources. Even if PNHs are operating in collective manner, some inexperienced SHGs considered the sale of nursery products to outside farmers difficult. It may be led by irresponsibility in collective operation and also lack of technical support to SHGs.



Poly nursery house torn by swine
Source: JICA Survey Team

(3) Vermin Compost Production Unit (VCU)

In few MDI systems already installed, farmers have VCU to produce manure from cow dung with the help of earthworms. The unit in Pragatisil Village in Angara Block, Ranchi, shown in the photo below,



Vermin compost in Angara
Source: JICA Survey Team



Earthworm for vermin compost
Source: JICA Survey Team

operated by the farmer has simple structure made of vinyl sheet and bamboo screen. In Khamdhi Village in Satbarwa Block, Palamu District, farmers use dug holes in the backyard ground without any structure.

In both cases, the farmers recognised the effectiveness of vermin compost in the increase of production and quality.

(4) Agricultural Infrastructure

The Pithauria Assembly Market in Kanke Block, Ranchi District, has been established along the asphalt paved road of 4 m width. A unit of the market facility has a floor size of 5 m x 12 m, and approximately 3 m high with concrete roof supported by 12 pillars.

This market facility was constructed in 1980 by the State Agriculture Production Marketing Committee to provide auction space for sellers and buyers. However, the sellers and buyers do not use these facilities but in reality they trade along the road shoulders, which is more convenient for trading according to the interviews. In the surveys at ten existing markets, the situations regarding market infrastructure are similar.



Unused sheds in Pithauria Market
Source: JICA Survey Team

4.4.3 Present Status of Horticulture Production

Findings through the field visits of the past and ongoing rural development projects of SGSY, NRLM, and NHM during March-May 2014 are as follows:

(1) Effectiveness of Maximising Land Use of Limited Field for High Yielding and High Quality Horticulture Crops

In the area, some advanced farmers have already practiced effective land use methods to increase yield and improve the quality of crops. To increase household income under MDI, maximising the land use is indispensable. Their effective practices should be adopted in the project. To maximise land use, the following approaches might be considered important:



Mixed planting of leafy vegetables and tree crops (Ranchi District)
Source: JICA Survey Team

- (i) Raising healthy seedlings (e.g., using poly nursery houses, improving soil fertility, and using proper variety);
- (ii) Proper plant protection into the field (e.g., mulching, proper agro-chemical use, and integrated pest management); and
- (iii) Vertical land use (e.g., supporting pole or wire and mixed planting with tree crops).



Cucumber production without supporting poles (Pashchimi Singhbhum District)
Source: JICA Survey Team



Bitter gourd production using supporting poles and wires (Palamu District)
Source: JICA Survey Team

(2) Effectiveness of Selling Products in Off-season

Jharkhand State has a large potential in off-season horticulture production utilising its cooler temperature than the neighbouring states. Vegetable production by MDI during off-seasons of neighbouring states ensures bargaining power of products due to large market demand. For Jharkhand, utilisation of climate differences among neighbouring states such as Odisha, Chhattisgarh, West Bengal, Uttar Pradesh, and Bihar is an important aspect to sell products at a higher price. In Jharkhand, farmers can supply their products to these large markets through "assembly markets" which are trading places between farmers and traders/wholesalers. To sell horticulture products at a higher price, MDI is very effective to sell products in advantageous season especially in the summer season. In the project, the following methods might be effective:



Traders came from Odisha State to buy cauliflowers and capsicums at the Chanho Market (Ranchi District)

Source: JICA Survey Team

- (i) Control of harvest time to sell products at a higher price (e.g., shifting cultivation season and shortening cultivation period);
- (ii) Selection of crops and varieties needed by the market (e.g., selection of crops which cannot be sold in a particular season in and around Jharkhand State); and
- (iii) Organise production cluster of particular crops to attract traders during off-season (e.g., vegetable production planning by farmers' organisation and stable supply of products).



Raising of healthy seedlings under protected and controlled condition (Ranchi District)

Source: JICA Survey Team

(3) Necessity of Avoiding Risks in Crop Production

To mitigate unpredictable influence on horticulture production, some advanced farmers have already been practicing useful farming techniques. In the project, the following methods might be effective:

- (i) Protection of crops from under-irrigation and over-irrigation through optimum water supply of MDI;
- (ii) Protection of crops and seedlings through low pest pressure and seedlings from soil-borne diseases by mulching application and poly nursery houses; and



A handmade nursery at the farmer's house (Palamu District)

Source: JICA Survey Team



Fence to protect from animal feeding damage in the summer season (Ranchi District)

Source: JICA Survey Team

- (iii) Protection of crops from animal feeding damage by fencing during summer season.

(4) Effectiveness of Minimising Farm Inputs to Reduce Production Cost

To enhance household benefits, minimising farm inputs are also important. In the project, the following methods might be effective:



Furrow irrigation using pump in the summer season (Ranchi District)

Source: JICA Survey Team



Salinity accumulation on farm land (Ranchi District)

Source: JICA Survey Team

- (i) Effective use of irrigation water, fertiliser, fuel and electricity of pump, labour work by MDI, poly nursery houses, and mulching; and

- (ii) Shortening production period by MDI and poly nursery houses.

(5) Necessity of Sustainable Agriculture Practices in Jharkhand

For sustainable agriculture, effective use of water resources and minimising fertiliser application by MDI is required.

4.4.4 Present Status of Processing and Marketing of Horticultural Products

It can be evaluated that the marketing aspect was not well designed in the existing MDI system application in the surveyed sites. As a result, the MDI did not remarkably contribute to the marketability of its beneficiaries, except for a few cases. This section describes the marketing practices of both farmers and traders in the surveyed areas.

(1) Farmers' Marketing Practices in the Surveyed Areas

(a) Market Linkage

Market linkage significantly decides the outcome of MDI installation if it ultimately aims to promote commercialised horticultural farming. However, only two visited villages out of the ten, namely, *Pragatisil* in Ranchi District and *Chichikhurd* Village in Hazaribagh District, have received related supports. Particularly, in the case of *Pragatisil*, JSLPS invited several wholesalers to the village and encouraged them to transact with farmers at the village level. As a result, farmers were able to save on transaction costs through negotiating a price with buyers in advance as well as reducing their transportation cost.

On the other hand, farmers in the other eight villages, without such support, have to bring their products to nearby markets by bicycle or *autorickshaw*. Most farmers have weekly access to local markets although they prefer daily access. Regarding price information, they learn about it only at the market.

A number of farmers mentioned that occasionally traders do not offer a proper price to the farmers. In case the farmers could not accept the price, they are compelled to bring back their products. These series of situations tend to increase the transaction costs of farmers.

(2) Post-harvesting Practices

Proper post-harvesting practices can increase products' value. However, it is observed that MDI holders in the surveyed sites have hardly conducted even simple post-harvesting practices. They do not measure products' weight at the farm-gate level although most transactions in the markets are based on weight. Therefore, traders have to increase their transaction costs by paying for loading and scaling of products at the market. In addition, all interviewee did not store their products, mainly due to lack of storage facility and preference for fresh vegetables. Currently, simple grading, such as eliminating spoiled products, is conducted by famers at the village level. There is also limited awareness on the importance of grading by sizes, while size is the key in determining price at the market.

(a) Individual Selling

In most sites, farmers tend to sell their products individually while they occasionally share transportation with others. Only in *Chichikurd* Village in Hazaribagh District, an NGO called Support, recently began to promote collective selling of tomatoes, however, farmers in the village said that they have not gained much advantage from the practice, yet.

(3) Traders' Marketing Practice in the Surveyed Areas

While the farmers seem to sell their products in a less organised way, traders especially in assembly markets actively manipulate price fluctuations, logistical advantage, their existing network, and even the passive attitude of farmers. In major assembly markets such as Ratu or Tamar, prices of products fluctuates from time to time even within a day. Traders are, therefore, required to react to such fluctuation speedily and select a business partner from his network, right before delivery, in order to maximise their profits. This is because most traders pay prices to their backward partners, based on the auction price of destined wholesale market. Besides, for those who trade vegetables in a broader supply chain, it is crucial to transact uniformed quality and volume on time. A trader in the Tamar Assembly Market insisted that he was not interested in purchasing products at the farm gate level even with a great volume unless the products be properly graded and packed. He claimed that since his position was still at an upstream layer in a whole supply chain, he had to take the risk of losing his profits and no room to consider farmers' sake.

In conclusion, it is summarised that MDI holders in the sites still have limited knowledge and skills to increase their product's value and to decrease their transaction costs. On the contrary, traders seem to be well equipped with those skills. To fill the gap and to maximise MDI's function in current dynamic marketing arenas, farmers need to develop their capacity of entrepreneurship with a sense of cost-effectiveness and competitiveness.

4.5 Issues and Challenges

Through the examination of the MDI programmes by JSLPS together with field observations, several problems and constraints have been identified such as the feasibility of PNH component, improper utilisation and maintenance of MDI systems, and so forth. The challenges may include among others optimal coverage of the beneficiaries in consideration of creating tangible impacts, competition and/or demarcation with other initiatives to promote MDI, and management structure for the implementation of MDI programmes at a large scale.

Common Issues and Challenges among the Projects

(1) Feasibility of PNH as Business Enterprise

It was found out that a majority of the PNHs provided in the past were not utilised. The main reasons are: (i) limited availability of nursery trays, (ii) poor capacity of the SHGs in raising quality seedlings coupled with their poor appreciation of merits of trays-grown seedlings, and (iii) lack of business acumen of SHGs to run a risky trade of supplying seedlings where best price realisation time is as short as one week and business opportunities are limited to a few batches in a year. Sale and/or purchase of seedlings are not commonly observed, and farmers grow seedlings as per the convenience of time and actual requirement of quantity. It is also noted that farmers often give out left over seedlings free of cost to fellow farmers. Based on these findings, the feasibility of PNH as business enterprise should be re-examined in the current contexts of target rural communities. With the introduction of MDI, however, the improvement of vegetable cultivation practices are anticipated, for which the use of quality seedlings is essential. Hence, appropriate measures that can substitute the PNH business to ensure the availability and use of quality seedlings by MDI farmers need to be sought out.

(2) Problems Concerning the Utilisation and Maintenance of the MDI Systems

It was observed in some cases that the farmers do not properly utilise the MDI or adequately maintain the facilities especially the drip lines (laterals). In some plots, farmers practice furrow irrigation although the MDI pipelines have already been installed, and some other farmers stopped using MDI as sufficient water was available for their production activities. Such cases are more likely to be observed in the communities where MDI was provided on grant basis. These cases indicate absolute necessity to conduct thorough consultation and orientation to foster adequate understanding on the advantages and suitability of MDI prior to the selection of beneficiaries.

In other places, it was observed that some drip lines are set across the bunds of the farms, left to be stamped upon; some leave the extra pipes uncovered in the open field and exposed to rain and sunlight, which may lead to quality degradation. These observed incidences not only imply insufficient understanding on the part of the MDI farmers, but also cast some doubts on the appropriateness of field guidance by the suppliers to be provided at least for an initial few years after system installation.

In certain SHGs, some members complained that they do not know what to do when pipes are stuffed, and that the suppliers no longer respond to their claims. Some SHG members consider that the unavailability of services from the suppliers may be attributed to the procurement system in which JSLPS personnel or the DRDA officials were the ones to negotiate and coordinate with the suppliers, and not the members of SHGs themselves.

In order to minimise malfunctioning and inappropriate maintenance of MDI systems, it is assumed to be necessary not only to foster the technical capacities among the beneficiary farmers and communities, but also to cater continuous professional services through facilitation with suppliers and their contracted dealers for sustainable operation, maintenance, and updates of MDI systems, the potential for which should further be explored.

Issues and Challenges in NRLM

(1) Optimal Coverage of Beneficiaries to bring about Tangible Impacts

In the ongoing pilot of the recycling model, the initial grant per one FC is limited to Rs.50,000. In the prototype scenario, even with the matching contribution raised by other members, only four members of the FC at initial stage would avail the MDI systems and the other members have to wait for a certain time until the repayment by the first batch of MDI beneficiary farmers would reach to the amount to cover the cost of installation of another unit. It was also found that the number of beneficiaries at the initial stage becomes even smaller in some FCs where the alternative fund arrangements are applied based on the funding capacities of its members. In those cases, the increase in their vegetable production would be on a gradual pace, little by little, over the passage of time, and the initial increase may not be large enough to draw attention of, let alone to attract interests among, the local traders.

Considering that the emphasis of the proposed I-HIMDI is on the intensification of horticultural production, the marketing aspects cannot be overlooked in the entire framework. It is necessary to realise a fair increase in the volume of production in a certain geographical area to create some impacts in terms of marketing of horticultural produce. It may thus be desirable to introduce a system in which a larger number of farmers would avail MDI at one time so as to realise conspicuous increase in the volume of production. If many members in one farmers group are to be provided with loans at the same time, necessity of revolving within the group may not be as pressing as in the replication model, thus the repayment conditions may also be less strict. However, it should also be necessary in such cases to simultaneously take facilitating measures to promote appropriate marketing channel.

(2) Management Structure

In the current undertaking of the recycling model, the overall supervision on the implementation has been given by the project manager at the state level, as the project has been of pilot nature and implemented only in Ranchi District. The existing personnel at the field offices such as the District Mission Management Unit (DMMU) and the Block Mission Management Unit (BMMU) under the NRLM programme are the ones responsible in taking care of the FCs, in addition to their original services to the SHGs.

However, as the proposed I-HIMDI is to be implemented in the wider geographical coverage with far larger number of beneficiaries, it may not be possible to solely rely on the existing field staff with primary mandate to implement the NRLM. Although the initial formation of the beneficiary groups may require support and assistance of the existing staff who have already established rapport with the target communities, additional human resources should be allocated, who should desirably be equipped with technical skills and knowledge on MDI and horticultural production as well.

As these additional personnel to implement I-HIMDI may be recruited on contract basis, further supportive measures other than the regular services of the contractual staff of JSLPS may also need to be taken in order to ensure the sustainability of MDI operations and maintenance in a longer term perspectives. Since most of the MDI suppliers provide after sales services with allocation of their own technical and supportive personnel at the field level and have linkages with local dealers, they may also be tapped and mobilised as important human resources. Hence, the possibilities of strengthening systematic involvement of suppliers in the entire management structures to avail better services in

terms of maintenance supports should further be explored.

Other Projects implemented by other Governemtn Agencies

(1) Competition and/or Demarcation with Other Interventions on MDI

Currently, the programme of NMMI has been implemented under the supervision of DoA, in collaboration with the programmes of NHM. The NMMI programme is targeted to the farmers who own more than 0.2 ha of land, and the programme provides subsidy to cover 90% of the MDI installation cost. Since the target of the proposed I-HIMDI are smaller scale farmers with 0.1 ha, provision of MDI on 100% loan basis may be considered as somewhat impedimental, if compared with the provision with larger grant portion under the NMMI programme.

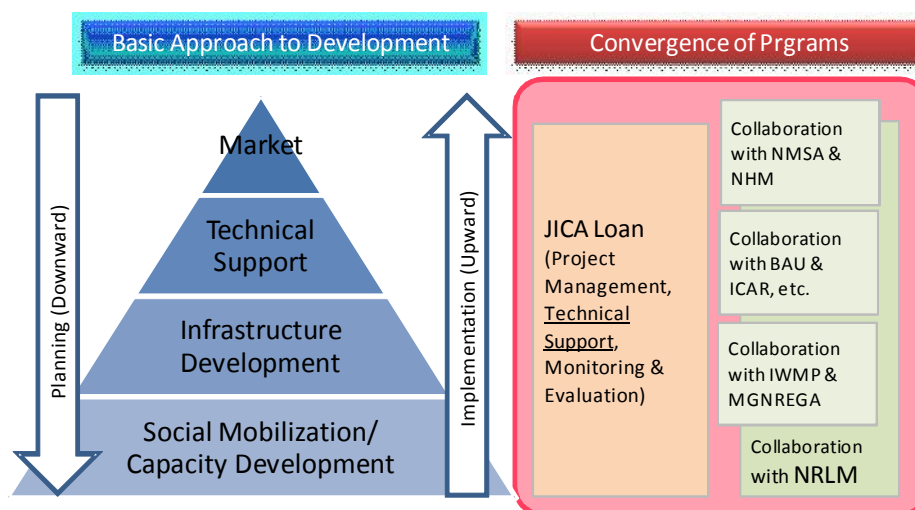
As the convergence between NMMI and NHM is proposed under the current five-year plan to be the National Mission of Sustainable Agriculture (NMSA), it is necessary to study further the contents and mechanisms of the MDI programme under the new initiatives so as to clarify the demarcation between NMSA and I-HIMDI. Some measures to attract the potential beneficiaries that may serve as the comparative advantage should be included in the programme components of I-HIMDI.

CHAPTER 5 SELECTION OF TARGET AREAS AND GROUPS

5.1 Development Concept

Referring to Figure 2.6.1, a basic development approach is simply framed as shown in Figure 5.1.1 in due consideration of major components of the Initiative for Horticulture Intensification by Micro Drip Irrigation (I-HIMDI) project. Needless to say, a livelihood promotion shall be implemented in a step by step manner from social mobilisation to market. At this planning stage, however, I-HIMDI shall be designed in reverse order, i.e., from market to social mobilisation, to ensure sustainable development, with the following reasons:

- Jharkhand has already achieved self-sufficiency of vegetables, and is exporting the surplus products to big cities in neighbouring states. Stand alone interventions to agriculture base livelihood promotion in remote areas has limited success in India due to a weak market linkage;
- Technical support shall be planned to export more vegetables to neighbouring states, in other words, it shall focus on how to ensure quality, quantity, and constant supply of vegetables demanded by market side;
- Micro drip irrigation (MDI) system is a main infrastructure component of I-HIMDI. It shall be considered what kind of agriculture infrastructures are required to meet the market demand; and
- Social mobilisation is indispensable for rural livelihood promotion. The self-help groups (SHGs) will play an important role in I-HIMDI, which include repayment of loan, operation and maintenance of MDI systems, vegetable cultivation, processing and marketing of horticulture products. In addition, linkage of SHGs and MDI farmer groups with Panchayati Raj Institutions and Gram Panchayats is most needed.



Source: JICA Survey Team

Figure 5.1.1 Development Concept of I-HIMDI

Planning and management convergence with other programs are extremely important for efficient and effective implementation of I-HIMDI as shown in Figure 5.1.1; which is the sooner the better.

- Social mobilisation and capacity development shall be collaborated with the National Rural Livelihoods Mission (NRLM). The Jharkhand State Livelihood Promotion Society (JSLPS) as the

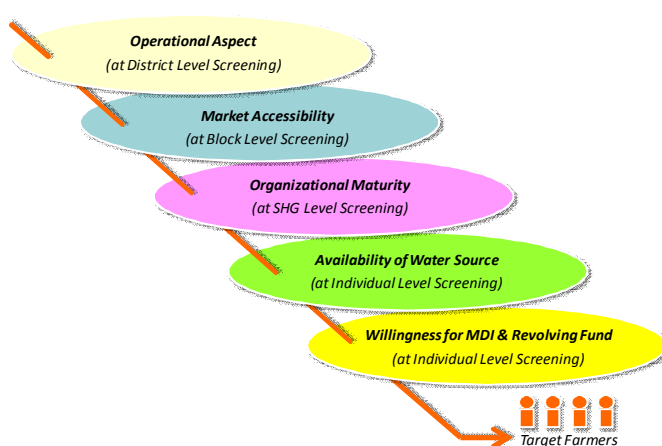
project implementation agency (PIA) of NRLM has a lot of experiences and resources in this specific field.

- Infrastructure development shall be collaborated with the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) for the construction of dug wells and Integrated Watershed Management Programme (IWMP) for the conservation of water resources.
- Technical support shall be collaborated with Birsa Agriculture University (BAU) and Indian Council of Agricultural Research (ICAR) in Ranchi in various training and research activities for horticulture intensification by micro drip irrigation.
- Market linkage and development shall be collaborated with the National Horticulture Mission (NHM).

5.2 Selection Concept

Willingness of farmers to improve their livelihood through I-HIMDI is a prerequisite among other conditions. It shall be confirmed in the course of selection process of target MDI farmers.

In the planning of I-HIMDI, there may be five important factors to be considered, i.e., (i) Operational Aspect, (ii) Market Accessibility, (iii) Organisational Maturity, (iv) Availability of Water Source, (v) Willingness for MDI and O&M Fund as illustrated in Figure 5.2.1. It is most



Source: JICA Survey Team

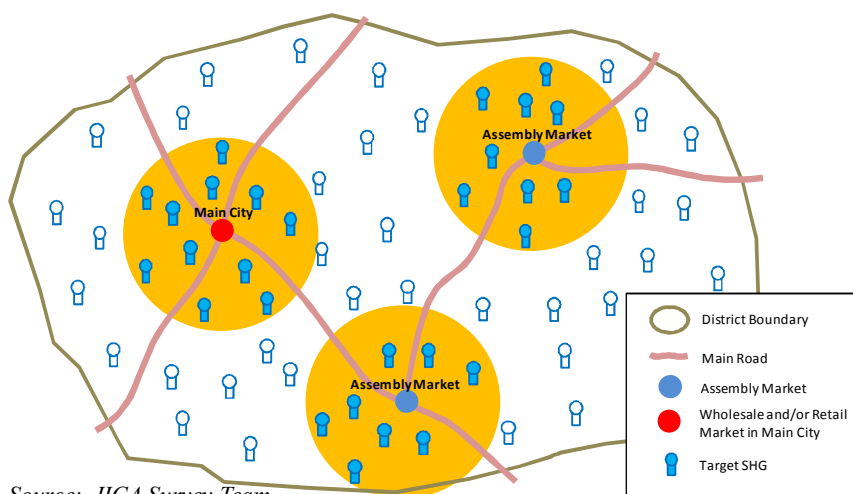
Figure 5.2.1 Selection Concept of Target MDI Farmers

essential to select target MDI farmers from intersection area of six factors.

The total number of target MDI farmers is planned to be 60,000. To narrow down the target MDI farmers from 2.7 million farmers in Jharkhand, a step by step approach will be applicable; in this case, macro to micro, in other words, District by project purpose → Block by market accessibility → SHG by organisational maturity → Farmers by eligibility.

In the selection of target SHGs, a cluster approach will be essential, which has various advantages, as follows:

- To maximise function and benefit derived from MDIs;



Source: JICA Survey Team

Figure 5.2.2 Image of Cluster Approach in the Selection of Target MDI Farmers

5.4 Selection Criteria

As noted below, target MDI farmers will be confirmed in accordance with the following criteria in the planning stage of I-HIMDI.

Table 5.4.1 Selection Criteria of Target Areas, Groups, and Farmers (Draft)

Target	Selection Criteria	Reference
District	<p>Two districts from each horticultural agro-climatic region of Jharkhand, the following four aspects are evaluated by a scoring system:</p> <ul style="list-style-type: none"> - Rate of scheduled tribe (ST) and scheduled caste (SC) (%) - Marginal cultivator population (Heads) - Vegetable production area (ha) - JSLPS Intensive and Partnership blocks 	<p>Target blocks will be fixed throughout the project operation.</p> <ul style="list-style-type: none"> - Census 2011 - JSLPS
Block	<p>Blocks nearby assembly markets, being backed up by the natural resources and conservation:</p> <ul style="list-style-type: none"> - Location of assembly market. <p>In addition, the following information shall be used for verification of selected block, if available.</p> <ul style="list-style-type: none"> - Groundwater potential in the target blocks. - Soil property (pH, N, P, K) in the target blocks. - Location of subprojects of IWMP. - Security information. 	<ul style="list-style-type: none"> - Market survey and hearing by the JICA Survey Team - Dynamic groundwater resources of Jharkhand State 2011, Water Resource Development (WRD) - Assessment and mapping of some important soil parameters including soil acidity for the state of Jharkhand towards a rational land use plan, Directorate of Soil Conservation of Department of Agriculture (DoA) - Annual plan of IWMP, Rural Development Department (RDD) - JSLPS
Group	<p>Institutional maturity of SHGs, which could be evaluated as follows:</p> <ul style="list-style-type: none"> - SHG maturity (Grade 1 = RF, Grade 2 = CIF) <p>Revolving Fund (RF):</p> <ul style="list-style-type: none"> - SHG should be in active existence at least since the last 6 months; - SHG should be practicing Panachasutra; - Should have passed Grade-1 on the basis of practice of Panachasutra; and - In intensive blocks, in addition to Panachasutra, the SHGs should have received training in preparing Micro-investment Plans (MIPs). <p>Community Investment Fund (CIF):</p> <ul style="list-style-type: none"> - Household plans prepared in consultation with the family members; - Appraisal of the household plans by the SHG; - Priority on the basis of vulnerability of the member; and - Priority on the basis of the urgency and/or seasonality of the need. 	<ul style="list-style-type: none"> - SHG profiles (updated time to time depending on the progress) under NRLM <p><i>Note:</i></p> <ul style="list-style-type: none"> - Over 70% of SHG members are categorised as below poverty line (BPL) household.
Farmers	<ul style="list-style-type: none"> - SHG member - Small and marginal farmers who have a strong willingness for off-season vegetable cultivation with MDI. - Having water source (open well, tube-well, etc.) or planning to built open wells or tube-well by MGNREGA, etc. - Having own farmland or leased farmland over 1,000 m². - Having a pump for MDI. - Bearing the cost for farm inputs, tools, and fences. - Having willingness to repay for O&M fund in SHG for sustainability of facilities installed by I-HIMDI in a proper manner. - No bank defaulter. 	<p>MDI plan to be prepared for application of MDI installation in the planning stage of the project.</p>

Source: JICA Survey Team

It is noted that the selection criteria mentioned above will be re-examined every year in view of the plan-do-check-action (PDCA) cycle to make flexible operation in accordance with actual conditions.

5.5 Selection Method

The method for selection of target districts, blocks, and groups for MDI is as follows:

(1) Target Districts by Scoring Method

The state of Jharkhand is divided into six agro-climatic regions. Two districts from each region shall be selected to develop region-wise horticulture models with MDI in consideration of future extension in post-projects. In the selection of the target districts, the following four aspects are evaluated by a scoring system:

- Percentage of ST and SC,
- Population of marginal cultivators,
- Vegetable production area, and
- JSLPS operation experience.

The range between the highest figure and the lowest figure are equally divided into ten sub-ranges with score of 1 to 10 in order except JSLPS operation with 3 points for intensive and partnership blocks. Accordingly, the maximum score is 33 points in total.

(2) Target Blocks by Evaluation of Accessibility to Major Markets, Natural Condition, and Security

In the selection of target blocks, major assembly and city markets shall be first identified for the identification of target blocks. The assembly market, which is an unmediated aggregating market of vegetables and fruits, is located in and around the production areas, and primarily functions as a key nexus for farmers to access various traders leading their products to broader end-users. In other words, natural conditions such as water and soil in and around production areas must be suitable for vegetable cultivation. Taking notice of the locations and functions of assembly markets, blocks nearby major assembly markets shall be tentatively selected subject to adjustment as a result of the market survey.

To ensure the natural conditions of the blocks, GIS maps of groundwater potential and soil suitability by block shall be prepared and cross-checked with the available data to be obtained by water and soil tests discussed in Section 5.8. Similarly, GIS maps of IWMP shall be referred to in the final selection of target blocks.

Accessibility to the assembly market can be evaluated by distance, road condition, and mode of transportation as shown in Table 5.5.1. Judging from the availability of three-wheelers in villages, blocks located within 20 km (but priority shall be placed on the areas within a radius of 10 km) from assembly markets will be considered as target blocks.

Table 5.5.1 Classification of Accessibility to Assembly Market

Distance from Farm to Assembly Market	Road Condition	Mode of Transportation
5 km or less	Asphalt pavement or dirt road	Bicycle or Walk
10 km or less	Asphalt pavement or dirt road	Motorbike
20 km or less	Asphalt pavement	Three Wheeler (Auto)
Over 20 km	Asphalt pavement	Truck and Light truck

Source: JICA Survey Team

It is noted that site security was also considered in the final selection of target blocks based on the latest security information.

(3) Target Groups and Farmers based on SHG Basic Information

Target group is an institutionally matured SHG, and target MDI farmers shall be selected from potential SHG members for the first year of the project operation from the viewpoint of fidelity guarantee and responsibility for repayment of MDI loan. The potential SHG profile survey shall be carried out annually to project the number of potential farmers who have strong will to install MDI systems. The potential farmers will be screened by the process of preparation of MDI plan and application documents for MDI installation in the initial planning stage of the project implementation as shown in Table 5.5.2.

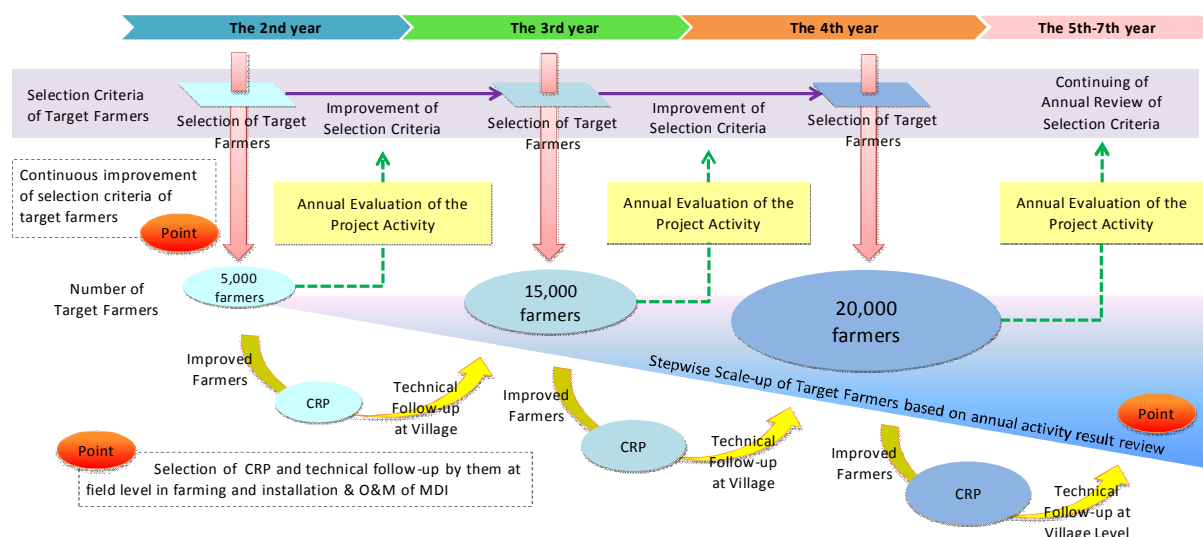
Table 5.5.2 Implementation Process of MDI Installation after Selection of Target Farmers

Step	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Flow	Selection of MDI farmers	Formulation of MDI Farmer Group	Preparation of MDI plan	Application of MDI Installation	Appraisal & Decision	Installation of MDI system*	Recording & Reporting
I-HIMDI PMU (JSLPS)	- I-HIMDI PMU (JSLPS) shall select MDI farmers from potential SHGs in the target block/ district based on the criteria.	- PMU shall formulate MDI Farmer Group under social mobilization program.	- In due course, PMU shall support MDI farmers to prepare MDI plan including re-payment schedule.	- PMU shall support MDI farmers to prepare an application of MDI installation.	PMU shall evaluate the application documents including MDI plan, and then decide whether it is acceptable or not.	PMU shall procure system suppliers of MDIs. - PMU shall confirm the commissioning test of MDI system. - PMU shall monitor after-sales services to be provided by system supplier.	- PMU shall keep monitoring and recording of the MDI installation as well as O&M.
MDI Farmer	- MDI farmer shall be a family member of SHG member, who has a strong desire to install MDI system in addition to water source and farmland more than 0.1 ha.	- MDI farmer shall form MDI Farmer Group on SHG basis. The member of MDI Farmer Group shall not be less than 10.	- MDI farmer shall prepare MDI plan with support of Technical Officer and Field Organizer.	- MDI farmer shall prepare application of MDI installation with support of Technical Officer and Field Organizer.	- N/A	- MDI farmer shall provide labor force to install MDI system. - MDI farmer shall observe the commissioning test of MDI system. - MDI farmer shall take an initial O&M training to be provided by a system supplier.	- MDI farmer shall operate and maintain MDI system in a proper manner. - MDI farmer shall keep operation record and account book.

Source: JICA Survey Team

Major points to ensure project sustainability will mainly depend on (i) selection criteria of target groups and farmers, (ii) project scale (number of target farmers), and (iii) extension services and O&M training to farmers. The following points shall be considered to ensure the sustainability of I-HIMDI:

- To modify selection criteria and method for target groups and farmers every year based on the annual evaluation of the project activities in the previous year.
- To scale up the number of target groups and farmers year by year based on the annual performance review.
- To establish a follow up system for extension services and O&M of MDI systems at field level by progressive farmers certified as “model farmers” or “CPR” for technical follow up in the area.



Source: Prepared by JICA Survey Team

Figure 5.5.1 Methodology to ensure the Sustainability of the Project

5.6 Selection of Target Districts and Blocks

(1) Selection of Target Districts

The JICA Survey Team has carefully reviewed the target districts initially proposed by JSLPS. Taking into account the project purposes and target beneficiaries, the JICA Survey team has evaluated all 24 districts in Jharkhand by scoring of (i) SC+ST coverage rate, (ii) marginal cultivator population, (iii) vegetable production area, and (iv) JSLPS operation as Intensive and Partnership blocks.

To establish the region-wise horticulture models in consideration of future extension, two districts in each agro-climatic region of Jharkhand have been selected in the evaluation.

As a result of the scoring, the following twelve districts were selected by the JICA Survey Team as target districts of I-HIMDI and approved by JSLPS at the Interim Meeting held on 15 May 2014.

Table 5.6.1 Districts Originally Proposed by JSLPS and Districts Selected by the JICA Survey Team

Districts Originally Proposed by JSLPS	Districts selected by the JICA Survey Team and approved by JSLPS
10 Districts (Ranchi, Hazaribagh, Palamu, Pakur, Pashchimi Singhbhum, Lohardaga, Gumla, Godda*, Khunti, and Dumka)	12 Districts (Ranchi, Hazaribagh, Giridih**, Palamu, Latehar**, Pakur, Pashchimi Singhbhum, Saraikela-Kharsawan**, Lohardaga, Gumla, Khunti, and Dumka)

* District which is eliminated from target districts.

** Districts which are newly selected as target district.

The result for scoring of target districts is shown in Table 5.6.2, and which has been agreed by JSLPS.

Table 5.6.2 Scoring Result of Target Districts

Agro Climatic Region	District	Rate of SC+ST (%)	Score	Marginal Cultivator Population	Score	Vegetable Production Area (ha)	Score	JSLPS Intensive & Partnership Block as of March 2014	Score	Total Score	Selected Districts
			(1)		(2)		(3)		(4)	(1)+(2)+(3)+(4)	
I	Ramgarh	32.39	3	31,410	1	17,088	5		0	9	
	Ranchi	41.01	5	109,476	4	30,655	10	✓	3	22	✓
	Khunti	77.77	10	59,068	2	15,533	5	✓	3	20	✓
	Simdega	78.23	10	62,015	2	9,545	3	✓	3	18	
II	Purbi Singhbhum	33.37	3	62,166	2	11,172	3		0	8	
	Pashchimi Singhbhum	71.10	9	106,708	4	6,388	1	✓	3	17	✓
	Saraikela-Kharsawan	40.46	4	59,290	2	10,214	3		0	9	✓
III	Chatra	37.02	4	43,580	1	7,792	2		0	7	
	Garhwa	39.75	4	66,479	2	4,706	1		0	7	
	Palamu	36.99	4	64,690	2	6,223	1	✓	3	10	✓
	Latehar	66.85	9	56,318	2	10,225	3	✓	3	17	✓
IV	Kodarma	16.18	1	44,119	1	5,658	1		0	3	
	Giridih	23.05	2	235,247	10	11,096	3	✓	3	18	✓
	Dhanbad	24.97	2	64,155	2	9,840	3		0	7	
	Bokaro	26.91	2	86,581	3	5,546	1		0	6	
	Hazaribagh	24.52	2	129,789	5	12,901	4		0	11	✓
V	Deoghar	24.87	2	55,758	2	7,655	2		0	6	
	Godda	30.06	3	67,613	2	5,582	1	✓	3	9	
	Sahibganj	33.09	3	27,220	1	7,655	2		0	6	
	Pakur	45.26	5	36,785	1	4,041	1	✓	3	10	✓
	Dumka	49.24	6	110,178	4	9,278	2	✓	3	15	✓
	Jamtara	39.61	4	63,206	2	7,817	2		0	8	
VI	Lohardaga	60.21	8	46,864	1	11,518	3	✓	3	15	✓
	Gumla	72.11	10	124,755	5	18,764	6	✓	3	24	✓
	JHARKHAND	38.29		1,813,470		246,892					

Note: Two districts in each agroclimatic sub-zone were selected to consider regional balance.

Range between the highest figure and the lowest figure are equally divided into 10 ranges of 1 to 10 for scoring.

Source: Prepared by the JICA Survey Team based on the data of Census 2011

(2) Selection of Target Blocks

The JICA Survey Team has first identified 11 major city markets and eight assembly markets in and around Jharkhand based on the information obtained from the Jharkhand State Agricultural Marketing Board (JSAMB), agri-business persons, and traders. The summary by target blocks is shown in Table 5.6.3.

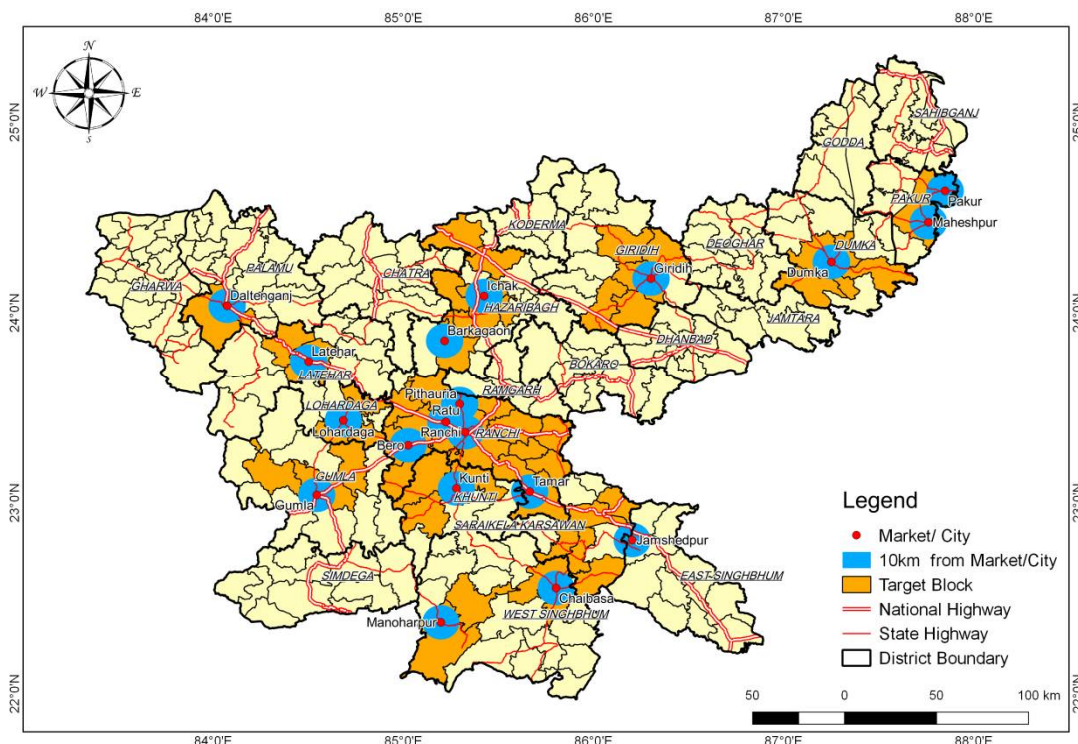
Table 5.6.3 Summary of Major Markets in Target Districts

Agro-climatic Region	District	Number of Target Blocks	Major City Market**	Assembly Market
I	Ranchi	18	Ranchi	Bero, Pithauria, Ratu, Tamar
I	Khunti	3	Khunti	-
II	Pashchimi Singhbhum	4	Chaibasa	Manoharpur
II	Saraikela-Kharsawan	5	Jamshedpur*	Jamshedpur*
III	Palamu	2	Daltenganj	-
III	Latehar	2	Latehar	-
IV	Giridih	5	Giridih	-
IV	Hazaribagh	8	-	Barkagaon, Ichak
V	Pakur	3	Pakur	Maheshpur
V	Dumka	4	Dumka	-
VI	Lohardaga	4	Lohardaga	-
VI	Gumla	3	Gumla	Gumla
	Total	61		19

Note: * Outside of the district, ** Other major city markets are Bokaro, Phusro, Deoghar, Chirkunda, Dhanbad, and Ramgarh in Jharkhand

Source: Prepared by the JICA Survey Team based on hearing from agri-business men and traders in April 2014.

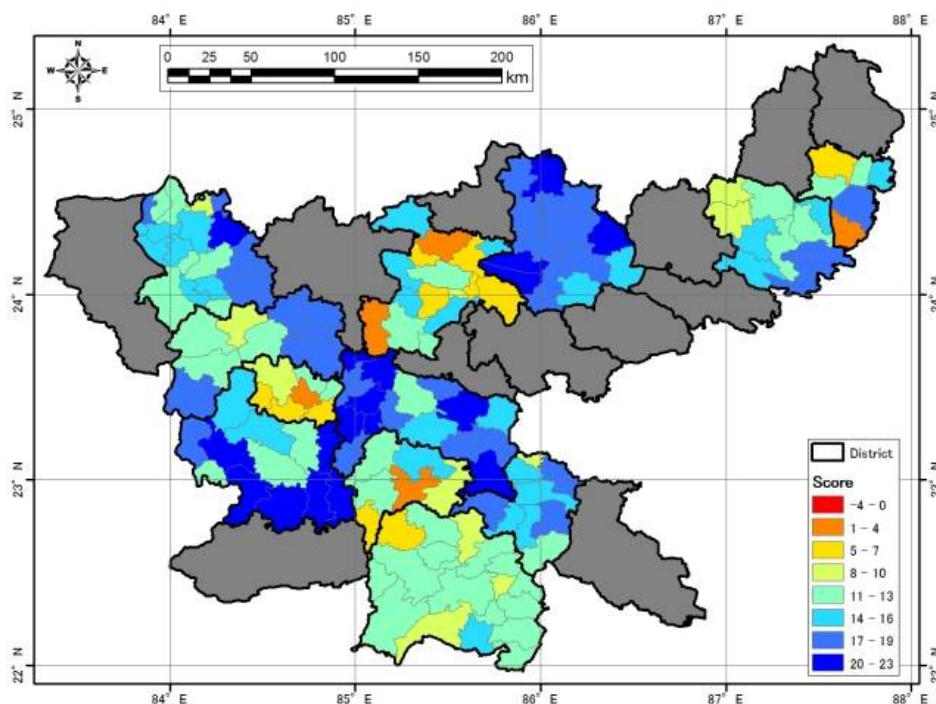
The number of target blocks (61) in the above table means an aggregate number of all blocks located within 10 km from the major city and assembly markets. Distribution of major city and assembly markets are depicted in Figure 5.6.1.



Source: JICA Survey Team

Figure 5.6.1 Location of Assembly Market/City Market and Accessible Blocks

Beside it, the target blocks are cross checked by the potential map of water resources shown in Attachment 3.6.1 and Figure 5.6.2 and it was confirmed that majority of the selected blocks does not overlap with water deficient areas. Groundwater availability shall be confirmed in the implementation stage of I-HIMDI at the field level because it actually depends on micro geographical condition.



Source: JICA Survey Team

Figure 5.6.2 Result of Prioritisation by Water Resource

On the other hand, as mentioned in previous sentences, there are many related national missions and

programmes done and will be done by GoI and GoJ, which are expected to collaborate. IWMP is one of the programme to cooperate and its activities are listed in below table.

Table 5.6.4 List of Project under IWMP for the year 2013-14

No.	District	Block	No. of MWS*	Project Area (ha)	Project Cost (Rs. Lakh)	Forest Areas (ha)	Forest Areas (%)	Earlier Proposed PIAs	Final Selected PIAs
Integrated Action Plan (IAP) Districts									
1	Bokaro	Gumia	12	7008.90	1051.34	5937.29	84.71	Divisional Forest Officer (DFO), Territorial Division	DFO, Bokaro Forest Division
		Gumia	11	5295.35	794.30	3092.62	58.40		
		Gumia	13	6171.12	925.67	4941.57	80.08		
		Gumia	8	4359.64	653.95	3924.31	90.01		
2	Chatra	Lawaloong & Simaria	11	5836.03	875.40	4015.56	68.81	DFO, Territorial Division	DFO, South Forest Division, Chatra
		Kanhachatti & Itkhor	12	5387.99	808.20	2367.12	43.93	Jan Jagaran Kendra	Soil Cons., Chatra
3	Purbi Singhbhum	Boram Patamda &	8	5675.52	851.33	4714.69	83.07	Tagore Society for Rural Development	DFO, Adityapur Forest Division
4	Gumla	Verno	6	4956.83	743.52	752.97	15.19	Citizen Foundation	Citizen Foundation
		Palkot	6	5249.78	787.47	2049.29	39.04	Social Action For Rural Development (SARDA)	SARDA
5	Khunti	Torpa	7	5584.03	837.60	1134.05	20.31	Professional Assistance for Development Action (PRADAN)	Soil Cons., Khunti
6	Kodarma	Kodarma	8	3913.30	586.99	635.04	16.23	Watershed Cell cum Data Centre (WCDC)	Soil Cons., Kodarma
7	Lohardaga	Kuru	6	5000.00	750.00	596.76	11.94	PRADAN	Soil Cons., Lohardaga
		Bhandra	6	5392.25	808.84	160.66	2.98	Samriddhi Foundation	
8	Saraikela Kharsawan	Kharsawan	4	5797.37	869.61	3745.71	64.61	Singhbhum Gramodyog Vikas Sansthan	DFO, Saraikela Forest Division
9	Simdega	Jaldega & Kolebira	9	6204.16	930.62	3856.00	62.15	DFO, Territorial Division	DFO, Territorial Division
		Kolebira	9	5817.70	872.65	2170.49	37.31	Gramin Vikas Trust	Soil Cons., Simdega
10	Pashchimi Singhbhum	Manoharpur	8	5395.36	809.30	3703.02	68.64	DFO, Saraikela Forest Division	DFO, Saraikela Forest Division
11	Palamu	Hussainabab & Chhatarpur	6	5446.13	816.92	3655.09	67.11	WCDC	DFO, Palamu Forest Division
12	Garhwa	Bhandaria	8	5751.73	862.76	4558.89	79.26	WCDC	DFO, Garhwa Forest Division
13	Ramgarh	Mandu	9	4710.10	706.52	7068.71	86.38	DFO, Territorial Division	DFO, Ramgarh Forest Division
Sub Total of IAP District - 13 District, 20 Project			167	108953.29	16342.99	60080.14			
Non Integrated Action Plan (Non-IAP) District									
14	Dumka	Kathikund & Dumka	10	5475.57	657.07	1193.93	21.80	Badlao Foundation	Soil Cons., Dumka
		Kathikund	11	5726.27	687.15	3129.71	54.66	Indian Grameen	DFO,

Preparatory Survey on Initiative for Horticulture Intensification by Micro Drip Irrigation in Jharkhand

No.	District	Block	No. of MWS*	Project Area (ha)	Project Cost (Rs. Lakh)	Forest Areas (ha)	Forest Areas (%)	Earlier Proposed PIAs	Final Selected PIAs
								Services	Dumka Forest Division
15	Deoghar	Palajori & Sarath	12	5178.53	621.42	391.15	7.55	Network for Enterprise Enhancement and Development Support (NEEDS)	NEEDS
16	Jamtara	Kundahit	7	5220.84	626.5	1691.10	32.39	Indian Rheumatology Association (IRA)	Soil Cons., Jamtara
17	Sahibganj	Taljhari, Borio & Barhait	5	6022.07	722.65	3945.73	65.52	DFO, Territorial Division	DFO, Sahibganj Forest Division
18	Pakur	Hiranpur	4	5062.42	607.49	263.59	5.21	Sarvangin Vikas Samiti, Pakur	Sarvangin Vikas Samiti, Pakur
		Littipara	3	4916.84	590.02	1263.42	25.70	Bhagwan Mahaveer Viklang Sahayata Samiti (BMVSS), Pakur	BMVSS, Pakur
Sub Total of Non IAP District – 5 Districts, 7 Projects			52	37602.54	4512.3	11878.63			
Grand Total – 18 Districts, 27 Projects			219	146555.83	20855.29	71958.77			

Note: "MWS" means "microwatershed"

Source: 11th General Body Meeting of JSWM-SLNA (2nd in this Financial Year 2013-14)

As a result of the selection and verification mentioned above, the following blocks were selected as prioritised area for I-HIMDI. Those blocks were selected based on information, as of July 2014. Therefore, it is subject to modification flexibly based on the latest situation at the implementation stage of I-HIMDI.

Table 5.6.5 List of the Selected Blocks for I-HIMDI (1st Priority Blocks)

No.	District	Market		Block
		Name	Type*1	
1	Dumka	Dumka	C	Dumka
2	Dumka	Dumka	C	Jama
3	Dumka	Dumka	C	Masaliya
4	Dumka	Dumka	C	Shikaripara
5	Giridih	Giridih	C	Bengabad
6	Giridih	Giridih	C	Giridih
7	Giridih	Giridih	C	Jamua
8	Giridih	Giridih	C	Dumri
9	Giridih	Giridih	C	Pirtanr
10	Gumla	Gumla	C	Chainpur
11	Gumla	Gumla	C	Sissai
12	Gumla	Gumla	C	Gumla
13	Hazaribagh	Barkagaon	A	Barkagaon
14	Hazaribagh	Barkagaon	A	Katkamdag
15	Hazaribagh	Barkagaon	A	Katkamsandi
16	Hazaribagh	Ichak	A	Barhi
17	Hazaribagh	Ichak	A	Chauparan
18	Hazaribagh	Ichak	A	Daru
19	Hazaribagh	Ichak	A	Hazaribagh
20	Hazaribagh	Ichak	A	Ichak
21	Khunti	Bero	A	Karra
22	Khunti	Kunti	C	Khunti
23	Khunti	Kunti	C	Torpa
24	Latehar	Latehar	C	Latehar
25	Latehar	Latehar	C	Manika

No.	District	Market		Block
		Name	Type*1	
26	Lohardaga	Lohardaga	C	Bhandra
27	Lohardaga	Lohardaga	C	Kuru
28	Lohardaga	Lohardaga	C	Lohardaga
29	Lohardaga	Lohardaga	C	Senha
30	Pakur	Maheshpur	A	Maheshpur
31	Pakur	Pakur	C	Hiranpur
32	Pakur	Pakur	C	Pakur
33	Palamu	Daltenganj	C	Daltenganj
34	Palamu	Daltenganj	C	Chainpur
35	Ranchi	Bero	A	Bero
36	Ranchi	Bero	A	Itki
37	Ranchi	Bero	A	Lapung
38	Ranchi	Bero	A	Mandar
39	Ranchi	Pithauria	A	Ormanjhi
40	Ranchi	Ranchi	C	Silli
41	Ranchi	Ranchi	C	Kanke
42	Ranchi	Ranchi	C	Nagri
43	Ranchi	Ranchi	C	Namkum
44	Ranchi	Ranchi	C	Ranchi Urban
45	Ranchi	Ranchi	C	Angara
46	Ranchi	Ratu	A	Burmu
47	Ranchi	Ratu	A	Ratu
48	Ranchi	Ratu	A	Chanho
49	Ranchi	Tamar	A	Bundu
50	Ranchi	Tamar	A	Rahe
51	Ranchi	Tamar	A	Sonahatu
52	Ranchi	Tamar	A	Tamar
53	Saraikela Karsawan	Chaibasa	C	Saraikela
54	Saraikela Karsawan	Chaibasa	C	Kharsawan
55	Saraikela Karsawan	Chaibasa	C	Gobindpur
56	Saraikela Karsawan	Jamshedpur	C	Chandil
57	Saraikela Karsawan	Jamshedpur	C	Nimidih
58	West Singhbhum	Chaibasa	C	Jhinkpani
59	West Singhbhum	Chaibasa	C	Khuntpani
60	West Singhbhum	Manoharpur	A	Goelkera
61	West Singhbhum	Manoharpur	A	Manoharpur

*1: Market Type: A=Assembly Market, C=City Market

Note: This list is subject to modify flexibly based on latest situation.

Source: JICA Survey Team

After above selection, the JICA Survey Team confirmed the activities under MGNREGA in the selected blocks in order to make convergence between the project (I-HIMDI) and MGNREGA. As a result, it was clarified that many of well projects under MGNREGA have been done and on-going in the selected blocks. Increasing availability of water sources would widen the potential target MDI farmers. The list of activities in the blocks are summarised as following.

Table 5.6.6 List of Wells under MGNREGA Actual

SN	District	Market		Block	FY2013-2014				Date	
		Name	Type*1		Completed	On-going	Approved but Not in progress	Proposed but Not approved		Total
1	Dumka	Dumka	C	Dumka	135	307	71	1	514	23.7.2014
2	Dumka	Dumka	C	Jama	149	508	124	12	793	23.7.2014
3	Dumka	Dumka	C	Masaliya	212	611	20	2	845	23.7.2014
4	Dumka	Dumka	C	Shikanipara	72	100	66	2	240	23.7.2014
5	Giridih	Giridih	C	Bengabad	43	643	26	11	723	23.7.2014
6	Giridih	Giridih	C	Giridih	11	644	14	16	685	23.7.2014
7	Giridih	Giridih	C	Jamua	19	696	5	1	721	23.7.2014
8	Giridih	Giridih	C	Dumri	74	273	2	1	350	23.7.2014
9	Giridih	Giridih	C	Pirtanr	18	169	12	1	200	23.7.2014
10	Gumla	Gumla	A/C	Chainpur	234	3	65	10	312	23.7.2014
11	Gumla	Gumla	A/C	Sissal	0	0	0	0	0	23.7.2014
12	Gumla	Gumla	A/C	Gumla	0	19	4	0	23	23.7.2014
13	Hazaribagh	Barkagaon	A	Barkagaon	8	216	13	2	239	23.7.2014
14	Hazaribagh	Barkagaon	A	Katkamdag	14	133	35	1	183	23.7.2014
15	Hazaribagh	Barkagaon	A	Katkamsandi	0	26	17	0	43	23.7.2014
16	Hazaribagh	Ichak	A	Barhi	37	95	30	2	164	23.7.2014
17	Hazaribagh	Ichak	A	Chauparan	58	109	2	2	171	23.7.2014
18	Hazaribagh	Ichak	A	Daru	10	105	20	0	135	23.7.2014
19	Hazaribagh	Ichak	A	Hazaribagh	282	1,395	242	26	1,945	23.7.2014
20	Hazaribagh	Ichak	A	Ichak	31	191	38	4	264	23.7.2014
21	Khunti	Bero	A	Karra	1	273	18	346	638	23.7.2014
22	Khunti	Kunti	C	Khunti	0	4	4	159	167	23.7.2014
23	Khunti	Kunti	C	Torpa	0	27	25	750	802	23.7.2014
24	Latehar	Latehar	C	Latehar	44	67	9	11	131	25.7.2014
25	Latehar	Latehar	C	Manika	7	10	6	1	24	25.7.2014
26	Lohardaga	Lohardaga	C	Bhandra	123	218	175	4	520	25.7.2014
27	Lohardaga	Lohardaga	C	Kuru	304	560	208	9	1,081	25.7.2014
28	Lohardaga	Lohardaga	C	Lohardaga	18	494	155	4	671	25.7.2014
29	Lohardaga	Lohardaga	C	Senha	103	384	13	4	504	25.7.2014
30	Pakur	Maheshpur	A	Maheshpur	0	0	0	0	0	25.7.2014
31	Pakur	Pakur	C	Hiranpur	0	0	0	0	0	25.7.2014
32	Pakur	Pakur	C	Pakur	0	0	0	0	0	25.7.2014
33	Palamu	Daltenganj	C	Daltenganj	18	119	7	0	144	25.7.2014
34	Palamu	Daltenganj	C	Chainpur	142	292	101	2	537	25.7.2014
35	Ranchi	Bero	A	Bero	228	307	6	0	541	25.7.2014
36	Ranchi	Bero	A	Itki	59	73	13	1	146	25.7.2014
37	Ranchi	Bero	A	Lapung	22	48	0	33	103	25.7.2014
38	Ranchi	Bero	A	Mandar	37	387	6	17	447	25.7.2014
39	Ranchi	Pithauria	A	Ormanjhi	0	0	0	0	0	25.7.2014
40	Ranchi	Ranchi	C	Silli	32	177	0	1	210	25.7.2014
41	Ranchi	Ranchi	C	Kanke	140	223	2	33	398	25.7.2014
42	Ranchi	Ranchi	C	Nagri	0	0	0	0	0	25.7.2014
43	Ranchi	Ranchi	C	Namkum	0	0	0	0	0	25.7.2014
44	Ranchi	Ranchi	C	Ranchi Urban	0	0	0	0	0	25.7.2014
45	Ranchi	Ranchi	C	Angara	0	0	0	0	0	25.7.2014
46	Ranchi	Ratu	A	Burmu	7	217	9	0	233	25.7.2014
47	Ranchi	Ratu	A	Ratu	11	3	0	0	14	25.7.2014
48	Ranchi	Ratu	A	Chanho	0	0	0	0	0	25.7.2014
49	Ranchi	Tamar	A	Bundu	0	1	0	0	1	25.7.2014
50	Ranchi	Tamar	A	Rahe	29	285	2	0	316	25.7.2014
51	Ranchi	Tamar	A	Sonahatu	12	220	19	0	251	25.7.2014
52	Ranchi	Tamar	A	Tamar	0	3	0	0	3	25.7.2014
53	Saraikela Karsawan	Chaibasa	C	Saraikela	0	0	0	0	0	26.7.2014
54	Saraikela Karsawan	Chaibasa	C	Kharsawan	9	24	3	0	36	26.7.2014
55	Saraikela Karsawan	Chaibasa	C	Gobindpur	0	0	0	0	0	26.7.2014
56	Saraikela Karsawan	Jamshedpur	A/C	Chandl	0	0	0	0	0	26.7.2014
57	Saraikela Karsawan	Jamshedpur	A/C	Nimidih	0	0	1	0	1	26.7.2014
58	West Singhbhum	Chaibasa	C	Jhinkpani	5	132	0	0	137	26.7.2014
59	West Singhbhum	Chaibasa	C	Khuntpani	10	5	0	0	15	26.7.2014
60	West Singhbhum	Manoharpur	A	Goelkera	47	98	0	0	145	26.7.2014
61	West Singhbhum	Manoharpur	A	Manoharpur	108	184	3	0	295	26.7.2014
		Total			2,923	11,078	1,591	1,469	17,061	

Note: *1) Market Type: A=Assembly, C=City

Source: Prepared by JICA Survey Team based on MGNREGA website <<http://nrega.nic.in/netnrega/home.aspx>>

In addition to the 1st priority areas, 46 blocks were selected as the 2nd priority areas from the blocks which were not selected as the 1st priority areas although located in 10 km from the assembly and city markets and the blocks which were located between 10 km to 20 km from assembly and city markets.

Table 5.6.7 List of the Selected Blocks for I-HIMDI (2nd Priority Blocks)

No.	District	Market		Block
		Name	Type*1	
1	Dumka	Deoghar	C	Jarmundi
2	Dumka	Dumka	C	Kathikund
3	Dumka	Dumka	C	Ranishwar
4	Giridih	Giridih	C	Birni

No.	District	Market		Block
		Name	Type*1	
5	Giridih	Giridih	C	Gande
6	Gumla	Bero	C	Verno
7	Gumla	Gumla	C	Ghaghra
8	Gumla	Gumla	C	Palkot
9	Gumla	Gumla	C	Raidih
10	Gumla	Latehar	C	Bishunpur
11	Hazaribagh	Barkagaon	A	Churchu
12	Hazaribagh	Barkagaon	A	Dari
13	Hazaribagh	Barkagaon	A	Keredari
14	Hazaribagh	Bokaro	C	Bishnugarh
15	Hazaribagh	Ichak	A	Barkatha
16	Hazaribagh	Ichak	A	Padma
17	Hazaribagh	Ichak	A	Tatijharia
18	Khunti	Kunti	C	Erki
19	Khunti	Kunti	C	Murhu
20	Latehar	Daltenganj	C	Barwadih
21	Latehar	Latehar	C	Balumath
22	Latehar	Latehar	C	Chandwa
23	Latehar	Latehar	C	Garu
24	Latehar	Latehar	C	Herhang
25	Lohardaga	Bero	A	Karro
26	Lohardaga	Latehar	C	Kisko
27	Lohardaga	Latehar	C	Peshrar
28	Pakur	Mururai	A	Pakuria
29	Pakur	Pakur	C	Amrapara
30	Pakur	Pakur	C	Litipara
31	Palamu	Daltenganj	C	Bishrampur
32	Palamu	Daltenganj	C	Lesliganj
33	Palamu	Daltenganj	C	Nawabazar
34	Palamu	Daltenganj	C	Pandwa
35	Palamu	Daltenganj	C	Patan
36	Palamu	Daltenganj	C	Satbarwa
37	Palamu	Daltenganj	C	Tarhasi
38	Palamu	Latehar	C	Panki
39	Saraikela Karsawan	Jamshedpur	C	Adityapur
40	Saraikela Karsawan	Tamar	A	Ichagarh
41	Saraikela Karsawan	Tamar	A	Kundahit
42	West Singhbhum	Chaibasa	C	Chaibasa
43	West Singhbhum	Chaibasa	C	Chakrdharpur
44	West Singhbhum	Chaibasa	C	Manjhari
45	West Singhbhum	Chaibasa	C	Tantnagar
46	West Singhbhum	Chaibasa	C	Tonto

*1: Market Type: A=Assembly Market, C=City Market

Note: This list is subject to modify flexibly based on latest situation.

Source: JICA Survey Team

5.7 Selection of Target SHGs and Farmers

Social mobilisation and capacity development of SHGs in Jharkhand are in progress under NRLM. In the selection of target SHG and farmers, willingness for MDI and O&M fund, capacity of SHG, and availability of well for MDI are major important criteria. In terms of these criteria, the following points must be considered:

(1) Eligible SHG in the Grading System of NRLM

According to the “Community Operational Manual (COM)” of NRLM, SHG would be graded from 1st to 3rd as shown in Table 5.7.1.

Table 5.7.1 Type of Grading of SHGs

Type of Grading	Purpose of the Grading	Indicative Timing of the Grading	Criteria
1 st Grading	For judging readiness/eligibility of the SHG to receive Revolving Fund (Rs.10,000–15,000/SHG)	3-6 months from the date of formation of the SHG	1. Following the <i>Panchasutra</i> i) More than 90% attendance of the members to their meetings ii) Regular saving as agreed norms iii) Regular inter-loaning iv) Regular repayment v) Regular registration (bookkeeping, meeting minutes, etc.) 2. opening a bank account
2 nd Grading	For judging readiness/eligibility of the SHG to receive Community Investment Fund (Rs.40,000–50,000/SHG)	More than 6 months from the date of formation of the SHG	i) Following <i>Panchasutra</i> at least 6 months (26 weeks or more) ii) Regular inter-loaning for the last 6 months iii) Developing its participatory Micro-Credit Plan (Micro-Investment Plan) iv) Continuous commitments of the members
3 rd Grading	For judging readiness/eligibility of the SHG to receive external credit (bank loan)	More than 9 months from the date of formation of the SHG	i) Following <i>Panchasutra</i> ii) Saving pattern of the members of the group iii) Utilised percentage of the total corpus iv) Recovery rate v) Maintenance of books and records

Source: NRLM “Community Operational Manual”

First priority to receive the services of I-HIMDI is the SHGs which have passed the 3rd grading. In the case of no candidate SHG in the level, the eligibility can be expanded to the SHGs in the 2nd Grading. In the beginning stage of I-HIMDI, SHG's ability will be evaluated based on the above grading method to select target SHGs.

(2) Verification of Existence of Enough Number of Eligible Farmers in the Target Areas

The JICA Survey Team estimated the number of potential farmers which will exist in the selected target blocks in the project implementation period. As a result of the estimation, it was proved that there will be more than 85,000 farmers which are eligible for I-HIMDI in the project period. The results of the estimation are summarised in the following table:

Table 5.7.2 Estimation of Numbers of Eligible Farmers in 1st Priority Blocks

Item	Figure	Formula	Source
Ratio of SHG Farmer Members supported by JSLPS in Total Small and Marginal Farmers (<2 ha) in 23 JSLPS Intensive Block	34.90%	(A)	JSLPS
Number of Small and Marginal Household (<2 ha) in the 1st priority blocks	688,128 households	(B)	Census 2011
Number of Potential SHG Farmer Members in the 1st priority blocks	240,138 households	(C) : (A) x (B)	-
Ratio of Farmers who own Available Wells in Summer Season in SHG in the 1st priority blocks	35.46%	(D)	Sample SHG Survey by the JICA Survey Team
Number of Farmers who own Available Wells in Summer Season in the 1st priority blocks	86,182 households	(E) : (C) x (D)	-
Average Number of Member Farmers per SHG	13 farmers/SHG	(F)	Sample SHG Survey by the JICA Survey Team
Number of Target SHG in the 1st priority blocks	18,472 SHGs	(G) : (E) / (F)	-

Note: Data are as of July 2013

Source: JICA Survey Team

Table 5.7.3 Estimation of Numbers of Eligible Farmers in 2nd Priority Blocks

Item	Figure	Formula	Source
Ratio of SHG Farmer Members supported by JSLPS in Total Small and Marginal Farmers (<2 ha) in 23 JSLPS Intensive Block	34.90%	(A)	JSLPS
Number of Small and Marginal Household (<2 ha) in the 1st priority blocks	476,413 households	(B)	Census 2011
Number of Potential SHG Farmer Members in the 1st priority blocks	166,255 households	(C) : (A) x (B)	-
Ratio of Farmers who own Available Wells in Summer Season in SHG in the 1st priority blocks	35.46%	(D)	Sample SHG Survey by the JICA Survey Team
Number of Farmers who own Available Wells in Summer Season in the 1st priority blocks	58,976 households	(E) : (C) x (D)	-
Average Number of Member Farmers per SHG	13 farmers/SHG	(F)	Sample SHG Survey by the JICA Survey Team
Number of Target SHG in the 1st priority blocks	12,789 SHGs	(G) : (E) / (F)	-

Note: Data are as of July 2013

Source: JICA Survey Team

JSLPS has already conducted some SHG support programs such as NRLM, SGSY, and Sanjeevani mainly in 23 JSLPS Intensive Blocks. According to the estimation using Census 2011 data and achievement by JSLPS, approximately 34.9% of small and marginal households (less than 2 ha) are covered by the JSLPS support programs in JSLPS Intensive Blocks. According to the above assumption, it is expected that 86,182 potential household exist in the 1st priority blocks (61 blocks) and 58,976 potential households in the 2nd priority blocks (46 blocks). In total, it is expected that 145,158 households exists in 107 blocks.

5.8 Sample SHG Survey and Analysis

The JICA Survey Team has prepared survey questionnaires and operation manual for water and soil tests to gain an understanding of SHG organisational status, vegetable cultivation, marketing, social environment, water and soil conditions in the survey area. Used forms and questionnaire are shown in Attachments 5.8.1, 5.8.2, and 5.8.3. The original number of samples was 350 in 12 target districts. The samples were distributed according to the size of vegetable production area in the target districts and further allocated to the blocks nearby major assembly markets as shown in Chapter 3. The tested items are pH, EC, and arsenic for water; and pH and EC for soil. It is noted that water and soil tests are taken up by two steps: (i) sampling of water and soil and (ii) laboratory testing of samples, to minimise time for the tests.

Prior to the commencement of the survey, the guidance meeting for survey assistants was organised by the JICA Survey Team in collaboration with JSLPS on 22 April at JSLPS Office and 29 April 2014 at the JICA Survey Office. The survey was commenced on 23 April and completed on 16 May 2014. The total number of actual surveyed is 347. The analysis of survey data has been done during the 2nd field survey period. The results of the survey are annexed in Attachment 5.8.4.

5.9 Questionnaire Survey to confirm Willingness of Farmers

The JSLPS conducted an additional survey in November 2014 to confirm willingness of potential farmers to participate the Project on condition that repayment of Rs. 15,000 (60% of MDI facility cost) with 1.5% monthly interest in 3 years for O&M fund to be used mainly for future maintenance of the MDI facility. The survey targeted at 400 potential farmers in villages where MDI facilities had been

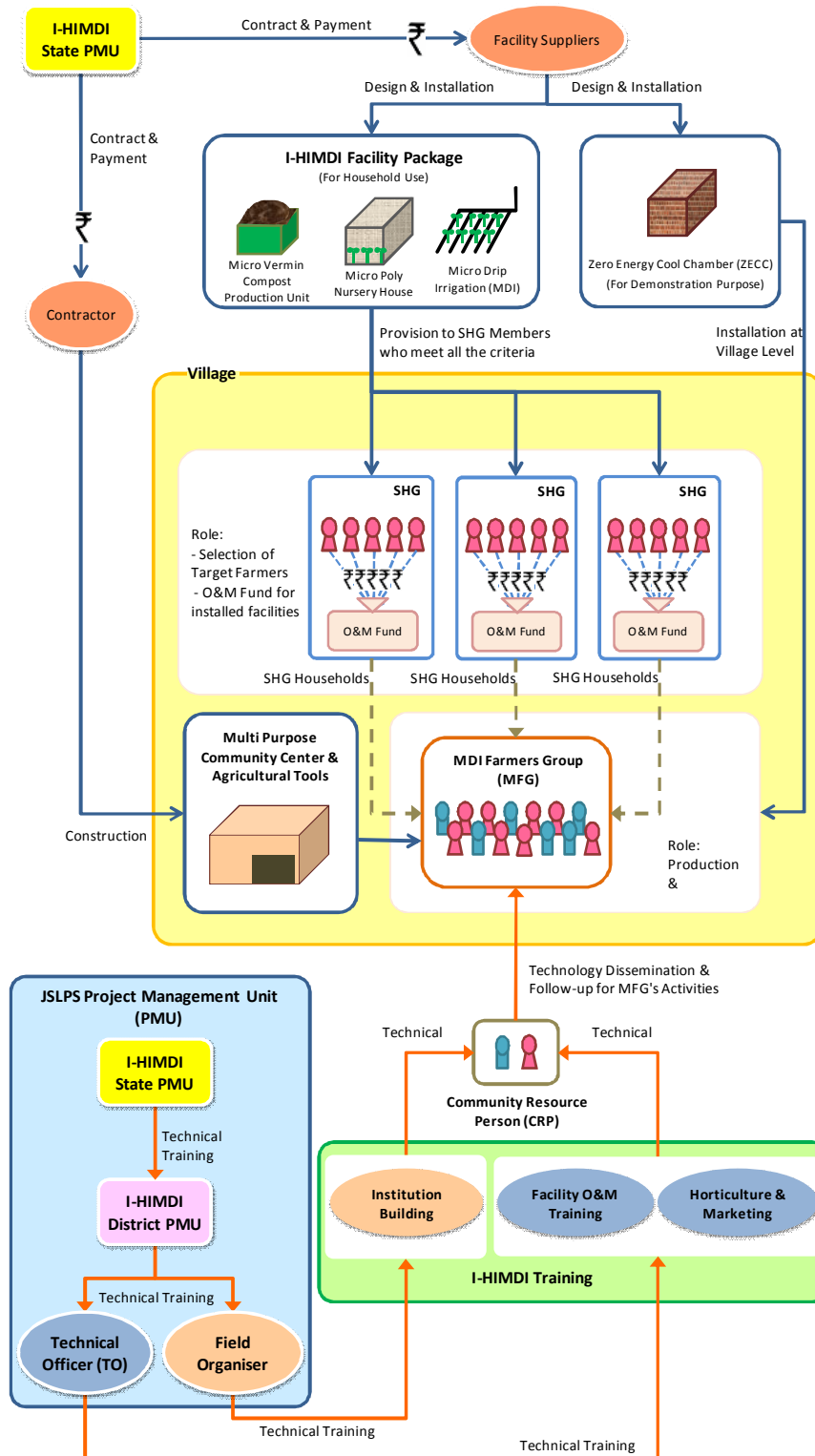
installed under the UNDP project, SGSY/NRLM programme, and other government programmes, using the survey manual and questionnaire form shown in Attachment 5.9.1 and Attachment 5.9.2.

The analysis of survey data was done during the 4th field survey period. Out of 376 effective answers, 370 farmers express their willingness to participate the Project which account for 98.4%. The results of the survey are annexed in Attachment 5.9.3.

CHAPTER 6 PROJECT SCOPE

6.1 General

The project scope of the proposed Initiative for Horticulture Intensification by Micro Drip Irrigation (I-HIMDI) is illustrated in Figure 6.1.1.



Source: JICA Survey Team

Figure 6.1.1 Project Scope of I-HIMDI

In the Project (I-HIMDI), MDI Package composed of Micro Drip Irrigation (MDI) System, Micro Poly Nursery House (PNH), and Vermin Compost Production Unit (VCU) will be provided to Self Help Group (SHG) members who are willing to introduce the MDI system (hereinafter called as "MDI farmers"). MDI farmers must meet all the selection criteria to be established by I-HIMDI. In a broad sense, the MDI farmer shall include not only herself but also her family members. (Details are mentioned in Section 6.2.)

The provided facilities are divided in grant and loan portions. The MDI farmers must repay the amount equivalent to the loan portion to their respective SHG savings account as O&M fund, which will be mainly used for maintenance of facilities and replacement of parts for sustainable use of MDI installed in I-HIMDI. However, the repaid money is kept differently from ordinary corpus, and used for earmarked purposes mainly for O&M of MDI facilities for sustainable use in and after the project period. Agreements and signature on application form by all family member are required to participate the Project. (Details are mentioned in Chapter 7.)

Zero Energy Cool Chamber (ZECC) and Agriculture Tools will be provided at the village level for demonstration purpose. Multipurpose Community Centre will be provided as grant basis and used for cooperative marketing by MFGs. (Details are mentioned in Section 6.2.)

The MDI farmers and their family members will be organised as an MDI Farmer Group (MFG) for the sake of cooperative horticulture production and marketing activities. The I-HIMDI Project Management Unit (PMU, JSLPS/JICA Project) will select and appoint several capable farmers as Community Resource Persons (CRPs) and provide a series of trainings to MFGs through the CRPs: institution building, horticulture production and marketing training, and facility O&M training. (Details are mentioned in Section 6.3.)

In the target area, SHG members are mainly female because SHGs were originally created for the purpose of empowerment of rural females. On the other hand, MFGs will be comprised of females and their family members (males) because in farming practices, especially vegetable growing, in Jharkhand, both genders work together. Also in some areas where labour migration is common, females are the main agricultural practitioners. Hence, I-HIMDI will organise an MFG comprising both genders and provide technical training for them equally. (Details are mentioned in Chapter 8.)

6.2 Agricultural Infrastructure Development

The infrastructure and equipment components are summarised in Table 6.2.1 and described hereunder.

Table 6.2.1 Summary of Infrastructure and Equipment Components

Component	Recipient (units)	Description	Finance
MDI System	MFG member farmers (60,000)	1,000 m ² farmland, direct connection without tank	40% Grant, 60% by Farmer
PNH	MFG member farmers (60,000)	2 x 3 m with seeds, trays, cocopeat, fertiliser, pesticide	100% Grant
VCU	MFG member farmers (60,000)	1.2 x 3 m with earthworms	100% Grant
Agricultural Tools	MFG (1,200)	Sprayers, plastic crates, etc. for common use, one each for MFG	100% Grant
ZECC	MFG (2,400)	1.5 x 1.0 x 0.6 m, for demonstration, two each for MFG	100% Grant
Market Centre	MFG (1)	In Ranchi, 100 m ² with two cold	100% Grant

Component	Recipient (units)	Description	Finance
(Godown cum Cold Storage)		storages, one vehicle, and plastic crates	
Multipurpose Community Centre	MFG (38)	38 locations, two each for an existing market	100% Grant

Source: JICA Survey Team

6.2.1 MDI System

(1) Conditions of Beneficiary

The beneficiary MDI farmers should satisfy the following conditions:

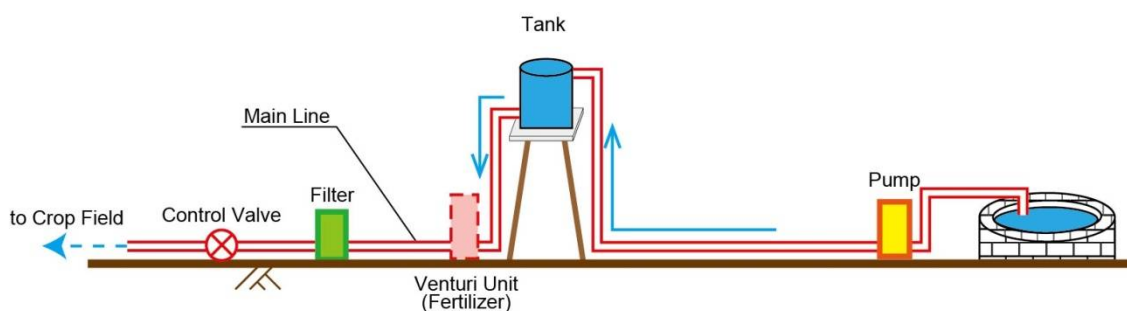
- a) The farmer has interest and willingness to cultivate horticultural crops by MDI.
- b) The farmer has reference in SHG.
- c) The farmer has water source and lifting device.
- d) The farmer has farmlands larger than 1,000 m².
- e) The farmer is or becomes a member of an MFG in the village.
- f) The farmer is not bankrupt.

The standard MDI farmland size will be 1,000 m². JSLPS has promoted MDIs of this size, and it seems adequate for MDI beginner farmers. The MDI system will be installed in a farmland close to the residence because frequent operation is required, and the system will be pressure-based irrigation, without overhead water storage tank for the following reasons.

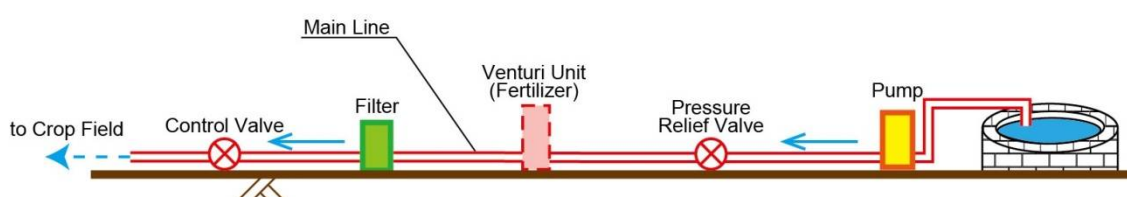
(2) Selection of Irrigation Method

Schematic diagrams of overhead tank based gravity-fed irrigation and direct pumping systems are illustrated in Figure 6.2.1, and the comparison of those systems is summarised hereunder and in Table 6.2.2.

Overhead Tank Type



Direct Pumping Type



Source: JICA Survey Team

Figure 6.2.1 Schematic Illustration of Different Types of MDI Systems

Assumption

Based on the methodology¹ adopted by National Bank for Agriculture and Rural Development (NABARD) Jharkhand Regional Office for drip irrigation, the daily irrigation water requirement for 1,000 m² of horticulture field is estimated at 5,000 L in the peak season. In a field of 1,000 m², 2,778 drippers are placed supposing that the lateral spacing is 1.2 m and the dripper spacing is 30 cm.

Overhead Tank Type

The gravity dripping rate is about 0.86 L/hr if the tank is set at 3 m above the ground. Therefore the irrigation time with a 1,000-L tank is $1,000/0.86/2,778 = 25$ min. To fill a tank of 1,000 L, usually it takes about 10 min. As for irrigation, the water requirement for 1,000 m² of vegetable field in summer is 5,000 L/day, irrigation from a tank-based system requires five cycles of tank filling, totalling $(25 + 10) \times 5 = 175$ min daily. In addition, as the pressure in drip line tubes is limited, a pressure compensated (PC) dripper is used in order to control the emitting rate, which is more expensive than a normal one. Furthermore, a tank and its stand are needed to be installed, of which the cost is higher than Rs.10,000.

Direct Pumping Type

Under the pressure generated by the pump (2 kg/cm²), the drip discharge is designed at 2 L/hr with normal dripper (non-pressure compensating (NPC)). Therefore, to supply irrigation water of 5,000 L, only 54 min ($5,000/2/2,778$) is enough. Besides, for a direct pumping type MDI, it will be technically feasible to expand the system because it works without limitations of repeated filling of tank based systems.

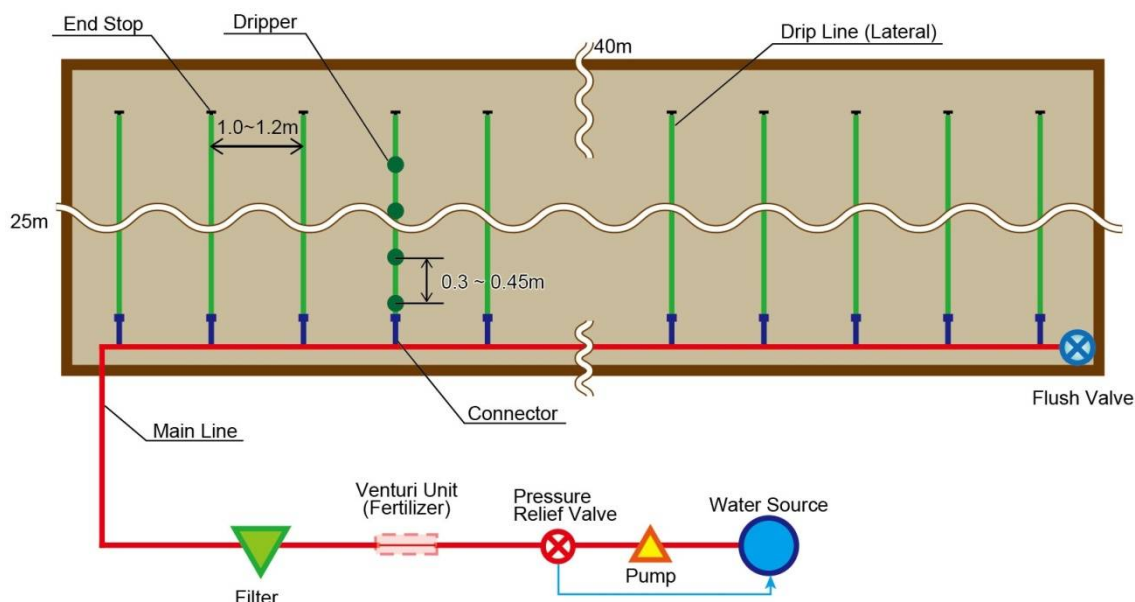
¹ Potential evapotranspiration 6 mm/day, crop factor 0.4, crop coefficient 1, spacing 0.7 m

Table 6.2.2 Comparison of Drip Irrigation Methods

Item	Overhead Tank Type	Direct Pumping Type	Difference
Pump Operation Time	5 times a day 50 min in total	Once a day 54 min	Little difference
Irrigation Time	175 min	54 min	Direct pumping type requires shorter time.
Fuel Consumption	In proportion to pump operation time		Little difference
Overhead Storage Tank	Necessary	Not required	Direct pumping type is less costly.
Dripper	PC (high cost)	NPC (low cost)	Direct pumping type is less costly.
Scope of System Expansion	Difficult (additional tank required)	Easy (just additional pipes and laterals required)	Direct connection type has advantage in system expansion.

Source: JICA Survey Team

Based on the simple comparison given above, the direct pumping type has advantages of shorter irrigation time, less installation cost and easier expansion of system. Accordingly, the direct pumping type is proposed for I-HIMDI. The typical layout of the MDI system is illustrated in Figure 6.2.2 below.



Source: JICA Survey Team

Figure 6.2.2 Typical Layout of MDI System by Direct Pumping Type

The pump is assumed to generate the system operating pressure of 2 kg/cm^2 , and the internal dripper will be normal, non-pressure compensating. The lateral spacing will be 120 cm and the dripper spacing 30 cm for the proposed horticultural crops. The geometry of the crops will be modified to suit the system. For a $1,000 \text{ m}^2$ MDI farmland, about 2,800 plants will be grown in single row spacing.

6.2.2 Poly Nursery House

All the MDI farmers will be provided with a PNH in order to raise healthy nursery plants for MDI farms, which is essential for production increase and quality improvement.

A plastic nursery tray of 104 cells (13 x 8) with size of 300 mm x 486 mm is popular for common

vegetables, such as tomato and chili. Supposing that the number of seedlings to be planted in a farmland of 1,000 m² is 3,000, space allowance is 20%, expectation of seed germination is 90%, a PNH of the size of 2 m x 3 m and 1 m height is proposed².

The frame will be metallic or of reinforced plastic. The top roof will be covered by ultraviolet stabilised sheet, and the sides will be of insect proof net. The skirt shall be closed at the ground to prevent intrusion of insects. As the nursery period will be 3-4 weeks and it is assumed that cropping will be practised in three seasons a year, a foldable or dismantlable type PNH is proposed, as illustrated in Figure 6.2.3, so that it can be kept safe whilst unused.

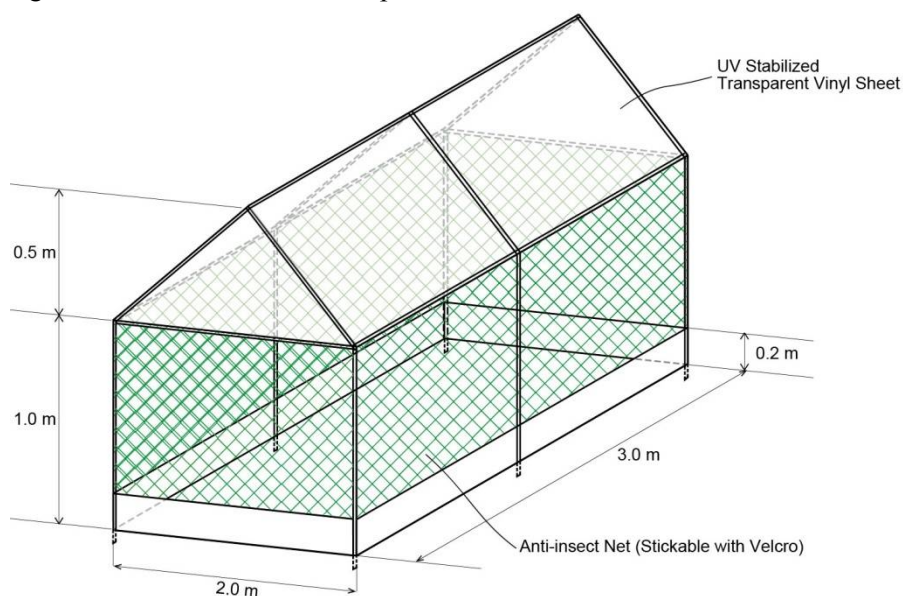


Figure 6.2.3 Proposed PNH

Velcro tape will be attached to the edge of the insect proof net so that the net can be opened and closed. The farmers can reach out to the seedlings from outside the PNH for various nursery operations.

For the smooth operation of PNH, 35 nursery trays, cocopeat, fertiliser, pesticide and vegetable seeds for one crop season will be provided to the farmer. The PNH and its appurtenant input will be on full grant to the farmers as project subsidy.

6.2.3 Vermin Compost Production Unit

A small size simple vermin compost unit will be provided to individual MDI farmers. With vermin compost bag made of high density poly ethylene (HDPE), a vermin compost unit can be assembled easily. The size will be about 3 m x 1.2 m, and the compost will be accumulated up to 0.5 m deep, which is popular in Indian markets.

As compost of 1.2 m³ is required for a farmland of 1,000 m², a VCU of the size 3 x 1.2 x 0.5 m (1.8 m³) is considered adequate.



Vermin Compost Bed

Source: <http://www.indiamart.com/neelgiri-tarpaulin/agricultural-products.html>

² 300 mm x 486 mm x 3,000/104 x 120% / 90% = 5.61 m² ≈ 6 m²

Net windows are provided at sides for aeration, and at bottom for excess water drain. An image of a prefabricated VCU is shown in the photo on the right hand.

As the vermin compost should be protected from direct sunlight, it should be placed under a shade. Shade such as a simple thatched roof should be prepared by the farmer at his own cost. VCU will be given to the MDI farmers on 100% grant basis together with earthworms. To secure the procurement of earthworms, it is proposed that JSLPS promote their production in the target blocks.

The three infrastructures described above (MDI, PNH, and VCU) will be provided to all the MDI farmers as an integrated MDI package, because they are essential for effective farming on drip irrigation, for improved quality and increased production.

6.2.4 Agriculture Tools and Materials

(1) Agriculture Tools

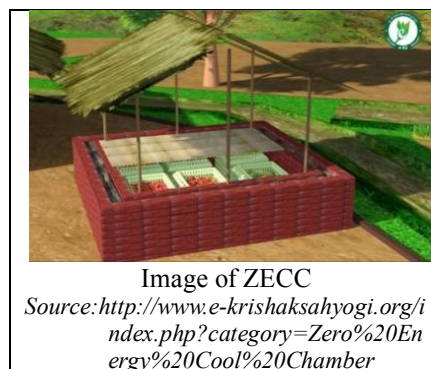
In order to assist the horticulture farming activities under MDI system, agriculture tools are proposed to be provided to the farmers. The tools are provided on grant basis and managed by SHGs, and the farmers who want to use a tool will pay the fee for its rental.

Tentatively sprayers for pesticides and plastic crates for carrying products to market are proposed, however, other tools are acceptable on need basis as far as they are useful and helpful for MDI farming and marketing.

(2) Zero Energy Cool Chamber (ZECC)

In order to demonstrate small-scale cooling structures in the villages, cool chambers are proposed to be provided. About 2,400 units are supposed to be installed at the village level.

Simple cool chambers, denominated Pusa Zero Energy Cool Chamber³, are becoming popular in the neighbouring states such as Odisha. It requires no energy input for operation but applies the principle of evaporation cooling. It is said to reduce the temperature by 10-15 degrees of ambient temperature and maintain the humidity as well so that the produce can be kept fresh for a few days. Therefore, the farmers are able to hold the shipment for a short time until quantity of produce becomes enough or the market price rises. An image of this cool chamber is given in the photo on the right.



The required materials for the chamber assembly are bricks, sand, a water tank or bucket, pipes and tubes, and a simple thatched roof with bamboo poles. Just water the sand to moisten the surrounding chamber, so that the vegetables stored inside are cooled.

ZECC of 1.5 m x 1.0 m x 0.6 m high is proposed for village level demonstration purposes, totalling to 2,400 units.

³ <http://www.orihort.in/Download/ZeroEnergycoolChamber.pdf>

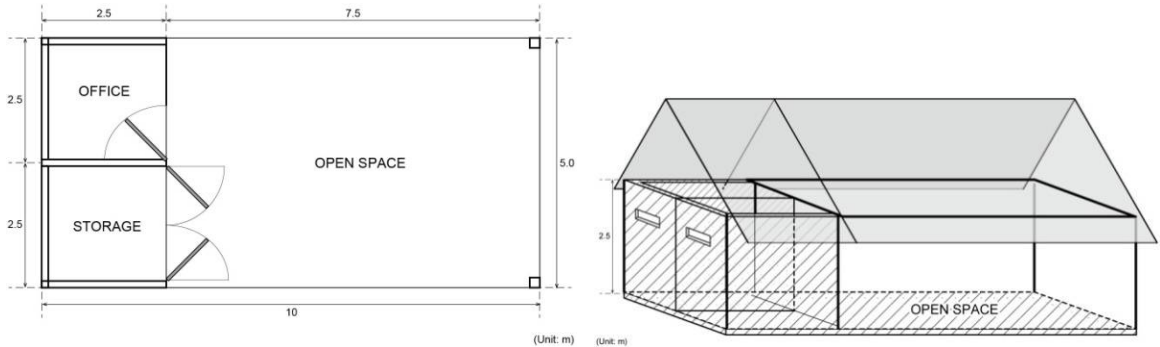
6.2.5 Processing and Marketing Facilities

(1) Multipurpose Community Centre

According to the surveys by the JICA Survey Team on existing horticulture markets, effective infrastructures to be installed in the existing markets seem difficult due to complex operations and ownership.

Instead, community centres cum market infrastructure will be constructed at the village level where an office, a storage bin, grading facilities, weighing scales, whiteboard, etc., will be provided on need basis for common use. Existing public facilities, if available, will be utilised for this purpose. The land should be acquired by JSLPS, or the villagers should offer the necessary space.

The typical centre will have a space of 50 m², with concrete floor and a roof. An office and a storage bin should be equipped with lockable doors. A sample rough design is given in Figure 6.2.4.



Source: JICA Survey Team

Figure 6.2.4 Multipurpose Community Centre Layout and Sketch (Sample)

This centre is expected to be a model in the future which functions as a market centre where traders gather for purchase of farm produce in the village. SHG will be responsible for the maintenance and operation of this community centre. The project will offer grants for establishment of this community centre.

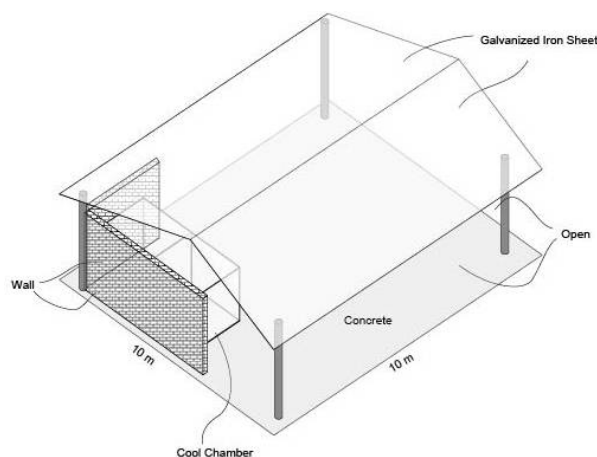
The locations will be accessible for the farmers in the village and not far from the existing market. Two such centres are planned to be constructed for existing earmarked market in the project area. As there are 19 markets in the target blocks, 38 community centres will be constructed, of which the locations will be determined by JSLPS during the implementation of the project.

The construction of community centres will commence after horticulture production by I-HIMDI seems smoothly implemented, for example, after the loans for the first batch MDI farmers be completely repaid.

(2) Godown cum Cold Storage

A godown cum cold storage will be constructed for demonstration purpose. It will be constructed near an existing market in Ranchi District to store vegetables and fruits in two units of cool chambers and ship them to the market. The dimensions of cool chambers are 1.8 m x 2.1 m and 1.8 m x 3.0 m with a height of 2.4 m. The centre will have a roofed concrete floor with an area of 100 m² constructed in a state-owned land, of which a sample plan is given in Figure 6.2.4. A vehicle (auto rickshaw) and 1,000 plastic crates will be equipped too, in order to carry the produce to the nearby market smoothly. Guidelines for running the market centre by SHG/Village Organisation (VO) will be drafted by JSLPS

and vetted by JICA.



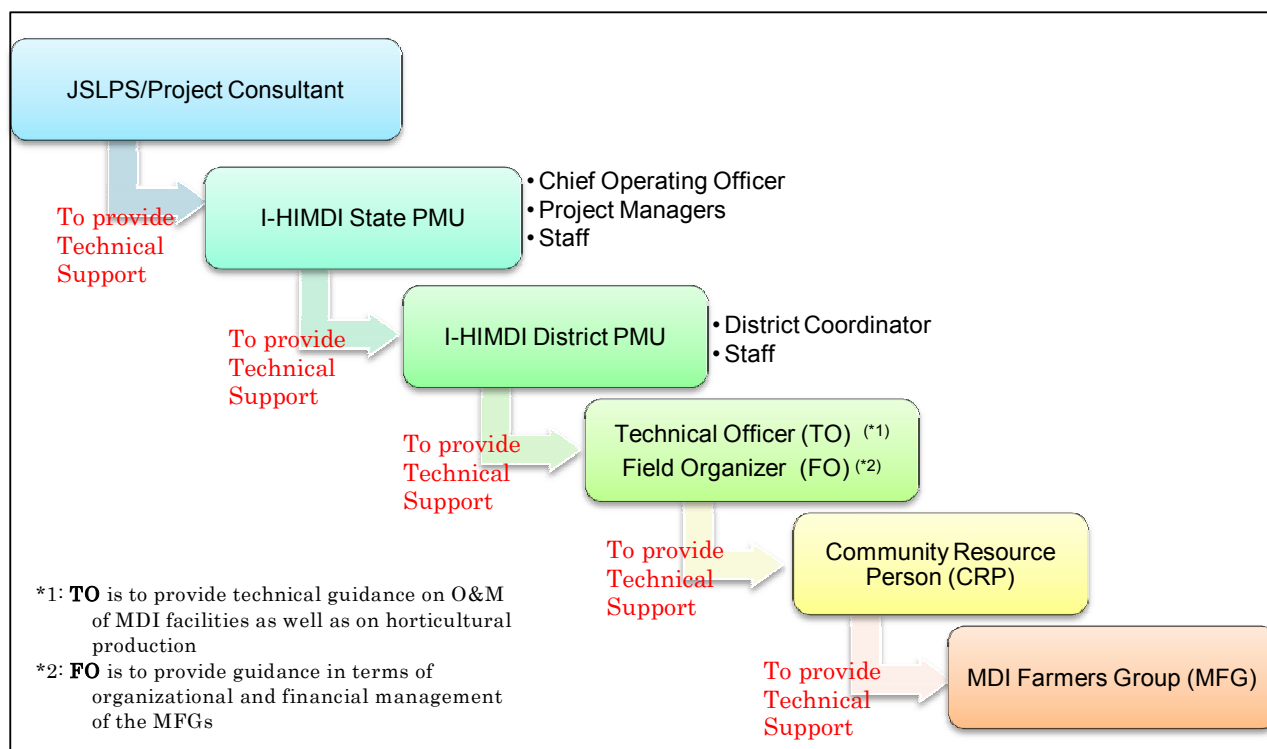
Source: JICA Survey Team

Figure 6.2.5 Market Centre (Godown cum Cold Storage)

The construction of the market centre and procurement of appurtenant equipment will be financed fully by the project.

6.3 Capacity Development

I-HIMDI will serve the staff with various technical support including trainings as capacity development needs occurring at each stage of implementation process. The technical support shall be provided from the project consultant to MDI farmers in cascade manner as shown in Figure 6.3.1.



Source: JICA Study Team

Figure 6.3.1 I-HIMDI Technical Support System

6.3.1 Institution Building

Upon the recruitment of the project staff, a set of compulsory training should be provided to the project personnel to foster among them a thorough understanding on the entire framework of the project including detailed components and implementation schedules. Basic technical orientation should also be given for both state and district Project Management Unit (SPMU and DPMU) staff at the very initial stage, which would furnish them with necessary and relevant technical and managerial skills and knowledge.

The field staff of the project, i.e., technical officer (TO), field organiser (FO), and CRP are the major functionaries to extensively support MFGs in terms of organisational and financial management, as well as in terms of horticultural production with MDI facilities. It is therefore necessary to equip them with appropriate skills and knowledge to guide the MFGs. Hence a series of training of trainers (TOT) would be conducted for them on relevant technical aspects such as basic O&M of MDI facilities, horticultural production techniques, and marketing including postharvest techniques. As for the organisational and financial management of MFGs, the training programme should be formulated in close alignment with existing training on institution building under NRLM being conducted by JSLPS. After initial TOT, the plan of training activities for the MFGs is to be formulated by the field staff, based on which the training and monitoring would be undertaken in their respective areas of jurisdiction.

The detailed contents of the prototype training on institution building for the PMU staff and field staff are described in Table 6.3.1.

Table 6.3.1 Contents of the Training for the PMU Staff and Field Staff (Institution Building)

Title	Trainers / Organisation	Trainees	Purposes
Project Orientation for State PMU staff	- (JSLPS) - (Project consultants)	- I-HIMDI COO - PMs - MIS officer - Fund manager - Accountants - Procurement officer - Human resources development assistant	a. To provide basic orientation to the State PMU staff b. To foster a common and clear understanding on the entire framework of the project
Project Orientation for District PMU staff	- (SPMU) - I-HIMDI COO - PMs	- I-HIMDI DC - MIS assistants, - Accountants	a. To provide basic orientation to the State PMU staff b. To foster a common and clear understanding on the entire framework of the project c. To confirm the levels of understanding among State PMU staff who serve as trainers
Thematic refresher training for State PMU staff	- (Project consultants) - I-HIMDI COO	- PMs - MIS officer - Fund manager - Accountants - Procurement officer - Human resources development assistant	a. To identify the challenges in managerial and technical aspects pertaining to the operation of the project as a whole b. To provide the relevant State PMU staff with necessary updates of skills and knowledge in their respective fields of expertise
Thematic refresher training for District PMU staff	- (SPMU) - I-HIMDI COO - PMs - I-HIMDI MIS officer - I-HIMDI fund manager	- I-HIMDI DCs - MIS assistants - Accountants	a. To identify the challenges in managerial and technical aspects in the project operation at the field level b. To provide the relevant District PMU staff with necessary updates of skills and knowledge in their respective fields of expertise
Project Orientation for TO and FO	I-HIMDI DC	- TO - FO	a. To provide basic orientation to TO and FO b. To foster a common and clear understanding on the entire framework of the project

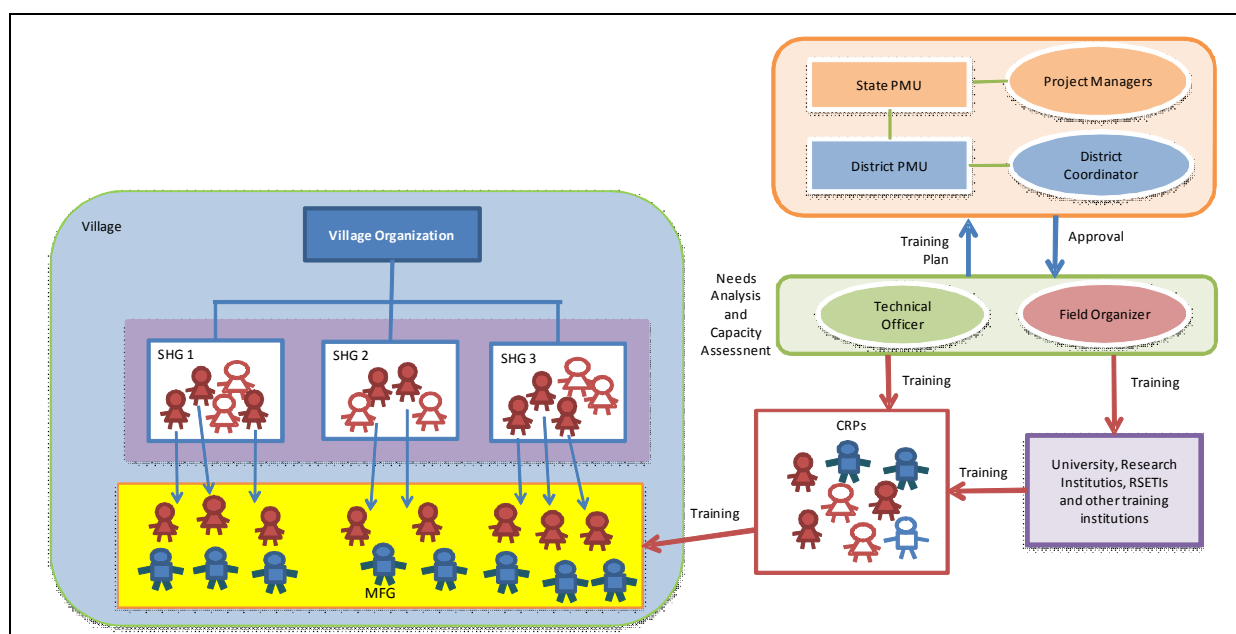
Title	Trainers / Organisation	Trainees	Purposes
			c. To confirm the levels of understanding among TO and FO who serve as trainers
Training on baseline survey in target villages and registration of MDI farmers	I-HIMDI DC	- TO - FO	a. To confirm an understanding on the criteria of I-HIMDI for selection of its beneficiaries (MDI farmers) b. To foster an understanding on the framework of the baseline survey c. To develop the skills of group formulation d. To develop the skills of registration of MDI farmers and their MFG
Project Orientation for CRP and MDI farmers	- TO - FO	- CRPs - MDI Farmers	a. To foster a common and clear understanding about the project b. To confirm an understanding about loan and repayment among MFG members and their family c. To establish a system of who looks after their MDI facilities and cultivation during migration period d. To confirm the participation of women into the decision making at MFGs
Training on Group Management	I-HIMDI DC	- TO - FO	a. To foster a sense of participatory management b. To develop the skills of sensitising and mobilising the target farmers c. To develop the facilitation skills to stimulate good leadership and communication in a group d. To develop the monitoring and reporting skills along with respective MFG's regulations and norms based on <i>Panchasutra</i> and the environmental and social aspects
	FO	CRP	a. To foster the sense of participatory management b. To develop leadership and communications skills c. To develop the group regulation and norms along with <i>Panchasutra</i> d. To foster an understanding how to fill in the monitoring and reporting forms including monitoring of environmental and social aspects
Training on making a MDI Plan	I-HIMDI DC	- TO - FO	a. To foster an understanding on the objectives and the contents of MDI Plan (installation and O&M plan, repayment schedule of O&M fund, etc.) including the environment management plan (EMP) and Forest Dwellers Development Plan (FDDP) b. To foster a sense of participatory planning c. To develop the facilitation skills when a MFG makes its MDI Plan and application form
	- TO - FO	- CRP - MFG members	a. To foster an understanding on the objectives and the contents of MDI Plan (installation and O&M plan, repayment schedule of O&M fund, etc.) b. To foster a sense of participatory planning c. To make a MDI Plan including EMP and FDDP in respective MFG d. To make an application form in respective MFGs
Training on O&M fund management	I-HIMDI DC	FO	a. To foster an understanding of resource mobilisation and regular repayment b. To develop the capacity of accounting and practices including bookkeeping c. To foster an understanding of the purpose and limited usages of O&M fund d. To develop the monitoring skills of financial management e. To develop the skills of problem solving such as dealing with potential defaulters
	FO	- CRP - MFG members	a. To foster an understanding on resource mobilisation and regular repayment b. To develop the capacity on accounting and practices including bookkeeping c. To foster an understanding of the purpose and limited usages of O&M fund
Training on programme convergence	I-HIMDI DC & Consultant/ Sp	- TO - FO	a. To provide a basic understanding about convergence with related programmes b. To collect information about the services delivered by relevant programmes in needs of the MDI farmers c. To build human networking of related programs
	- TO	CRPs	a. To provide a basic understanding about convergence of

Title	Trainers / Organisation	Trainees	Purposes
	- FO		the programme b To converge the resources and materials of relevant programmes as per needs of the MDI farmers c To develop the skills to create linkage between relevant institutions
Training on risk mitigation aspects of the MDI program	I-HIMDI DC & Consultant/ Sp	- TO - FO	a To foster an basic understanding about essential factors leading sustainability of the programme b. To provide trainings to identified impeding factors (risks) at the early stage c. To develop the capacity of mitigating possible risks in implementing the programme
	- TO - FO	- CRPs - MFG members	a. To foster a basic understanding about essential factors leading sustainability of the programme b. To provide trainings to identified impeding factors (risks) at the early stage c. To take needed actions to mitigate possible risks in implementing the programme

Source: JICA Survey Team

Note: SP= Specialist, PM= Project Manager, DC= District Coordinator, MIS= Management Information System, M&E= Monitoring and Evaluation, ICAR= Indian Council of Agriculture Research, KVK= Krishi Vigyan Kendra, ATMA= Agricultural Technology Management Agency

The technical support of the project shall be provided in a cascade manner as mentioned above. The proposed training structure of I-HIMDI is illustrated in Figure 6.3.1.



Source: JICA Study Team

Figure 6.3.2 Proposed Training Structure of I-HIMDI

6.3.2 Installation, Operation, and Maintenance of MDI Systems

The responsibility of MDI system including PNH and VCU belongs to individual farmers, and their adequate O&M of the system are key points for the success of the project. Nevertheless, most of the farmers have little experience and knowledge on drip irrigation. The support from the project, suppliers, and other institutions are indispensable for smooth development of MDIs.

The project aims at installation of 60,000 MDI systems in a four-year implementation term in 12 districts. A TO will be deployed for 500 MDI farmers and a FO for 250. Therefore, the total number

of TOs will be 120, and that of FOs will be 240. A CRP will be appointed among 50 farmers; therefore, 1,200 CRPs will be employed in total.

(1) Capacity Buildings of SPMU and DPMUs

a) Orientation on MDI Systems

The purpose is that JSLPS staff such as TOs and FOs understand the basic concept, features, principles, system structure, advantages, and so on about the MDI systems, PNH and VCU. It is supposed that 72 persons (TOs and FOs at the state level) will be the target trainees. The five lecturers will be MDI and horticulture specialists from universities such as Birsa Agriculture University (BAU), research institutes such as ICAR, and technical staff of suppliers of MDI, PNH and VCU.

This orientation will take place in Ranchi, and consist of one-day lecture and one-day exposure visit to experimental MDI farms. This will be repeated every year for newly recruited staff. Guidelines and videos for MDI system shall be prepared. These training materials are given to the participants and will be used in the district level trainings.

b) O&M of MDI Systems

Before installation of MDI systems, O&M of systems will be instructed in Ranchi to newly employed TOs. This training will be specialised in O&M of MDI systems. Detailed O&M method may differ between the suppliers' systems; therefore, instructions shall be given by the O&M manual prepared for common use.

It is essential to give hands-on instructions on actual systems. Demonstration on equipment in the field is required. The instructors will be MDI system suppliers and specialists of universities and research institutes. This training consists of one-day lecture and one-day exposure trip.

This instruction will be repeated every year.

(2) Capacity Building of CRPs

a) Orientation on MDI Systems

When MFGs are selected for MDI installation, basic orientation on MDI will be given to CRPs at the district level. At DPMU, TOs, and KVK technical staff give this orientation to CRPs of MFG where MDI will be installed. The materials prepared for the state level orientation will be reused.

The number of CRPs will be around 20 at the district level, but other farmers are allowed to participate in order to increase their interest in the MDI introduction.

b) O&M of MDI systems

Before installation of MDI systems, O&M of systems will be instructed to newly employed CRPs. TOs and KVK technical staff instruct the O&M method to CRPs at the DPMU office. Practical training will be conducted in existing MDI fields.

The training will be focused mainly on the following contents:

- MDI: land preparation, alignment of laterals, valve operation, fertigation, periodical maintenance method, mitigation of damage to equipment
- PNH: preparation of nursery beds, seeding, watering, and transplanting

- VCU: procedures of compost production, enrichment and application to fields

The necessary time will be one day in the office and another day in the field. This training will be repeated every year.

(3) Technical Support to Farmers

a) Orientation on MDI Systems

CRPs and successful MDI farmers will give instructions to farmers who are introducing MDI systems. Graphic manuals in Hindi language will be delivered to the farmers. The purpose of this is for the farmers obtain images of MDI and understand its basic concepts. This orientation will take one day in the village.

b) Pre-installation of MDI, PNH, and VCU

Prior to the installation and delivery of MDI, PNH, and VCU, CRP instructs to the farmers the following preparatory works:

- MDI: checking water source and pump, raising bed, and fencing preparation
- PNH: determination of place for PNH, crop selection
- VCU: determination of place for VCU, collection of organic manure, and preparation of shed

CPR will explain to farmers the assembling and operational procedure of the PNH and VCU.

c) Installation of MDI, PNH, and VCU

The supplier will install the MDI system by labour force of the farmers, demonstrate trial operation, and give instructions on O&M and provide a graphic manual in Hindi/regional language as per the usefulness to the farmers. These instruction manual will be offered at the supplier's cost. CRP will accompany the farmers in this installation, and help them in thoroughly understanding the purpose and usefulness of the MDI system.

The PNH and VCU will be delivered to SHG. Upon arrival of the units, the supplier will demonstrate the assembly and explain how to use and maintain the units. User's manuals will also be delivered to the farmers.

d) MDI System Calibration

Before cropping season, MDI system calibration will be carried out by the suppliers for water discharge adjustment at various points in the system. This calibration will be a part of the contract with the suppliers; therefore, this free calibration will be obligatory for the MDI suppliers. According to the contract, this calibration will be repeated for three years, before each cropping season, that means a total of nine times in three years.

In addition to the system calibration, the suppliers and CRPs will time to time review the actual MDI practice and advise the farmers up to her/his satisfaction for the correct operation. The designated representative of the provider and CRP will share their mobile phone numbers with the farmer for constant advice.

The detailed contents of the prototype training for O&M training on MDI and agricultural support facilities for PMU staff and field staff are described in Table 6.3.2 below.

**Table 6.3.2 Contents of the Training for PMU Staff and Field Staff
(O&M Training for MDI and Agricultural Support Facilities)**

Title	Trainers/Organisation	Trainees	Purpose
Technical Support to State PMU, District PMU			
Orientation on MDI, PNH, and VCU at State PMU and Exposure Visit	(JSLPS) (Project consultants)	- TO - FO	Orientation on MDI, PNH, and VCU
O&M of MDI, PNH, and VCU at State PMU and Exposure Visit	(JSLPS) (Project consultants)	TO	O&M of MDI, PNH, and VCU
Technical Support to CRP			
Orientation on MDI, PNH, and VCU at District PMU and Exposure Visit	- KVK - TO	CRP	Orientation on MDI, PNH, and VCU
O&M of MDI, PNH, and VCU at District PMU and Exposure Visit	- KVK - Suppliers - TO	CRP	O&M of MDI, PNH, and VCU
Technical Support to MFG			
Orientation on MDI, PNH,, and VCU at MFG	CRP	MFG members	Orientation on MDI, PNH, and VCU
Preparation for Installation of MDI, PNH, and VCU	CRP	MFG members	Understanding on preparatory Works
Installation of Infrastructure	- Suppliers - CRP	MFG members	Obtaining O&M skills on MDI, PNH and VCU
Calibration of MDI System	- Suppliers - CRP	MFG members	Calibration of system at the beginning of cropping season for three years

Source: JICA Survey Team

6.3.3 Agricultural Extension and Marketing

As a result of field survey, some important points to enhance project efficiency and effectiveness were observed. In consideration of the training contents under I-HIMDI, those points should be reflected. The major points are to maximise land use of limited MDI fields, to minimise farm inputs to reduce production cost and to introduce market-oriented farming and postharvest activities. Details of these points, training contents and extension procedure of I-HIMDI are described below.

(1) Policies of Agricultural Extension and Marketing Training

Although detailed contents of the training will be settled in the beginning of I-HIMDI implementation stage, the policies of agricultural extension and marketing training in I-HIMDI are as follows.

- (a) To maximise land use of limited MDI fields for high yield and high quality of horticultural crops
 - To raise healthy seedlings utilising micro PNH and VCU
 - To protect crops from pest and disease through sustainable and proper measures
 - To maximise land use physically through vertical land use such as using supporting pole and mix planting with tree crops
- (b) To minimise farm inputs to reduce production cost
 - To use irrigation water, fertiliser, fuel and electricity for pump operation and labour work effectively through MDI, PNH, and VCU
 - To shorten production period through MDI and PNH and effective fertilising
 - To protect crops from soil-borne diseases by mulching application and poly nursery under low pest and disease pressure
 - To protect crops from under-irrigation and over-irrigation through optimum water supply by

MDI

- To introduce new farm inputs (e.g., mulching, cocopeat, liquid fertiliser) through demonstration
 - To use water resources effectively by MDI for sustainable agriculture and for preservation of groundwater in Jharkhand
- (c) To introduce market-oriented farming and postharvest activities to sell horticultural products in advantageous season (off-season)
- To control harvest season by MDI to sell products at higher price
 - To do market-oriented farming by effective selection of crops needed by market
 - To introduce "Collective Marketing led by Lead Farmer" by MFGs and organising production cluster of particular crops to attract traders
 - To utilise multipurpose community centres and a godown cum cold storage effectively to enhance income of MFG members

(2) Contents of Agricultural Extension and Marketing Training

The detailed contents of the prototype training on Agricultural Extension and Marketing Training for the PMU staff and field staff are described in the following table.

**Table 6.3.3 Contents of the Training for PMU Staff and Field Staff
(Agricultural Extension and Marketing Training)**

Title	Trainers / Organisation	Trainees	Purpose
Project Orientation for Horticulture and Marketing	(JSLPS) (Project consultants)	- I-HIMDI COO - PMs - I-HIMDI DC	a. To provide a series of technical training on Horticulture and Marketing Trainings b. To provide a training on teaching method for TOs c. To conduct exposure visits to advanced MDI farmers in the state
Project Orientation for Postharvest	(JSLPS) (Project consultants)	- I-HIMDI COO - PMs - I-HIMDI DC	a. To provide a series of technical training on postharvest b. To provide a training on teaching method for TOs c. To conduct exposure visits to advanced MDI farmers in the state
Project Orientation for Horticulture and Marketing	I-HIMDI DC	TO	a. To provide a series of technical training on Horticulture and Marketing Trainings b. To provide a training on teaching method for CRPs c. To conduct exposure visits to advanced MDI farmers in the districts d. To distribute technical manuals on "MDI Horticulture and Marketing"
Project Orientation for Horticulture and Marketing	TO	CRP	a. To provide a series of technical training on postharvest] b. To provide a training on teaching method for MFGs c. To distribute technical manuals on "MDI Horticulture and Marketing"
Horticulture and Marketing Training (1): "Market Oriented Farming and MDI Crop Planning"	CRP	MFG	a. To provide technical training on "Market Oriented Farming and MDI Crop Planning" at the field b. To distribute technical manuals on "MDI Horticulture and Marketing"
Horticulture and Marketing Training (2): "Raising Seedlings and Plant Protection"	CRP	MFG	a. To provide technical training on "Raising Seedlings and Plant Protection" at the field b. To distribute technical manuals on "MDI Horticulture and Marketing"
Horticulture and Marketing Training (3): "Compost Making	CRP	MFG	a. To provide technical training on "Compost Making and Fertilisation" at the field b. To distribute technical manuals on "MDI Horticulture

Title	Trainers / Organisation	Trainees	Purpose
and Fertilisation"			and Marketing"
Horticulture and Marketing Training (4): "Collective Marketing"	CRP	MFG	a. To provide technical training on "Collective Marketing" at the field. To distribute technical manuals on "MDI Horticulture and Marketing"
Training on Postharvest and O&M of Multipurpose Community Centre	CRP	MFG	a. To provide technical training on "Postharvest, O&M of Multi-purpose Community Centre and ZECC" b. To distribute technical manuals on "Postharvest"
Training on "Advanced Marketing and O&M of Godown cum Cold Storage"	(JSLPS) (Project consultants)	- I-HIMDI DC - MFG in a selected market cluster	a. To provide technical training on "Advanced Marketing and O&M of Godown cum Cold Storage" b. To distribute technical manuals on "Advanced Marketing and O&M of Godown cum Cold Storage" c. To conduct an exposure visits to existing godown cum cold storages in the state

Source: JICA Survey Team

(3) Procedure of Agricultural Extension and Marketing Training

The technical support of the Project shall be provided in a cascade manner as abovementioned in Section 6.3.1. Technical dissemination shall be done by TO, FO, and CRP, who are the major functionaries to extensively support the MFGs for agricultural extension and marketing training. It is therefore necessary to equip them with appropriate skills and knowledge to guide the MFGs. Hence a series of TOT would be conducted for them on horticultural production techniques, and marketing including postharvest techniques.

6.4 Management Information System

The primary purpose of MIS is to track and manage project activities by providing the right information to the right set of people at the right time to support adaptive project management and decision making.

For efficient and timely monitoring of the project, a framework of MIS shall be developed in the form of integration of relevant information and data such as profile data of target SHGs and farmers, Environmental and Social Management System (ESMS), and project status report (PSR) in addition to operation and effect indicators. NRLM has also introduced and been operating MIS in their activities. Moreover, JSLPS has also installed and operated MIS to make their activities efficient. The existing MIS mentioned above is to be reviewed first hereafter.

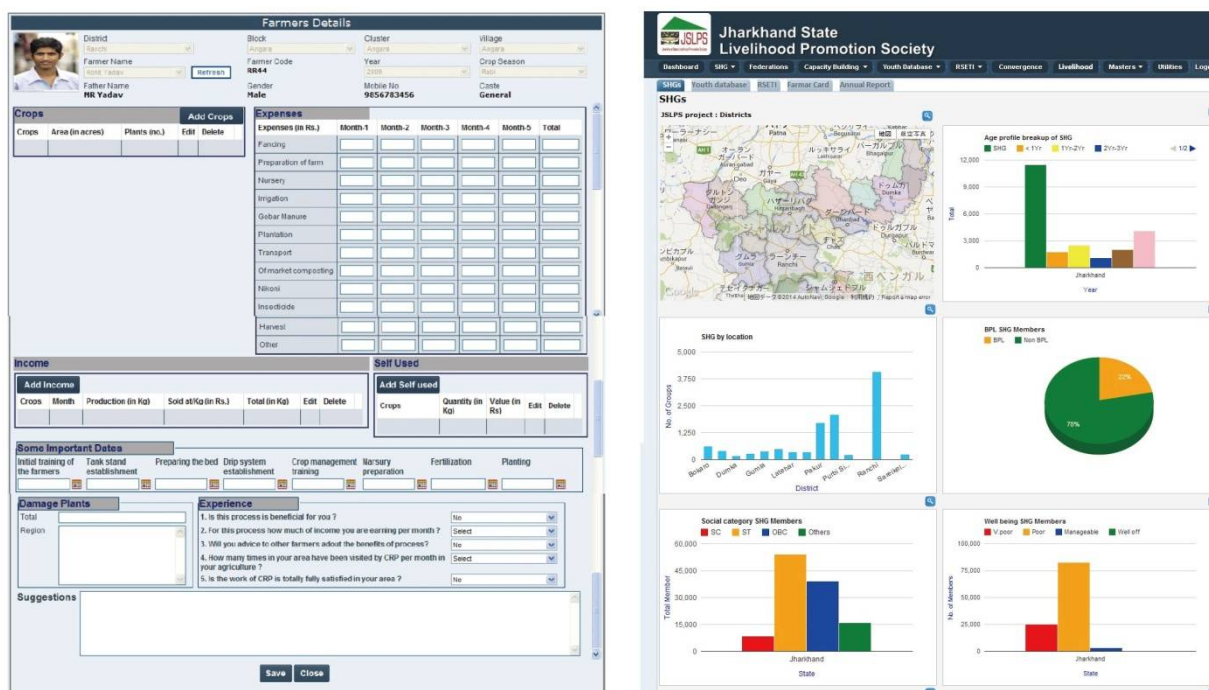
6.4.1 Existing Management Information System

(1) JSLPS

JSLPS-MIS (<http://mis.jslps.in/ADMIN/Dashboard.aspx>) was designed to minimise the complexities and make it useful for monitoring. The system was developed based on the following principles:

- The system is designed as computer-based information subsystem at State Project Unit to answer state level information needs to improve project management.
- The data would be collected by cluster coordinator and entered at block level.
- The webpage is to be identified in a participatory manner involving the key stakeholders.
- The system provides for a two-way flow of information.
- The design should be intelligent to minimise data entry during routine use.

As of May 2014, JSLPS has managed MIS for monitoring of Rural Self-Employment Training Institutes (RSETI), Youth Database and SHG activities. Samples of input and output interfaces are in Figure 6.4.1 below.



Source: JSLPS (<http://mis.jslps.in>)

Figure 6.4.1 Example of Interface of JSLPS-MIS (Left: Input, Right: Output)

According to the results of the interview survey with the engineer of JSLPS-MIS, the output of system could be helpful for the programme managers of different domains according to their requirements. Currently, the system has a problem in linkage between MIS and other agencies or domains outside of JSLPS.

(2) National Rural Livelihoods Mission

MIS-NRLM (<http://nrlm.gov.in>) was established to monitor the activities of NRLM and the conditions of target groups and to manage related information, e.g., SHG registration, management of annual allocations and expenditures, and SHG - bank linkage information.

The system is managed by several key players as shown below^{*4}.

(i) Nodal Officer

- Act as a state level system administrator and single point of contact for MIS related activities
- Create user of state/district/block levels
- Identify blocks as intensive/non-intensive

(ii) State Level User

- Enter/update management unit details, core staff team details, and key system approval dates
- Identify and add bank to the list of a national level bank which can be accessed by users
- Enter yearly allocation and expenditure of intensive and non-intensive blocks at the state level

⁴ Presentation on MIS for National Rural Livelihoods Mission (NRLM)

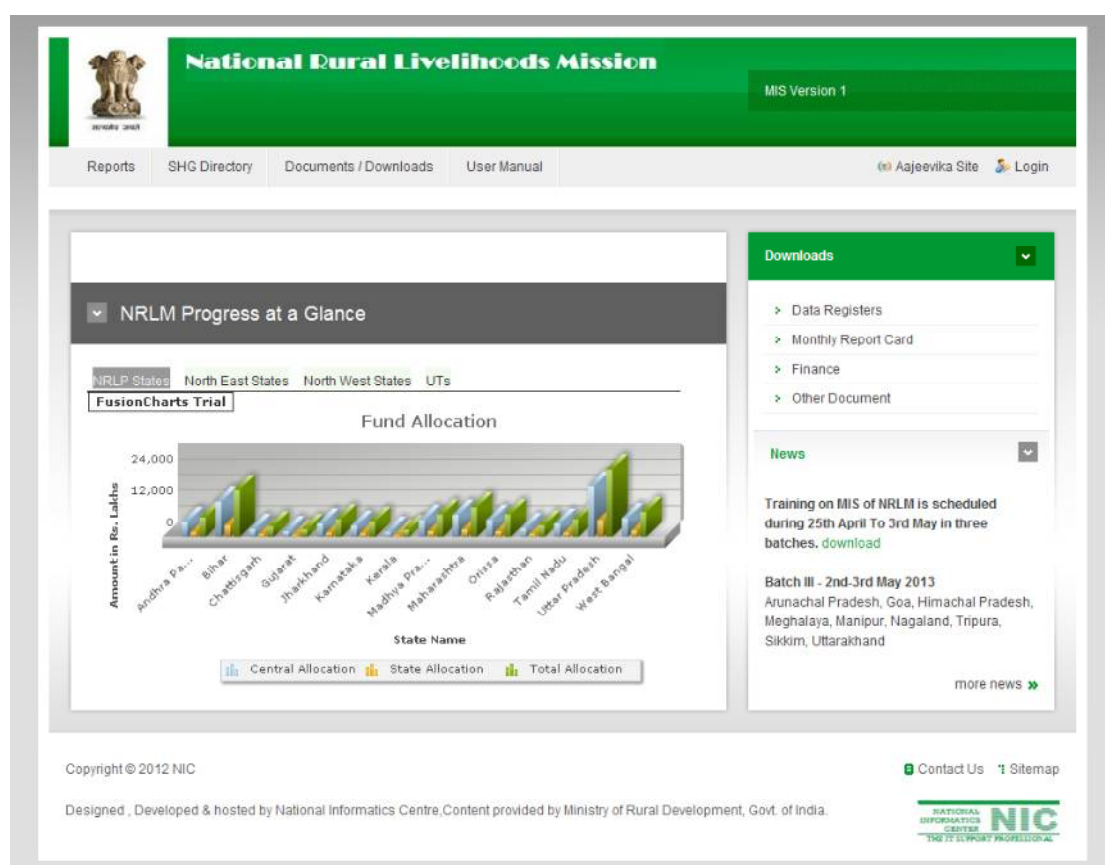
(iii) District Level User

- Enter/update management unit details and core staff team details
- Identify and add bank to the list of a state level bank which can be accessed by SHGs
- Enter yearly allocation and expenditure of intensive and non-intensive blocks at the district level

(iv) Block Level User

- Enter/update management unit details and core staff team details
- Manage cluster, VO, SHG registration, and linkage of SHG and bank
- Collect SHG monthly report card
- Enter annual allocation and expenditure of intensive and non-intensive blocks at the block level

An output interface of MIS-NRLM and an example of collecting form are shown in Figure 6.4.2 and Figure 6.4.3, respectively.



Source: NRLM (<http://nrlm.gov.in/nrlmlive/outerReportAction.do?methodName=showIndex>)

Figure 6.4.2 Output Interface of MIS-NRLM

Form for collecting SHGs information

State* :	District* :	Block* :	GP-Village* :
SHG Name* :		SHG Type* : <input type="checkbox"/> New <input type="checkbox"/> Revived <input type="checkbox"/> Pre-NRLM	
Promoted By (NRLM/State Project/NDO/Any Other) :		Date of Formation* :	
Micro Plan Prepared (yes/no):	Basic SHG Training (yes/no):	Bookkeeper Identified (yes/no):	Standard Bookkeeping practices (yes/no):
Number of times Bank Linkage happened (0 to 10):	Meeting Frequency (weekly/fortnightly/monthly):	Usual Amount of Saving:	
Bank Name:	Bank Branch Name:	Savings Bank Account Number:	Date of Opening of Account:

ii. SHG MEMBER DETAILS

S.No	Member Name*	Father/Husband Name*	Social Category*	Gender* (Male/ Female)	Sub Category			PIP category (RIP/ Poor/ Non-Poor)	Leader* (present/ Past/ Never)	UID/ Aadhaar	SECC No.	Mobile No.
					Disability (no/self/ family member)	(BPL/ APL) *	Religion: (Hindu/ Muslim/ Christian/other/ Buddhist/ Jainism/para)					

Prepared By:

Names:

Signature:

Date:

Source: NRLM (<http://nrlm.gov.in/nrlmlive/outerReportAction.do?methodName=showIndex>)

Figure 6.4.3 Collecting Form of SHG Information

6.4.2 Management Information System Proposed by the JICA Survey Team

Based on the current system installed in JSLPS and the implementation framework of the project as proposed in Chapter 7, MIS for I-HIMDI is designed as follows:

(1) Objectives

The objectives for utilising MIS in the project are: (i) to monitor the periodical achievement of distribution of MDI for target farmers in real time, (ii) to check loan repayment situation from farmer to SHG, and (iii) to monitor agricultural activities and farmer's benefit through periodical and continuous checking on farmer's input and income for MDI farming.

(2) Concept

Basic data obtained from farmers are collected by CRP weekly, as mentioned in Section 7.1, one CRP is responsible for 50 farmers and he/she has to collect the data weekly. Basic data for MIS consist of two types, one is farmers' data and the other is SHGs'. The farmers' data should include (i) progress of MDI installation on scheduled farmers, (ii) repayment condition of MDI loan, (iii) farmers' input for agricultural activity related to MDI farming, and (iv) farmers' income generated from selling products harvested in MDI field. On the other hand, SHGs' data consist of (i) training activities and progress against the plan established by PMU, and (ii) records of SHGs' account book particularly made for managing MDI loan. These collected data shall be input by the I-HIMDI computer operator in the district management office. These input data shall be integrated at the state level, and assist in monitoring the total and partial project status and in decision making.

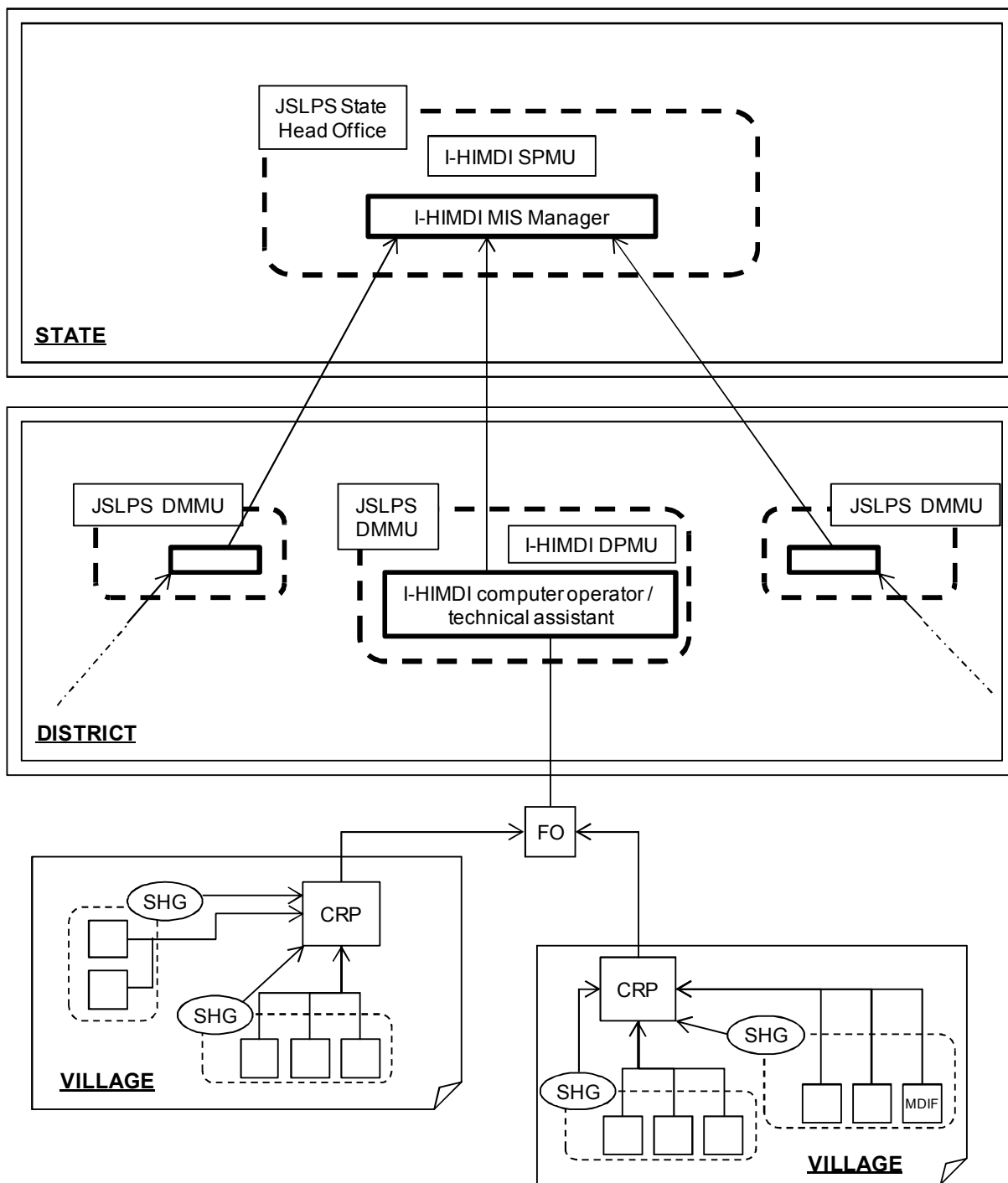
(3) Schematic Diagram

As described in the previous clause, the data collector is CRP and data input is assumed by the operator in the district management office. The schematic diagram of JSLPS MIS is shown in Figure 6.4.4 below.

Table 6.4.1 Features of I-HIMDI-MIS

No.	Data	Item	Planner/ Data Collector	Frequency
1	MDI distribution plan	- Farmer's name - Schedule	PMU	yearly
2	MDI installation result	- Farmer's name - Installed date	CRP => FO	monthly
3	Repayment schedule of MDI loan	- Farmer's name - Repayment date - Repayment amount - Interest	PMU	yearly
4	Repayment progress and result of MDI loan	- Farmer's name - Repayment date - Repayment amount - Outstanding amount	CRP => FO	weekly
5	Training plan / schedule	- Activity name - Schedule - Participant name	PMU	yearly
6	Training progress and result	- Activity name - Implemented date - Participant name	CRP => FO	monthly
7	Input for MDI farming	- Farmer's name - Vegetable name - Cropping period - Sale date - Sale quantity	CRP => FO	seasonally
8	Income from MDI farming	- Farmer's name - Vegetable name - Cropping period - Sale date - Sale quantity	CRP => FO	monthly

Source: JICA Survey Team



Note: DMMU = District Mission Management Unit
 Source: JICA Survey Team

Figure 6.4.4 Schematic Diagram of I-HIMDI-MIS

6.5 Consulting Services

The project consultant will be employed to assist PMU for smooth and efficient implementation of the project (I-HIMDI), which is assumed to be financed by JICA. It is preferable therefore that the project consultant has a good knowledge and experience of Japanese official development assistance (ODA) or yen loan projects. The project consultant would be selected through a method of shortlisting in accordance with JICA's guidelines for the employment of consultants under Japanese ODA loans published in April 2012. It usually takes about ten months for the selection procedure of the project consultant.

(1) Scope of the Consulting Services

I-HIMDI is unique among the yen loan projects in terms of infrastructure development with such as a microfinance approach. MDI system is a main component of the infrastructure development programme, which will be provided to 60,000 small and marginal farmers (SHG members) scattered over 12 districts of Jharkhand through responsible and capable SHGs. A part of the cost will be repaid by MDI farmers to the respective SHG mainly for provision of future O&M of MDI systems. Hence, good project management, intensive technical support for institution building, and human resources development are indispensable for successful completion of I-HIMDI.

Taking the above into consideration, the project consultant shall assist the PMU mainly in the following services:

- 1) Overall project management;
- 2) Construction management for agriculture infrastructure;
- 3) Institutional development of PMU;
- 4) Preparation of training program; and
- 5) Capacity building of target MDI farmers on O&M and farm management.

(2) Period of the Consulting Services

The period of the consulting services is set for 72 months from the date of notice to proceed, taking into account the work schedule of the consulting services shown in Figure 6.5.1.

Major Work Component	1st Year	2nd Year	3rd Year	4th Year	5th Year	6th Year	7th Year
1. Consulting Services		72 months					
2. Selection of Target MDI Farmers		5,000	15,000	20,000	20,000		
3. Agriculture Infrastructure Development Programme							
• MDI Package (60,000 units)			5,000	15,000	20,000	20,000	
• Multi Purposes Community Center (38 units)				12	26		
• Market Center (Godown and Cold Storage) (1 unit)					1		
4. Baseline/Follow-up Survey and Impact Assessment			BS	BS	BS	BS	BS IA
5. Institution Building Programme		PMU	12 DPMUs				
6. Development of Training Program and Modules		Preparation					
7. Farmers Support Programme			5,000	15,000	20,000	20,000	

Source: JICA Survey Team

Figure 6.5.1 Overall Work Schedule of the Consulting Services

(3) Requirement of Experts and Supporting Staff

The minimal man-month (M/M) input of the project consultant is estimated at 203 M/M for international experts, 327 M/M for national experts, and 498 M/M for supporting staff for the contract period of 72 months. The experts listed in Table 6.5.1 would be assigned to the project consultant team.

Table 6.5.1 Experts Required from the Project Consultant

Position of Experts		Required M/M
A	International Consultants (Professional-A)	
A1	Team Leader	50
A2	Monitoring and Evaluation Expert	12
A3	Construction Management Expert	23
A4	Institutional and Capacity Development Expert	34
A5	Irrigation and O&M Expert	33
A6	Horticulture Expert	33
A7	Market Expert	18
	Subtotal (A)	203
B	National Consultants (Professional-B)	
B1	Co-team Leader	66
B2	Monitoring and Evaluation Expert	55
B3	Institutional and Capacity Development Expert	55
B4	Irrigation and O&M Expert	53
B5	Horticulture Expert	53
B6	Market Expert	45
	Subtotal (B)	327

Source: JICA Survey Team

The tentative assignment schedule of the project consultant is shown in Attachment 6.5.1.

(4) Qualification of Experts

Experts to be assigned to the project shall be professional in their respective fields, having good management and communication capabilities. It is preferable for international experts to have real working experiences in Japanese ODA projects.

(5) Reports to be submitted

The project consultant shall prepare and submit five sets each with soft file of the following reports to the PMU during the services period:

- Inception report
- Monthly progress report and annual progress report
- Selection and appraisal manual of MDI farmers
- Baseline survey report
- Bid documents of infrastructure packages
- Bid evaluation report
- Impact assessment report
- Services completion report
- Other technical reports, etc.

(6) Terms of Reference for the Consulting Services

The draft terms of reference (TOR) for the consulting services, which has been prepared assuming a Japanese ODA loan, is given in Attachment 6.5.2.

(7) Project Status Report

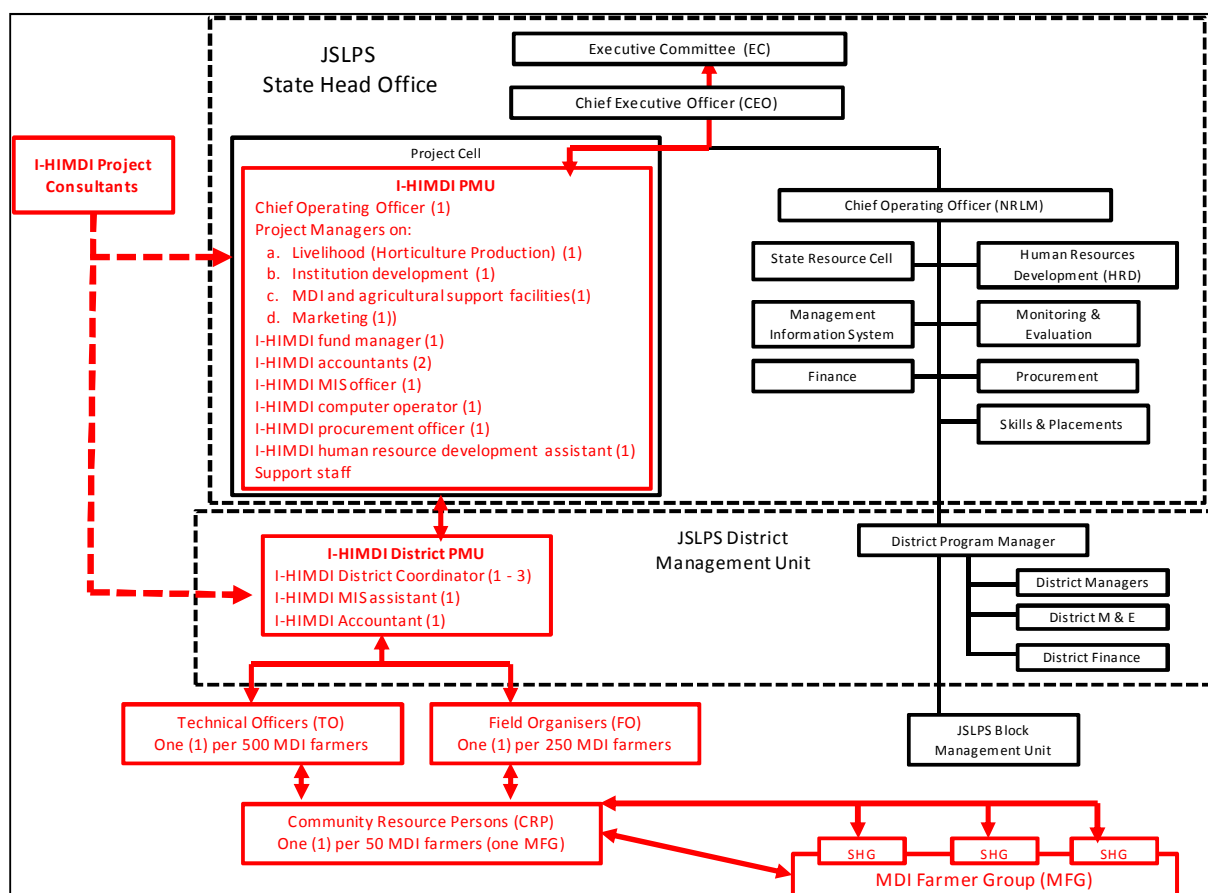
The draft project status report (PSR) has been prepared and is given in Attachment 6.5.3.

CHAPTER 7 ORGANISATIONAL STRUCTURE AND PLAN FOR PROJECT IMPLEMENTATION, OPERATION, AND MAINTENANCE

7.1 Organisational Structure and Plan for Project Implementation

7.1.1 Executing Agency and Project Management Unit

It is proposed that the Jharkhand State Livelihood Promotion Society (JSLPS) will be the executing agency of the Initiative for Horticulture Intensification by Micro Drip Irrigation (I-HIMDI) under general supervision of the Rural Development Department of the Government of Jharkhand. The Project Management Units (PMU) would be established at the JSLPS head office at the state level as well as at the District Mission Management Unit Offices of the target districts. The State PMU (SPMU) is to bear the overall responsibility of project implementation and monitoring, by overseeing the operations at the field level, while coordinating with other relevant administrative and technical agencies whose services and assistance may be mobilised in the implementation of I-HIMDI. The proposed organisational structure for implementation of I-HIMDI is shown in Figure 7.1.1, and their functions are summarised in Table 7.1.1. The details of the organisational setup and their staff at the state, district, and field levels are described in detail in the following sections.



Source: Proposed by the JICA Survey Team in consultation with JSLPS

Figure 7.1.1 Proposed Organisational Structures for Implementation of I-HIMDI

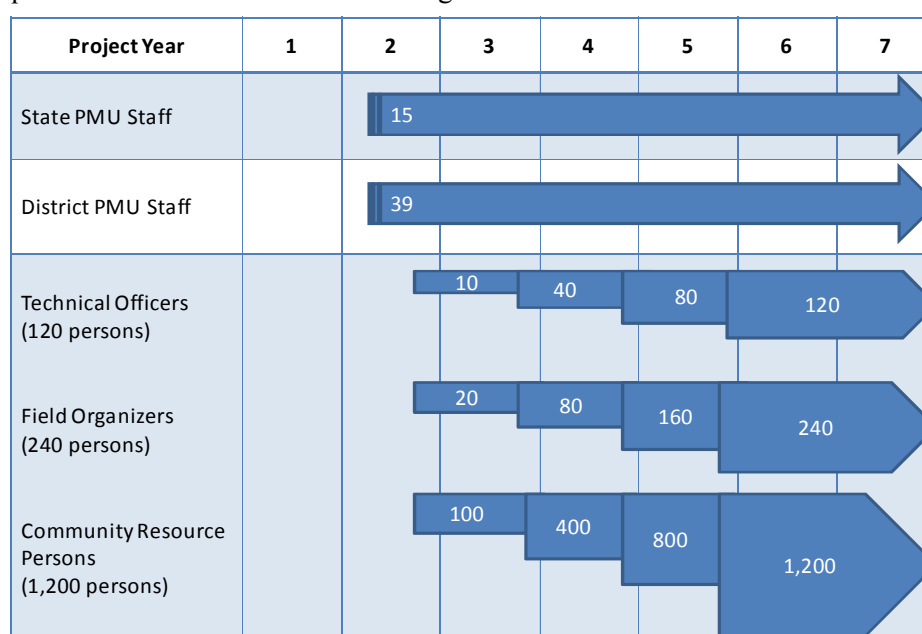
Table 7.1.1 Main Functions of the PMU and Field Staff

Functions	State PMU	District PMU	Field Staff
I. Overall Project Management			
a. Formulation, review, and revision of annual work plan and budget estimates	- Drafting of the documents - Discussion and finalisation with approval	- Review in terms of field activities	
b. Project fund management	- Consolidation of financial data - Overall fund management and budget control	- Bookkeeping - Consolidation of financial data at District PMU (DPMU)	- Maintenance of financial records
c. Monitoring and evaluation of physical and financial progress	- Design of the project-specific data set for management information system (MIS) - Administration of MIS - Consolidation of MIS data	- Maintenance of MIS data	- Field data collection
d. Coordination amongst Project staff	- SPMU meeting - Meeting with I-HIMDI District Coordinators (DCs)	- DPMU meeting (Including TOs and FOs)	- Regular consultation with CRPs by TOs and FOs - Regular visits to MFGs
e. Coordination with external entities	- Technical advisory meeting - Regular meetings of JSLPS	- Coordination with District Rural Development Agency (DRDA), Agriculture Technology Management Agency (ATMA), Krishi Vigyan Kendras (KVK) Non Government Organisations (NGOs), etc.	- Coordination with local Panchayati Raj Institutions (PRIs)
f. Baseline survey, annual follow-up evaluation, and terminal impact assessment	- Design of survey - Supervision on survey processes - Data analysis	- Supervision on data collection by field staff - Primary data processing	- Field data collection
g. Periodic and completion reporting	- Drafting of the documents - Discussion and finalisation with approval	- Provision of information regarding field activities	- Field data collection
h. Environmental and social consideration	- Overseeing the inclusion of environmental and social considerations in to the State Project Implementation Plan and Annual Action Plans - Ensuring efficient and effective implementation of the Environment and Social Management Framework (ESMF) and Forest Dwellers Development Framework (FDDF)	- Assuring the implementation of ESMF and FDDF in the project area - Capacity development of the project staff to implement ESMF and FDDF - Facilitation for preparation of EMP and if necessary, Forest Dwellers Development Plan (FDDP) by target villages and implementation of these plans	- Preparation and implementation of Environmental Management Plan (EMP) and FDDP
II. MDI and Agricultural Support Facilities			
a. Screening and appraisal of target SHGs and MDI farmers	- Setting of criteria - Data screening - Enlistment of candidates	- Enlistment of information on SHGs and MDI farmers	- Field data collection
b. Preparation of infrastructure development plan and design	- Drafting of the plan - Review of design drawings and cost estimates		
c. Procurement of facilities and equipment	-Preparation of bidding documents - Bid evaluation - Contract management		
d. Supervision on the contractors' services	- Supervision on the contractors work - Commissioning tests of completed facilities	- Supervision on the contractors' work in the field	- Assistance in supervision on the work in the field
III. Technical Support			
a. Production of training and awareness materials	- Designing the training programme		

Functions	State PMU	District PMU	Field Staff
	- Production of training materials - Production of awareness materials		
b. Planning and implementation of training for SPMU staff	- Training needs assessment - Curriculum development - Identification of trainers and resource persons - Setting of venue and logistical arrangements		
c. Planning and implementation of training for DPMU staff	- Training needs assessment - Curriculum development - Identification of trainers and resource persons - Setting of venue and logistical arrangements		
d. Planning and implementation of training of trainers (TOT) for the field staff	- Training needs assessment - Curriculum development - General supervision on implementation	- Training needs assessment - Curriculum development - Identification of trainers and resource persons - Setting of venue and logistical arrangements	
e. Planning and implementation of training for MFGs	- Training needs assessment - Curriculum development - General supervision on implementation	- Training needs assessment - Curriculum development - Identification of trainers and resource persons	- Preparation of resources and handouts - Setting of venue and logistical arrangements
f. Field guidance to the MFGs' operations	- General supervision on implementation	- Supervision of the guidance by field staff	- Regular and on-call visits to MFGs for consultation and guidance

Source: Proposed by the JICA Survey Team in consultation with JSLPS

The staff requirement of PMU is illustrated in Figure 7.1.2.



Source: Proposed by the JICA Survey Team in consultation with JSLPS

Figure 7.1.2 Staff Requirement of PMU

7.1.2 Organisation at the State Level

The PMU is to be established at the state level as an independent unit under the Project Cell of JSLPS. It

is assumed that SPMU would consist of the following personnel who will be the I-HIMDI employees:

- I-HIMDI Chief Operating Officer (COO)
- Project managers in the following fields:
 - (a) Livelihood (horticultural production)
 - (b) Institutional development
 - (c) MDI and agricultural support facilities, and
 - (d) Marketing
- I-HIMDI Support staff

The COO is responsible for the overall implementation of I-HIMDI, and accountable directly to the Chief Executive Officer (CEO) of JSLPS. The COO will work in close consultation and collaboration with the I-HIMDI project managers in their relevant fields of expertise. Since I-HIMDI will employ a large number of staff at the district and field levels, support staff as listed in Figure 7.1.2 and Table 7.1.4, who would exclusively handle administrative and financial transactions related to I-HIMDI, in line with the services of the existing JSLPS staff in relevant sections such as administration and logistics, MIS, monitoring and evaluation (M&E), finance, and procurement.

Table 7.1.2 Structures of State PMU and Staffing

Positions of the Project Staff	Nos.	Assigned locations	Reporting to
I-HIMDI COO	1	To be assigned in the I-HIMDI PMU Office established in the Project Cell at the JSLPS State Head Office	CEO, JSLPS
Project manager on livelihood (horticultural production)	1		I-HIMDI COO
Project manager on institution development	1		
Project manager on MDI and agricultural support facilities	1		
Project manager on marketing	1		
I-HIMDI fund manager	1		
I HIMDI accountants	2		
I-HIMDI MIS officer	1		
I-HIMDI computer operator	1		
I-HIMDI procurement officer	1		
I-HIMDI human resources development assistant	1		
Drivers	3		
Attendants (support staff)	1		

Source: Proposed by the JICA Survey Team in consultation with JSLPS

Since JSLPS does not have technical experts as its own staff in the current setup for National Rural Livelihoods Mission (NRLM), project managers for I-HIMDI should be recruited in consideration of their technical expertise and experience, while mobilising technical resources in other relevant institutions such as agricultural universities as the need arises. At the same time, it is proposed that the PMU personnel should be supported by project consultants and/or technical cooperation project team, not only in terms of management of I-HIMDI activities but also in terms of technical capacity enhancement of the personnel (the details of the consulting services and the necessity of technical cooperation project are described in Sections 6.5 and 9.7, respectively).

7.1.3 Organisation at the District Level

At the district level, DPMU of I-HIMDI should be established within the existing offices of the District Mission Management Unit (DMMU) of NRLM. It would also serve as a common platform, to provide administrative support such as financial transaction and information management. Currently,

the DMMU offices are established only in a few districts. However, the DMMU offices are to be established in other districts as JSLPS (State Rural Livelihood Mission, SRLM) plans to expand the intensive blocks over the state under the phasing plan of the NRLM to cover all districts by 2018-19. The targets of the NRLM phasing plan are as shown in Table 7.1.3 below, with which the phasing plan of I-HIMDI should carefully be aligned, and the target districts of I-HIMDI should be prioritised.

Table 7.1.3 Phasing Plan of NRLM in Jharkhand

	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
Coverage Area							
Districts	12	12	16	20	20	24	24
Blocks	40	40	78	120	160	200	259
Villages	1,179	2,383	5,503	8,703	13,503	19,183	25,923
Rural population	78,000	214,152	594,324	939,924	1,458,324	2,071,764	2,799,684
Institution							
SHGs	6,500	17,846	49,527	78,327	121,527	172,647	233,307
VOs	55	755	2,906	4,402	6,962	12,153	17,265
CLFs	6	19	160	160	234	312	480
BLFs	0	0	40	40	78	96	128
Fund (lakh)							
RF	450	1,779	5,106	8,994	14,826	21,727	32,646
CIF	1,000	3,234	12,105	22,473	38,025	51,827	73,665
VRF	55	199	2,050.4	5,697.8	10,753.8	18,504.1	28,806.4

Notes: CLFs= Cluster Level Federations, BLFs= Block Level Federation

RF= Revolving Fund, CIF= Community Investment Fund, VRF= Vulnerability Reduction Fund

Source: JSLPS

It should also be noted in this context, that the proposed I-HIMDI implementation framework depends on the proposition that JSLPS (SRLM) would conduct social mobilisation, formation of SHG, establishment of *Panchasutra*, and organising various trainings for the SHG members and community development cadre. As per the experiences of SGSY, provision of the professional guidelines and internal capabilities of the SHGs nurtured are the necessary conditions, for successful alleviation of rural poverty. It is inevitable that I-HIMDI will be implemented within the intensive blocks, including resource blocks under NRLM.

The staffing of DPMU and the field staff to be supervised by DPMU are as shown in Table 7.1.4 below. As the heads of DPMU, I-HIMDI DC, to be employed by I-HIMDI, would be assigned to play supervisory roles on the activities undertaken in respective districts. I-HIMDI MIS officers and accountants will also be attached to DPMU, who will be responsible for programme monitoring and financial supervision over the activities carried out by the field staff and community groups. The DCs coordinate with relevant organisations and agencies at the district level, such as DRDA, the Integrated Watershed Mission Programme (IWMP), ATMA, and cooperating NGOs. To facilitate effective coordination at the district level, setting up a taskforce that comprises of various stakeholders, such as successful/innovative farmers, input and service providers, experienced project workers, local traders, and scientists of the Indian Council of Agricultural Research (ICAR)/ the State Agricultural Universities (SAUs), may be an option worthy to be considered. The I-HIMDI DCs would also serve as liaison officers between the management at the state level and the personnel at the field level whose details are as described in the following section.

Table 7.1.4 Structure of District PMU and Field Staff

Level	Positions of the Project Staff	No.	Assigned Location	Report to
DPMU	I-HIMDI DC	15 ^(*)	To be assigned in the offices of DMMU of JSLPS	I-HIMDI PM
	I-HIMDI MIS officer	12		I-HIMDI DC
	I-HIMDI accountant	12		I-HIMDI DC
Field Staff	TO	120	To be assigned to the MFGs in the respective areas of jurisdiction under the target blocks	I-HIMDI DC
	FO	240		
	CRP	1,200	To be assigned to the respective MFGs	TO, FO

Note (*1): One DC is to be assigned per district, except for Ranchi and Hazaribagh, wherein three and two DCs, respectively, will be assigned to cover the larger number of blocks than in the other districts.

Source: Proposed by the JICA Survey Team in consultation with JSLPS

7.1.4 Project Personnel at the Field Level

There would be several field staff to be employed by I-HIMDI, to work in close coordination with the beneficiaries in the communities, under the supervision of DPMU and I-HIMDI DCs.

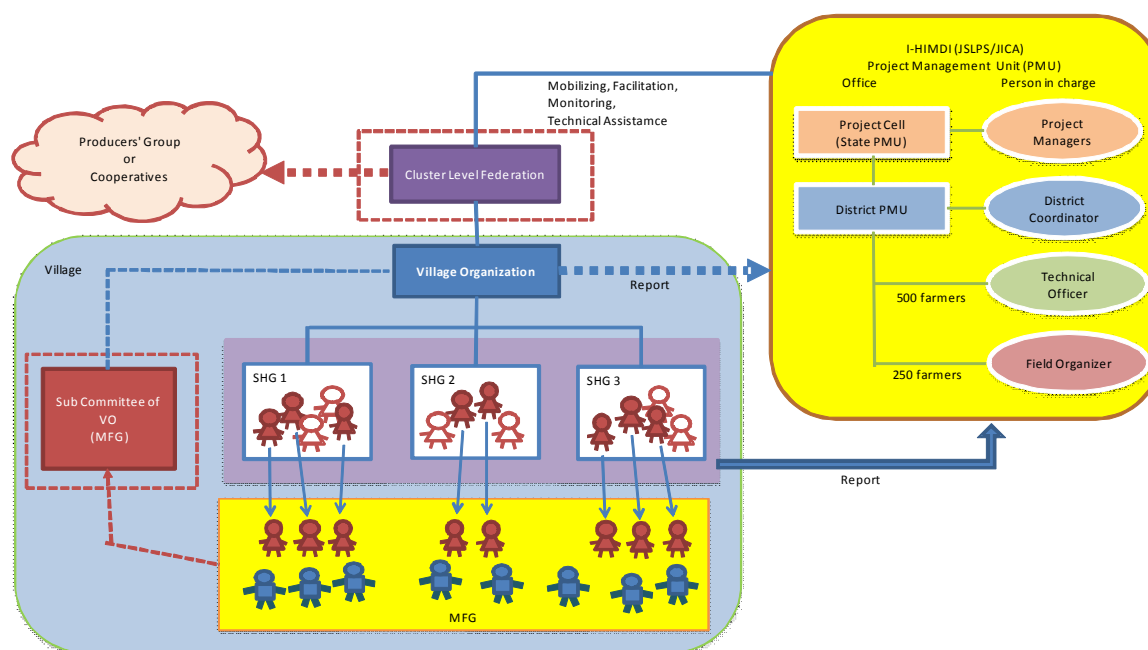
TO would be assigned per approximately 500 MDI farmers, whose primary role is to provide technical guidance in terms of the MDI system operations, horticultural production techniques, and marketing. These TOs are also expected to act as intermediaries to facilitate coordination amongst beneficiary farmers and concerned parties, including MDI suppliers and other technical resources persons in the locality.

As to the organisational management of the beneficiaries' groups, FOs are to be employed to cover 250 MDI farmers per one FO. The FOs are tasked to provide routine supervision of groups' activities and guidance in terms of group operations, including financial management such as loan repayments and savings, so as to help the groups to enhance their capacity to properly operate as a community group.

It should be noted that, at least in the initial group formulation stage under I-HIMDI, coordination and assistance may be rendered by the existing staff both at DMMU and BMMU under the NRLM programme that already have rapport with SHGs in the respective communities. As many of the newly employed FOs may not readily be equipped with such rapport or experience in community organising, the bridging support from the existing NRLM staff is considered to be essential upon the FOs' initial emersion to the communities.

7.1.5 Organisation at Village Level

At the community level, the beneficiary farmers would be organised into MFGs. The members of the MFG should either be members of SHGs or their family members, while the loan agreements are to be signed exclusively by the SHG members. An MFG would be composed of 20 to 50 members, amongst whom the representatives and officials such as president, secretary, and treasurer are to be selected to manage the group activities. Eligibilities of membership, proposed structures, and modalities of operations of the MFGs are described as follows:



Source: JICA Study Team

Figure 7.1.3 Proposed Operational Institution of I-HIMDI

(1) MDI Farmers

Beneficiaries (MDI farmers) must be selected from members of eligible SHGs, and meet all of the following selection criteria:

- Willing to install MDI facilities
- Having water source for MDI
- Willing to repay MDI loan to SHG, etc.

The selected MDI farmers have to return their loan to their SHG. The repayment will be corpus of the “MDI O&M Funds”, and will be utilised for maximising the gains from I-HIMDI (see Section 7.2.1). SHG should take responsibility for managing the repayment with the dedicated account (book). The members of the SHG would promote the MDI farmers’ repayments through peer monitoring. Then SHG has to report the repayment progressing via FO to DPMU of I-HIMDI with regular documentation for MIS.

The MDI farmers and their family member (males) are grouped into one MFG per village. The MFGs will receive technical training by the CRPs as well as by the external training institutions regarding organisational management including bookkeeping, MDI horticultural production, MDI O&M, and marketing (market linkage).

(2) Village Organisation and Cluster Level Federation

All SHGs in the same village assign their representatives (basically president and secretary) to a village organisation (VO). Namely, the VO is a forum of leaders of SHGs in the village. At present, SRLM (JSLPS) has been endeavouring to establish VOs, but has not yet completed to set up it for all villages. As well, a Cluster Level Federation is to be formed as a forum of VOs in the cluster.

When VOs are established and functions well, the MFGs will be regarded as a sub-committee of a VO. They are expected to eventually develop as a producer group or cooperative.

(3) CRP

The CRP is the key functionary at the community level other than the beneficiary groups. One CRP is assigned per village to take care of the MFG members not exceeding 50 farmers. CRPs would serve as the caretaker of the MFGs to work in close contact with the FOs. The CRP may be an innovative member of the MFG who can lead both farming and organisational activities of the group, and they would be trained by I-HIMDI as well as by NRLM. It should be noted that the JSLPS has recently been developing the policy on involvement of the CRP (*Aajieevika Mitra*) in NRLM, in which the principle of task based assignment is applied in consideration of sustainable functioning of these paraprofessionals. It is thus expected that the selection criteria, tasks to be carried out, as well as the mode of payment for the service of I-HIMDI CRPs should also be decided in close alignment with those under NRLM¹.

7.1.6 Annual Budget and Expenditure of Executing Agency

According to the annual audit report of JSLPS for the fiscal year 2012-13, the society handled a total sum of Rs.1,027 million, details of which are shown in Table 7.1.5.

Table 7.1.5 Income and Expenditure Account of JSLPS for Fiscal Year 2012-13

Income		Expenditure	
Items	Amount (Rs.)	Items	Amount (Rs.)
Transferred from Grant-in-Aid		NRLM	101,903,857
Adarsh Gram Yojna	120,000,000	National Rural Livelihood Promotion	36,722,052
UNDP Livelihood Promotion Project	10,620,361	Sanjeevani Project	11,347,175
Drip Irrigation Project	990,660	Special SGSY	110,777,543
National Rural Livelihood Promotion	34,257,248	Socio Economic Caste Census Programme	4,142,519
Sanjeevani Project	41,047,195	UNDP Livelihood Promotion Project	11,421,325
Special SGSY	109,789,194	Drip Irrigation Project	1,010,266
NRLM	670,159,749	Creation of Rural Development Fund	750,000,000
Other Income	669,343		
Advance refunded by DRDA	22,777,400		
Bank Interests	17,013,587		
Total	1,027,324,737	Total	1,027,324,737

Source: K.C. Tac & CO., Chartered Accountants, Audit Report of Jharkhand State Livelihood Promotion Society Financial Year 2012-13 (September 2013)

7.1.7 Coordination and Cooperation with Other Agencies

The proposed organisational arrangement for I-HIMDI is based on the existence and functions of the SHGs, which have been and would further be promoted under NRLM. As the target MDI farmers are to be selected amongst the members of existing SHGs and their family members, formation and functioning of SHGs in the target blocks is one of the key preconditions for project implementation. As JSLPS is the state nodal agency to implement NRLM in Jharkhand, it is anticipated that their phasing plans would properly be executed as per plan indicated in Table 7.1.3 so as to expand the NRLM operations to all districts and blocks including the target blocks of I-HIMDI by the

¹ It is to be noted that there are stipulations on the *Aajieevika Krishak Mitra* (drip) in the JSLPS draft policy. However, the descriptions on the requirements and expected roles and functions are yet of general nature, thus should further be examined through discussions among the project personnel upon commencement of the I-HIMDI.

commencement of I-HIMDI.

Availability of water resource is the basic prerequisite for the introduction of MDI. In the course of field survey, the JICA Survey Team found out that some MDI farmers obtain water from the check dam constructed under IWMP or from the open wells dug through the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) programme. Alignment with other existing programmes under the Rural Development Department (RDD), such as IWMP and MGNREGA, should further be explored so as to ensure the availability of water resources.

Once the project activities would be initiated, field level collaboration with various ongoing programmes and schemes should be sought out. One of the potential collaborations is with ATMA/KVK, which provides farmers with various skills and knowledge on farming techniques under their extension programme. As described earlier in Chapter 3, the innovative farmers are selected from communities to serve as Farmer Friends (*Krishak Mitra*) under the extension programmes of the Department of Agriculture and Sugarcane (DoA). They are the primary targets of various technical training and expected to deliver their learning to fellow farmers in their respective communities. These Farmer Friends may be considered as a very potential pool of human resources that may also be mobilised in the field operations of I-HIMDI to realise smooth implementation and sustainable management of project activities.

As to the marketing of horticultural produce, there may also be a scope for organisational scaling up in search of future integration in and/or collaboration with the existing programmes and organisations established under Department of Co-operative (DoC), such as vegetable growers cooperative societies, and their state level federations such as the Jharkhand State Adivasi Co-Operative Vegetable Marketing Federation Ltd. (VEGFED). Once the beneficiary farmers would organise themselves into such formal and higher level organisations of a certain scale, they may be able to avail benefits and services through the market promotion platforms provided by the primary cooperatives and their federations such as the utilisation of retail outlets and/or cold storage facilities, as well as the acquisition of agro-inputs at the lower price, and so forth.

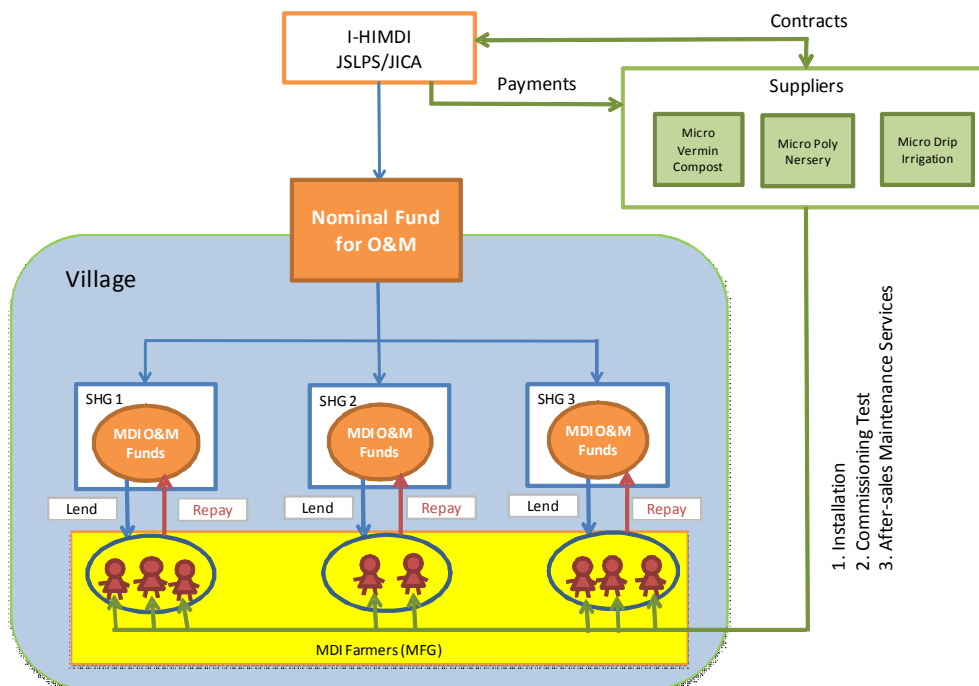
7.2 Measures to be Taken to Ensure Continuous O&M

Unlike large-scale infrastructure and physical facilities, the MDI and agricultural support infrastructures provided under I-HIMDI are primarily to be managed by individual farmers. Therefore, appropriate measures should be taken throughout the course of implementation of the project to ensure continuous O&M as well as further expansion of horticultural production with MDI in the target areas; initially at the level of MFG and individual farmers, then at the level of the executing agency, and eventually at the level where the beneficiaries would be linked to other organisations and schemes that would enable them to further develop themselves in longer term perspectives. The possible measures to be taken, or at least to be initiated, in the course of project implementation are described in the following sections.

7.2.1 Operation and Management of O&M Funds

(1) Fund Flow

I-HIMDI (JSLPS/JICA) makes contracts with respective suppliers of project components, which includes MDI system, micro poly nursery house, vermin compost unit, and other equipment. The payments for the suppliers are basically done by I-HIMDI if MDI farmers confirmed the set of MDI facilities.



Source: JICA Study Team

Figure 7.2.1 Flow of O&M Funds

The project fund will be provided to the MDI farmers in both grant and loan. The ratio of grant and loan was proposed by the JICA Survey Team and basically agreed upon by JSLPS at the presentation of the draft final report (DFR) on 14 July 2014, as shown in Table 6.2.1.

The MDI farmers will return the loan to their respective SHG savings account with promised interest. The repayments will be corpus of the MDI O&M fund. The SHG should prepare a dedicated book for MDI O&M Funds, and record individual repayments on it. The FOs of I-HIMDI are mainly in charge of monitoring repayments and bookkeeping.

SHGs (or VOs if established) should submit monthly reports on repayments by the MDI farmers and documentation (book and bank statement) through FOs to DPMU, which would then be forwarded to the state level PMU.

(2) Repayment Measures

Considering the affordability of the MDI farmers and the alignment of other MDI programmes under JSLPS, a loan portion of I-HIMDI would be set in the range from Rs.15,000 to Rs.20,000. The JICA Survey Team makes a trial calculation of the repayment plan, as shown in Table 7.2.1.

Table 7.2.1 Trial Calculation of Repayment Plan

Total Amount of Loan (Rs.)	Monthly Interest Rate (%)	Repayment Period (month)	Amount of Monthly Payment (Rs.)	Times of Prepayment	Amount of Prepayment per Time (Rs.)
Without Prepayment					
15,000	1.5	24	749	-	-
	1.5	36	542	-	-
20,000	1.5	24	998	-	-
	1.5	36	723	-	-
With Prepayment (It assumes Rs.5,000 out of Rs.15,000 for seasonal prepayment)					
15,000	1.5	24	499	3 times/year	1,017
	1.5	36	362	3 times/year	735
With Prepayment (It assumes Rs.6,500 out of Rs.20,000 for seasonal prepayment)					
20,000	1.5	24	674	3 times/year	1,322
	1.5	36	488	3 times/year	956

Source: JICA Survey Team

Based on the discussion with JSLPS at the presentation for DFR on 16 September 2014 by the JICA Survey Team, the terms and conditions of the repayment were mutually agreed as follows:

- Amount: 60% of MDI cost (approximately Rs.15,000)
- Monthly interest rate: 1.5%
- Repayment period: maximum of 36 months (a grace period of three months)
- Advanced repayment is acceptable.
- Agreements of all family members on the repayment and signature of them on an application form for the Project are required

The interest of 1.5% will be regarded as SHG's management fee, which can be used for operation fund of the respective SHG. By involvement of SHGs in a repayment process, peer pressure among the MDI farmers can be expected.

(3) Concept of O&M Funds under I-HIMDI

O&M Funds under I-HIMDI will be a dedicated fund to carry out all non-capital activities required for maximising gains from I-HIMDI in the implementation and post implementation phase. The resource of O&M Funds is the pool of repayments from beneficial farmers.

The utilisation of O&M Funds is earmarked on expenses on repair and maintenance of MDI and associated components, such as vermin compost unit and nursery raising facility. Also it may be used for the following purposes:

- Repair of fencing, replacement of plastic mulch, erecting of vertical trellis, repair or replacement of pumps, agricultural tools used in MDI plots;
- Purchase of seeds, soluble fertilisers, plant growth hormones, plant protection chemicals, etc. may also be made from the fund;
- Similarly, operational cost required in postharvest activities such as sorting, grading, packaging, and other farm level value addition may also be taken up from this O&M Funds;
- Sourcing e-information for better price for MDI commodities, documentation of success in film, etc. may also be included; and

- Capacity building programmes linked with tangible improvement in adoption of technology, crop production, out- and up-scaling of project are helpful in achieving the objectives of the project so these may also be taken up.

Regarding application of agricultural insurance, there is no appropriate scheme available in Jharkhand as of July 2014. If the Government of Jharkhand (or the Government of India) would newly set up an appropriate scheme, it may be considered to use the O&M Funds for agricultural insurance with the consent of the MFG member farmers.

7.2.2 Promotion of Horticultural Production with MDI as Livelihood Options for Poverty Alleviation Programme

In the current NRLM programmes, the beneficiaries are to select and carry out various livelihood options based on their needs and aspirations identified through participatory livelihood mapping and detailed livelihood analysis. Since the horticultural production with MDI has been one of the prototype livelihood options in NRLM in Jharkhand, the activities initiated through I-HIMDI may continuously be carried out, as JSLPS would be able not only to accumulate vast experience in supporting horticultural production with MDI by smallholder farmers but also to obtain technical skills and expert manpower through the implementation of I-HIMDI. With these technical capacities, it is expected that horticultural production with MDI should further be promoted as part of other rural poverty alleviation programmes.

JSLPS has been the nodal agency for implementation of SRLM, in line with NRLM, the national flagship programmes for rural poverty alleviation, in which farm-based value chains and sustainable agriculture for small producers are considered as vital livelihood options. The society also served as the executing agency of the foregoing national programme of SGSY before it has been reorganised into NRLM upon commencement of the Twelfth Five-Year Plan period. It is thus anticipated that JSLPS would continue to serve at least as an implementing agency of whatever rural poverty alleviation programme the state government would implemented in the coming years, and that the experience from I-HIMDI may effectively be utilised in other poverty alleviation programmes to be implemented by JSLPS.

7.2.3 Organisational Upgrading and Linkage with Other Existing Schemes

The organisational upgrading of MFGs should be considered in longer term perspectives. As the SHGs are to be evolved and be linked up with VOs and then into cluster federations (CFs) in the future scenario anticipated under NRLM, I-HIMDI would also support the efforts made through NRLM to facilitate the SHGs to further enhance their organisational capacities to develop the structure to link them with organisations at the higher levels. With such structure, the members would avail more stable access to credit for their future activities.

Another direction for the MFGs to envisage their future development is to organise themselves into more objective-oriented institutions, such as vegetable grower cooperative societies and/or producer groups so that they could build linkages with various supportive programmes and schemes. As Department of Cooperation has operated various supportive programmes to cooperative societies and their federations for better marketing, the beneficiary farmers may avail benefits and services through market promotion platforms and facilities such as the ones provided under the current VEGFED

programme. As a single MFG would not cover wide membership, the process of developing themselves into such a larger and formal institution may take time. It is, however, worthy in the process of project implementation at least to provide necessary information on the merits of such organisations to motivate the MFGs, once they would reach to a certain stage in which they could manage effective group operations with successful horticultural production with MDI.

CHAPTER 8 ENVIRONMENTAL, SOCIAL, AND GENDER CONSIDERATIONS

8.1 Environmental Administration

8.1.1 National Environmental Laws and Policies

The environmental and social considerations of the project in India are largely governed by the national laws and policies, which are in effect adopted and implemented by the state governments. The list of important laws and policies is presented in Table 8.1.1.

Table 8.1.1 Related National Laws and Policies

No.	Act/Policy	Summary
1	Environment (Protection) Act, 1986 and Environmental Impact Assessment (EIA) Notification, 2006	This act is the umbrella legislation, which provides for a holistic framework for the protection and improvement of environment by preparation of manuals, codes, or guides for prevention, control, and abatement of environment pollution. EIA Notification governs all environmental clearances for projects mentioned in the Schedule of Notification.
2	Forest Conservation Act, 1980 (amended in 1988)	The act provides for the conservation of forests and regulation of diversion of forestlands for non-forestry purposes. When a project is located within forestlands or is going to use forestland, prior clearance is required from relevant authorities under the Forest (Conservation) Act, 1980. The state governments cannot de-reserve any forestland or authorise its use for any non-forest purposes without prior approval from the central government.
3	Water (Prevention & Control of Pollution) Act, 1974 (Amended in 1988)	This legislation has been enacted to implement measures for effective prevention and control of water pollution. It empowers the State Pollution Control Boards to undertake the required measures.
4	Air (Prevention and Control of Pollution) Act, 1981	This has been enacted to implement measures for effective prevention of air pollution through Pollution Control Boards.
5	Municipal Solid Wastes (Management and Handling) Rules, 2000	These rules include procedures for collection, segregation, storage, transportation, processing, and disposal of municipal solid waste.
6	Insecticide Act, 1968 (Act No. 46 of 1968)	Insecticide trade i.e., import, manufacture, sale and transport, stock and distribution of pesticides, is governed by this act.
7	The Fertilizer Control Order 1985	This is used to regulate the movement, quality assurance, and fair distributions of chemical fertilisers to the public.
8	Land Acquisition Act, 1894 (amended in 1984)	LAA provides a framework for facilitating land acquisition in India. It enables the state government to acquire private land for public purposes and ensures that no person is deprived of land except under the act.
9	National Conservation Strategy and Policy Statement and Development, 2002	This policy is a statement of commitment by the Ministry of Environment and Forestry (MoEF) for reorienting the existing policies and action with an environmental perspective so as to give a new thrust towards conservation and sustainable development. The strategies and action point set out for agriculture, horticulture, animal husbandry, and irrigation are reflected in the State Environmental Policy Guidelines.
10	The National Environment Policy, 2006	This policy seeks to fill in a gap that still exists; it does not displace but builds on the earlier policy. Its main concerns are the conversion of wetlands and forest land into agricultural land; adverse impacts from intensive agriculture, the adverse impacts of use of chemical fertilisers and pesticides.
11	The Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006	This act recognises and vests forest rights and occupation on forest land in forest dwellings to scheduled tribes and other traditional forest dwellers who have been residing in such forests for generations but whose rights could not be recorded. The act provides for a framework for recording the forest rights so vested and the nature of evidence required for such recognition and vesting in respect of forest land.

Sources: Preparatory Survey on ODA loan for Crop Diversification in Himachal Pradesh, Final Report (2010.3), Jharkhand Tribal Development Plan (2013)

8.1.2 State Level Environmental Laws and Policies

Jharkhand State level laws and policies related to I-HIMDI are summarised in Table 8.1.2.

Table 8.1.2 State Level Laws and Policies related to Social and Natural Environment

No.	Act/Policy	Summary
1	Jharkhand Panchayat Raj Act (JPRA), 2001	The Jharkhand Panchayat Raj Act, 2001 provides for the constitution and governance of the 3-tier Panchayat Raj system in the state i.e., <i>Village Panchayat</i> , <i>Panchayat Samiti</i> , and <i>Zilla Parishad</i> levels.
2	Provisions of Panchayat (Extension to Scheduled Areas) Act (PESA)	PESA, 1996 is a crucial act for local self-governance in scheduled areas. The Panchayat Raj Institutions at the district, <i>Panchayat Samiti</i> /block and village levels have been vested with special powers and responsibilities to ensure effective participation of the tribal people in their own development. The <i>Gram Sabha</i> /village assembly has been empowered by this act to govern their own traditional institutions, common property resources, etc.
3	Jharkhand State Water Policy, 2011	Jharkhand has launched its State Water Policy in 2011. It lays down approaches for 'better and more equitable and productive water resources management in an environmentally sustainable manner for promoting growth reduction in poverty and minimising regional imbalance'. It also aims to create incentives for water users' organisations and enables creation of new institutional mechanisms to decentralise water resource planning. The approach of water policy also includes promotion of technologies to improve efficiency in water usage and formulating appropriate legislations to support other approaches.
4	Jharkhand Energy Policy, 2012	In order to reduce its GHG emissions, Jharkhand adopted the Energy Policy, 2012 which specifies electricity generation through non-conventional energy sources. It gives a waiver of 50% of electricity duty for a period of 10 years for entities generating electricity from renewable sources and further concessional access to transmission and distribution network.

Sources: *Jharkhand Tribal Development Plan (2013) P31-35*, *Jharkhand Action Plan on Climate Change (2013) P25*

8.1.3 EIA Procedure and Environmental Clearance

The EIA Notification (2006) provides an industry-wise required procedure for environmental clearance. All projects and activities are classified into two categories based on the spatial extent of potential impacts on human health as well as on natural and man-made resources:

- (i) Category A: This is expected to have high potential impacts. It will need clearance from the designated central government level authorities.
- (ii) Category B: This is expected to have lesser potential impacts than Category-A projects. It will require clearance from designated state level authorities.

The environmental clearance process for new projects will comprise a maximum of four stages. These four stages in sequential order are shown below.



Source: *EIA Notification 2006*

Figure 8.1.1 Environmental Impact Assessment Stages

Once an application has been submitted by a project authority along with all the requisite documents specified in the EIA Notification, it is scrutinised by the technical staff of the ministry prior to placing it before the Environmental Appraisal Committees (EAC). The EAC evaluates the impact of the project based on the data furnished by the project authorities and if necessary, site visits or on-the-spot assessment of various environmental aspects are also undertaken. Based on such examination, the committees make recommendations for approval or rejection of the project, which are then processed in the ministry for approval or rejection.

Agriculture is not included in the schedule that requires prior environmental clearance (EC) in the EIA Notification (2006). Summary of the 'List of Activities Requiring Prior EC' is shown in Table 8.1.3. As mentioned by the Chairman of State Environmental Impact Assessment Authority (SEIAA), Jharkhand and State Project Director of Jharkhand State Pollution Control Board, it is not necessary to follow EIA procedure if the project activities are not included in this list.

Table 8.1.3 Summary of the List of Projects or Activities Requiring Prior EC

No.	Project Activity	Category with Threshold Limit		Conditions, if any
		A	B	
1	Mining- Extraction of natural resources and power generation (for a specified production capacity)			
2	Primary Processing (e.g., Coal washeries, mineral beneficiation)			
3	Materials Production (e.g., Metallurgical industries, cement plants)			
4	Materials Processing (e.g., Petroleum refining industries, coke oven plants)			
5	Manufacturing Fabrication			
	Chemical Fertilisers	All projects except single super phosphate	Single super phosphate	-
	Pesticides industry and pesticide specific intermediates (excluding formulations)	All units producing technical grade pesticides	-	-
6	Service Sectors (e.g., Oil and gas transportation pipeline)			
7	Physical Infrastructure including Environmental Services (e.g., airports, ports, highways)			
8	Building / Construction Projects / Area Development Projects and Townships			

Source: EIA Notification 2006

8.1.4 Related Agencies and Organisations

(1) Ministry of Environment and Forestry (MoEF), Government of India

(a) Outline

The MOEF is the nodal agency in the administrative structure of the central government for the planning, promotion, co-ordination, and overseeing the implementation of India's environment and forest policies and programmes. The primary concerns of the ministry are: (i) implementation of policies and programmes relating to conservation of the country's natural resources including its lakes and rivers, biodiversity, forests, and wildlife, (ii) ensuring the welfare of animals, and (iii) prevention and abatement of pollution. Whilst implementing these policies and programmes, the ministry is guided by the principle of sustainable development and enhancement of human well-being.

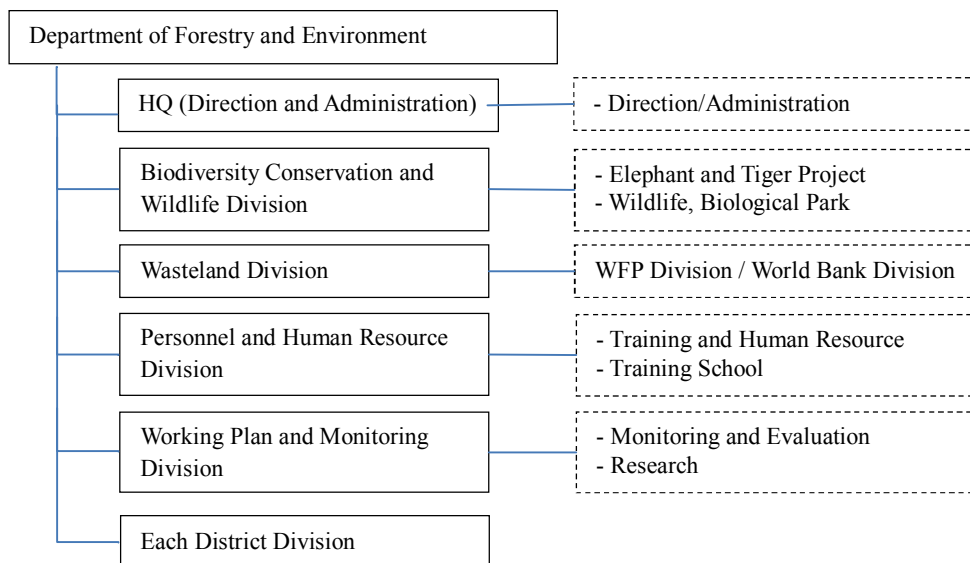
(b) Central Level / Impact Assessment Authority (IAA)

IAA is responsible for legislative development – preparation of guidelines and procedures, appraisal of EIA reports and projects, and granting approval for Category 'A' projects. As mentioned above, clearance is subject to the recommendation made by EAC to be constituted by the central government for the purpose of the EIA notification.

(2) Department of Forests and Environment (DoFE), Government of Jharkhand

The DoFE is housed in the Secretariat in Ranchi. All policy decisions are made at the secretariat level. Formulation of schemes for development, conservation, and growth of forests and wildlife, improvement of the living standard of villagers living in forest fringe areas, together with protection and monitoring of water and air from pollution, is done by the department at the secretariat level under the guidance of the state government. The department ensures the observance/compliance of provisions of

the different central and state acts/rules for development and conservation of forest and wildlife and protection of environment in the state. The organisational structure of the department is presented below.



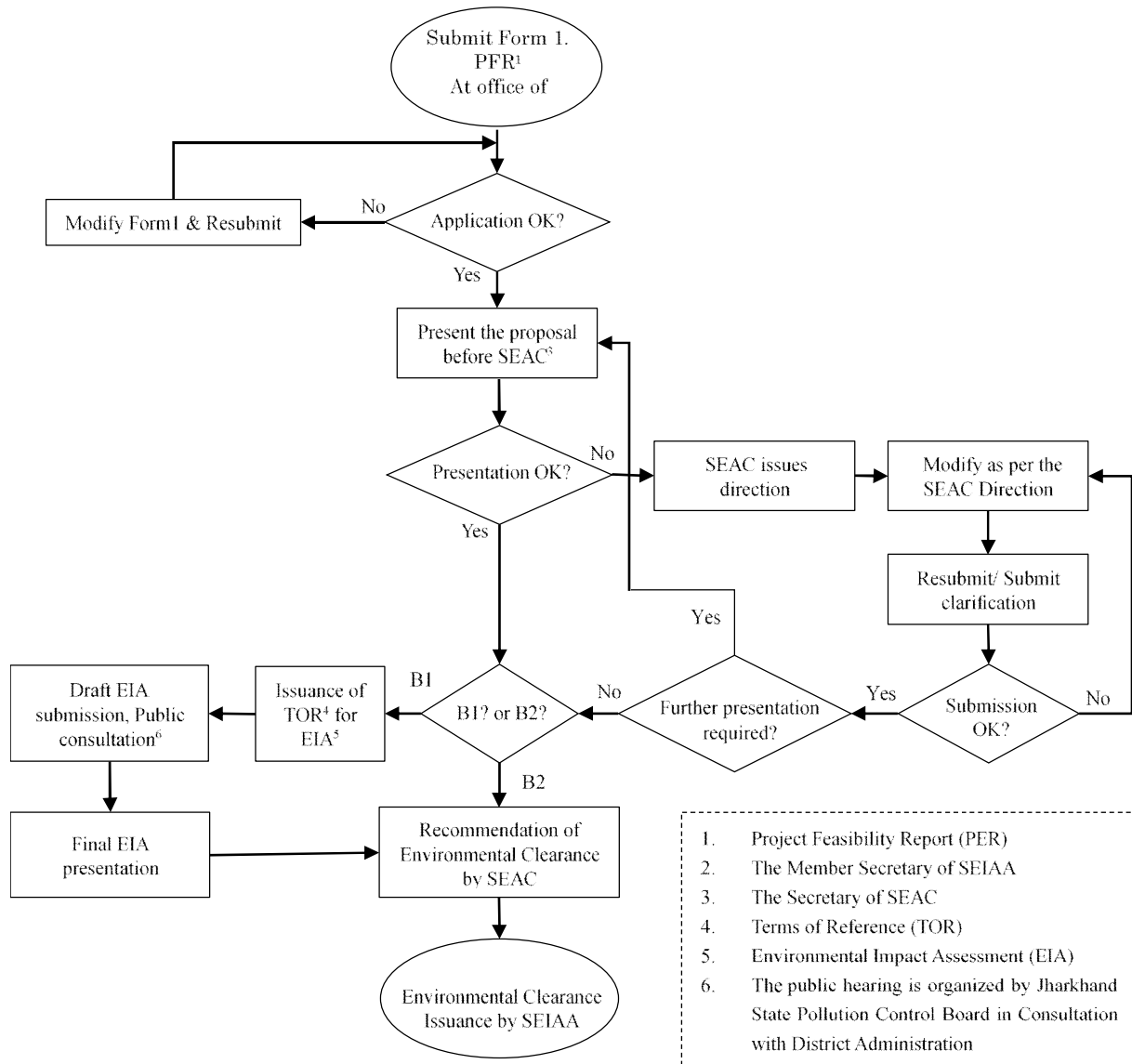
Source: JICA Survey Team

Figure 8.1.2 Organisational Structure of DOFE

(3) Jharkhand SEIAA and State Level Expert Appraisal Committee (SEAC)

To clear ‘B’ category industries/projects, the central government has decentralised the entire process of environmental clearance by creating an independent SEIAA supported by SEAC as per the Notification S.O. No. 255(E) dated 7 February 2011. SEIAA comprises three members and SEAC comprises six members and a secretary.

SEIAA and SEAC shall hold office for 3-year term from the date of notification, and exercise such powers and follow such procedures as enumerated in the said notification. SEIAA shall take its decision on the recommendations of the SEAC, and SEAC shall function on the principle of collective responsibility and endeavors to reach a consensus in each case. The process of Environmental Clearance Procedure set by SEIAA and SEAC is shown in Figure 8.1.3. EIA procedure and EC are not required if project activities does not fall under categories in EIA Notification 2006.



Source: Jharkhand State Level Environment Impact Assessment Authority (<http://www.jseiaa.org>)

Figure 8.1.3 Flowchart of EC Procedure at the State Level

(2) Jharkhand State Pollution Control Board (JSPCB)

Jharkhand State Pollution Control Board is the nodal agency in the state for controlling pollution and to implement the provisions of the Environment Protection Act and other associated acts and rules in the state. The functions of the board are provided under Section 17 of the Water (Prevention and Control of Pollution) Act, 1974 and the same section of the Air (Prevention and Control of Pollution) Act, 1981. JSPCB has its head office in Ranchi and regional offices cum laboratories in Dhanbad, Jamshedpur, Hazaribagh, and Deoghar. It also has a regional office in Tupudana, Ranchi and a central laboratory in Tupudana, Ranchi. In total, it has 94 regular employees and 64 casual employees.

(3) Jharkhand Tribal Development Society (JTDS)

JTDS is a society formed under the Department of Welfare, Government of Jharkhand. JTDS has been responsible for the implementation of Jharkhand Tribal Development Program (JTDP) and Jharkhand Tribal Empowerment and Livelihood Project (JTELP) funded by the International Fund for Agricultural Development (IFAD). JTDP was launched in April 2003 to reach out to 382 villages covering

22,600 households in eight years (up to 2011). JTELP is an 8-year project which started in October 2013 and implemented in Ranchi, Khunti, Gumla, Simdega, West Singhbhum, East Singhbhum, Saraikela-Kharsawan, Latehar, Godda, Dumka, Pakur, Sahibganj, and Jamtara districts. The project will target 136,000 households including tribal households, approximately 10,000 primitive tribal groups (PTGs), woman-headed households, rural youth, and below poverty line households (BPL). The project will ensure full participation of women in different project activities through self-help groups (SHGs).

8.2 Policy and Method of the Survey following JICA Guidelines (April 2010)

For the environmental and social considerations (for Category FI Project) as mentioned in the JICA Guidelines 2010 the methods and processes followed during the survey are shown in Table 8.2.1.

Table 8.2.1 Policy and Method of the Survey

	JICA Environmental and Social Consideration Guidelines (2010)	Policy and Method of the Survey
Environmental Review (Category FI)	1. JICA examines the related financial intermediary or executing agency to see whether appropriate environmental and social considerations as stated in the guidelines are ensured for projects in this category. JICA also examines the institutional capacity in order to confirm environmental and social considerations of the financial intermediary or executing agency, and, if necessary, requires that adequate measures be taken to strengthen capacity.	<p>(a) To obtain consent from the Jharkhand State Livelihood Promotion Society (JSLPS) or the Rural Development Department (RDD), the JICA Survey Team explained the summary of JICA Environmental and Social Consideration Guidelines 2010 and the environmental procedure for this project categorised as FI from the planning stage.</p> <ul style="list-style-type: none"> - <u>Checking the related laws and policies. Set meeting and discussion with or RDD, DoFE, and SEIAA/SEAC, related agencies.</u> <p>(b) Considering the implementation of capacity strengthen/development training for JSLPS or RDD of GoJ during this study, if necessary.</p> <ul style="list-style-type: none"> - <u>Confirmation of organisational structure and current situation. Preparation of the Environmental and Social Management System (ESMS) checklist.</u>
	2. The financial intermediary or executing agency examines the potential positive and negative environmental impacts of subprojects and takes the necessary measures to avoid, minimise, mitigate, or compensate for potential negative impacts, as well as measures to promote positive impacts, if any such measures are available.	<p>(a) Since the beginning of this study, positive and negative impacts will be confirmed and then some mitigation measures will be listed up, if necessary.</p> <ul style="list-style-type: none"> - <u>Confirmation of the contents of subprojects and evaluation of predicted impact and consideration of mitigation measures.</u> <p>(b) Affected groundwater and soil contamination by using pesticide and fertiliser (land acquisition and resettlement, in case) will be predicted as adverse impact by setting drip irrigation facilities.</p> <ul style="list-style-type: none"> - <u>Confirmation of component of subprojects and results of water quality survey.</u>
	3. In principle, JICA undertakes environmental reviews and information disclosure for the subprojects prior to their implementation in a same manner as specified for Category-A projects, if those subprojects are likely to be under the cooperation projects.	<p>(a) If subprojects will be classified as Category-A, necessary procedure will be confirmed and implemented promptly.</p> <ul style="list-style-type: none"> - <u>Checking the related laws and policies. Meeting and discussion with JSLPS or RDD, DoFE, and SEIAA/SEAC, related agencies.</u> <p>(b) If there is no clarity on the category of subprojects to be adopted, the JICA Survey Team will explain about the JICA Guidelines and related environmental procedure to JSLPS or RDD. In addition, the JICA Survey Team will mention about such situation in the study report.</p> <ul style="list-style-type: none"> - <u>Discussion with JSLPS or RDD/GoJ about EIA procedure and environmental clearance.</u>

	JICA Environmental and Social Consideration Guidelines (2010)	Policy and Method of the Survey
	4. JICA discloses the results of environmental reviews on its website after concluding agreement documents.	(a) If subprojects will be classified as Categorised-A, necessary procedure will be confirmed and implemented promptly. <ul style="list-style-type: none"> - <u>Checking the related laws and policies. Meeting and discussion with JSLPS or RDD, DoFE, and SEIAA/SEAC related agencies.</u> (b) If there is no clarity on the category of subprojects to be adopted, the JICA Survey Team will explain about the JICA Guidelines and related environmental procedure to JSLPS or RDD. In addition, the JICA Survey Team will mention about such situation in the study report. <ul style="list-style-type: none"> - <u>Discussion with JSLPS or RDD/GoJ about EIA procedure and environmental clearance</u>
Forest Dweller	1. Any adverse impacts that a project may have on forest dwellers are to be avoided when feasible by exploring all viable alternatives. When, after such an examination, avoidance is proved unfeasible, effective measures must be taken to minimise impacts and to compensate indigenous peoples for their losses.	(a) Collect information related to forest dwellers (scheduled tribe (ST) & scheduled caste (SC), PTGs) from JSLPS or RDD-GoJ and the Department of Forestry and Environment. (b) Discussion and meeting with agencies or organisations working with ST&SC and PTGs. (c) Confirmation of related national and states laws and policies. (d) Consideration of positive and negative impacts. (e) Obtain opinions from NGOs, if necessary. (f) The Forest Dwellers Development Framework (FDDF) will be prepared. It shall ensure consistency between FDDF and the project components. Those contents that should be described on FDDF are as follows: <ul style="list-style-type: none"> - <u>The types of programmes and subprojects likely to be proposed for financing under the project.</u> - <u>The potential positive and adverse effects of such programmes or subprojects on forest dwellers (ST&SC and PTGs).</u> - <u>A plan for carrying out the social assessment for such programmes or subprojects.</u> - <u>A framework for ensuring free, prior, and informed consultation with the affected forest dwellers (ST&SC, PTGs) communities at each stage of project preparation and implementation.</u> - <u>Institutional arrangements (including capacity building where necessary) for screening project-supported activities, evaluating their effects on forest dwellers (ST&SC, PTGs) preparing the FDPs, and addressing any grievances.</u> - <u>Monitoring and reporting arrangements, including mechanisms and benchmarks appropriate to the project.</u> - <u>Disclosure arrangements for FDPs to be prepared under the FDDF.</u>
	2. When projects may have adverse impacts on forest dwellers, all of their rights in relation to land and resources must be respected in accordance with the spirit of relevant international declarations and treaties, including the UN Declaration on the Rights of Forest Dwellers. Efforts must be made to obtain the consent of forest dwellers in a process of free, prior, and informed consultation.	
	3. Measures for the affected forest dwellers must be prepared as a Forest Dwellers Plan (FDP) (which may constitute a part of other documents for environmental and social consideration) and must be made public in compliance with the relevant laws and ordinances of the host country. In preparing the FDP, consultations must be made with the affected forest dwellers based on sufficient information made available to them in advance. When consultations are held, it is desirable that explanations be given in a form, manner, and language that are understandable to the people concerned. It is desirable that the FDP include the elements laid out in the World Bank Safeguard Policy, OP4.10, Annex B.	

Sources: JICA Environmental and Social Guidelines 2010, World Bank Operation Policy 4.10

8.3 Predicted Environmental and Social Impacts

8.3.1 Environmental and Social Conditions

(1) Natural Capitals

A major part of Jharkhand falls in Chota Nagpur plateau. Most of the land of the state is undulating. The western region (Ranchi, Lohardaga, and Palamu) is hilly in nature compared to the east. The Parasnath Hill, at a height of 4,480 feet is the highest peak of the state and is a major *Jain* pilgrimage centre. The undulating topography created several river basins and valleys; and partly explains the low reach of social and economic services to the remote areas. A brief overview of the natural capital of the state is presented in Table 8.3.1.

Table 8.3.1 Overview of the Natural Capital of Jharkhand

Items	Summary
Land use	Geographical area 79,700 km ² , Forest area 23,605 km ² (29.61%), Barren and uncultivated area 5,730 km ² (7.19%), Cultivable waste land 2,740 km ² (3.44%), Permanent pasture and other grazing land 874 km ² (1.10%).
Rainfall	On an average, the state gets 1200 mm rainfall a year. About 80% of this rainfall is from the south-west monsoon and is during June-September months. The western part gets slightly less rainfall compared with the eastern part. Further, the variability is also higher in the western region, from the comparison of a 30-year rainfall data of Garhwa (western region) and Godda (eastern region) districts.
Forest	The state is endowed with rich forests that yield a variety of products. Forests in Jharkhand extend over 23,605 km ² representing 29.61% of the total geographical area of the state of which 82% is protected forest and 17.5% is reserve forest. A small 33.49 km ² is unclassified forest. Dense, thick forests are mostly found in the western parts and north central parts of the state. About 93% of the forest area of the state is managed by 10,903 Joint Forest Management (JFM) committees. About 1.28 million families are involved in JFM, of which 0.51 million belong to scheduled tribes. Jharkhand has one national park and ten wildlife sanctuaries covering 2.6% of total geographic area of the state. The Palamu Tiger Reserve is also located in the state. The forests in Jharkhand yield several NTFP items. However, only a few of them are commercially exploited.
Environment (Pollution)	Jharkhand is suffering from environmental degradation. There are several factors such as degradation of forest, mining, air pollution, water pollution, and noise pollution. Ranchi's air pollution level is more than 200 units above the permissible limit. The exhaust from burning fuels in automobiles, homes, and industries is a major source of pollution in the air. Water pollution is another area, which needs immediate attention. It occurs when a body of water is adversely affected due to the addition of large amount of materials to the water.
Minerals	Jharkhand is endowed with rich mineral resources. It contributes to nearly 40% of total mineral production of the country. The coal production is 32.09%, iron ore is 31.84%, copper ore is 25.94%, pyrite is 90.98%, graphite is 57.47%, and kyanite is 8.33%. In addition to these minerals, the state also produces other metals and atomic minerals. The intensity of mining activity is putting the region under tremendous ecological stress.

Sources: Survey for Horticulture Intensification by Micro Drip Irrigation (MDI) Final Report III, December 2012 and Inside Jharkhand 5th Edition. 2014

(2) Physical Capital/Infrastructure

Brief overview of physical capital/infrastructure related to housing, drinking water, electrification, and roads are presented below.

Table 8.3.2 Overview of Physical Capital/Infrastructure

Items	Summary
Housing	In rural areas of the state, people largely live in <i>Kuchha</i> houses made of timber, bamboo, mud, tiles, bricks, etc. Better off people in the villages live in <i>Pucca</i> or <i>Semi-pucca</i> houses. Community buildings

Items	Summary																					
	are rare. People store agricultural produce in their houses and there is no community infrastructure for storage. Community storage spaces are required.																					
Drinking Water	<table border="1"> <thead> <tr> <th>Item</th> <th colspan="2">All</th> <th colspan="2">SC</th> <th colspan="2">ST</th> </tr> <tr> <td>Access to drinking water within the premises</td> <td>Urban</td> <td>Rural</td> <td>Urban</td> <td>Rural</td> <td>Urban</td> <td>Rural</td> </tr> </thead> <tbody> <tr> <td></td> <td>9.7</td> <td>57.2</td> <td>6.0</td> <td>34.3</td> <td>3.6</td> <td>39.7</td> </tr> </tbody> </table> <p>SC: Scheduled Caste, ST: Scheduled Tribe (figures represent %)</p>	Item	All		SC		ST		Access to drinking water within the premises	Urban	Rural	Urban	Rural	Urban	Rural		9.7	57.2	6.0	34.3	3.6	39.7
Item	All		SC		ST																	
Access to drinking water within the premises	Urban	Rural	Urban	Rural	Urban	Rural																
	9.7	57.2	6.0	34.3	3.6	39.7																
Electrification	Only 31.5% of the villages in Jharkhand are electrified. Lack of electricity is a big challenge for the promotion of enterprises in the rural areas. It is learned that the quality of power available needs a lot of improvement before the poor can start using electricity for their livelihood enterprises.																					
Roads	The national highway network in the state is about 1,600 km; state highways measure about 2,711 km. A 352 km long four-lane highway connects Barhi-Ranchi to Baharagora. Another 447 km long highway connects the Uttar Pradesh border near Garhwa to Jainitgarh near Orissa border in the south. The state, however, lags behind in rural connectivity. To address this issue, many projects have been included in the Pradhan Mantri Gram Sadak Yojana (PMGSY), which was launched in December 2000.																					

Sources: Survey for Horticulture Intensification by Micro Drip Irrigation (MDI) Final Report III, December 2012 and Inside Jharkhand 5th Edition. 2014

(3) Social Capital

A brief overview of the social capital of Jharkhand is summarised in Table 8.3.3 below.

Table 8.3.3 Overview of Social Capital of Jharkhand

Items	Summary
Population	The population of Jharkhand, according to the 2011 Census, stood at about 32 million, making it the 13th most populated state in India. The state makes up about 3.5% of the country's population a figure which was about 3% during the last census in 2001. The density of population per sq. km. is about 414, which is above the national average by 30 points. The state has a growth rate of about 22% which slightly exceeds the national growth rate of about 17%. The population of the state is raising considerably more due to the lack of education and lack of understanding about family planning.
Literacy	Literacy rate in Jharkhand has been in an upward trend and is 67.63% as per 2011 Census. Male literacy stands at 78.45% whilst female literacy is at 56.21%. In 2001, literacy rate in Jharkhand stood at 53.56% of which male and female literates were 63.83% and 38.87%, respectively.
Labour	Most of the workforce in the state is engaged in agriculture, wage labour, collection and sale of forest products, animal husbandry, household industry, mining, and quarrying. Employment in the service sector and in different industries is generally limited to urban industrial pockets. As per Census 2001, 10.1 million out of total population of 26.9 million comprised the workforce. Of this, about 64% are main workers. About 150,000 people were employed in the private organised sector at the end of 2005.
Health	There are 4,462 health sub-centres, 368 additional primary health centres (APHCs), 193 blocks primary health centres (PHCs), 37 referral hospitals, 22 district-level hospitals, ten subdivision hospitals, and three medical college hospitals. However, there are critical gaps such as shortfall of 30% in PHCs, inaccessibility of the health facilities due to terrain, and shortage of health care professionals. Diarrhea and fever are the major health problems for the people in Jharkhand. Overdose of the common medicines has also been reported.
Migration	Dry land agriculture coupled with food insecurity, drives people out of their homes in search of alternative employment. Labour migration is common in Jharkhand. Migration is of three kinds; (i) migration to nearby areas and for short-term agricultural labour, (ii) migration to West Bengal and North-East India for wage work in tea plantations, and (iii) migration to other cities such as Varanasi, Mumbai, Hyderabad, Gorakhpur (for manual casual wage labour/domestic servants/construction workers/rickshaw pulling/hotels).
Local Level Institutional and Political Set Up	There are three tier Panchayat Raj Institutions (PRIs) in Jharkhand. Elections were held for PRIs after 32 years (Bihar) and after a decade of the formation of Jharkhand State. The capacity of the elected representatives is limited as they are the first generation PRI leaders.

Sources: Survey for Horticulture Intensification by MDI Final Report III, December 2012 and Inside Jharkhand 5th Edition. 2014

The outline of the 12 districts targeted by the project is given in Table 8.3.4 below.

Table 8.3.4 Outline of the 12 Districts Selected for I-HIMDI

No.	District	Natural and Social Conditions
1	Giridih	Giridih is an old district and was carved out of Hazaribagh in 1972. The climate is semi-tropical with varying temperatures. The district contains a large portion of forested area. The district is famous for well-known Ruby-Mica and has several large coalfields, which contain one of the best qualities of metallurgical coal in India.
2	Pakur	Pakur is a hilly district with certain pockets of plain land. Topographically, it is divided into three parts. A narrow continuous strip of alluvial soil which lies in this district is very fertile. The rest of the area is less conducive for agricultural operation.
3	Lohardaga	The inhabitants of this district mainly depend on agriculture, forest produce, and seasonal migration. Around 80% of the population depends on agriculture. The main crop of this area is paddy. There is a vegetable growers' cooperative in the district. A cold storage is available, which is linked with larger vegetable markets. There are many tourist places including the new and old forts of Palamu.
4	Palamu	Autochthonous tribes probably inhabited the area in the past. Oraon tribe occupies the majority in the district followed by Kharwar and Chero. There are many minerals available in the district and also many tourist places in Palamu. The famous Betla National Park is spread over 1,250 sq km and is famous for its wildlife.
5	Latehar	Latehar is surrounded by hills, forests, and flowing rivers. Around 65% of the total area of the district is covered with forest. The economy of Latehar is agriculture-based. About 90% of the cultivable land is unirrigated.
6	Hazaribagh	Hazaribagh is very rich in minerals (mica and coal). Many important industries such as thermal power station, glass factory and steel, and institutions like colleges, universities, Tax Regional Training Center, and Police Training Collage are located in the district. There are some important tourist places such as Narsingthan Temple and National Park.
7	Dumka	Dumka is an old district of the Santhal Pargana. It is forest clad and hilly. There are many small rivers in the district, which join the Ganges. Dumka has predominantly undulating terrain with hard rocks in the underground. The fertility of soil is poor due to extensive erosion, acidic character, and low retaining capacity.
8	Ranchi	Most of the area is plateau. The average height of the division is 600 m MSL. Its main crop is paddy but in recent years it has become major producer of vegetables. Ranchi has many industries in the public and private sectors like Heavy Engineering Corporation, Ball and Needle Bearing, Cement Ltd, etc., also it has most civic amenities of a modern town. The population is around 3,000,000.
9	Khunti	The district was carved out of Ranchi District in 2007. The population is around 530,000.
10	Gumla	Gumla has many tourist attractions such as Anjan and Tanginath, and picturesque waterfalls. The district is very rich in minerals particularly in bauxite and limestone.
11	Pashchimi Singhbhum	The district is full of hills alternating with valleys, steep mountains, and deep forests on the mountain slopes. The district contains one of the best Sal forests, and the Saranda forest area is known all over the world. Scenically, it is beautiful with water holes and contains wildlife like elephants, bison, and rarely found tigers. But their numbers are decreasing in the forests adjoining habitation.
12	Saraikela-Kharsawan	Surrounded by lush green forests, hillocks serpent like rivers and rivulets. The district is not only rich in cultural heritage but also has large deposit of minerals like kyanite, asbestos, quartz, and other valuable minerals.

Source: *Inside Jharkhand 2014, 5th Edition*

8.3.2 Outline of Subprojects

The MDI package shall be the main subproject component of the project. The following table presents the details of the subprojects to be implemented. The exact location of some of the subprojects and beneficiaries will be identified in the implementation stage of the project.

Table 8.3.5 Outline of the Subprojects of I-HIMDI

Sub-project Items	Micro Drip Irrigation (MDI)	Poly Nursery House (PNH)	Vermin Compost Production Unit (VCU)	Multi-purpose Community Centre	Zero Energy Cool Chamber (ZECC)	Agri-culture Tools	Market Centre (Godown cum Cold Storage)	Farmer Support Programme – Training and Extension
Location	Approx. 2,400 villages – to be identified during implementation stage			To be identified during implementation stage			Near Ranchi to be identified during implementation stage	Approx. 2,400 villages – to be identified during implementation stage
Quantity	60,000 units	60,000 units	60,000 units	38 sites	2,400 sites	1,200 sets	1 site	60,000 farmers
Sensitive Area: Forest Dwellers	Negligible - this has to be identified during the selection of target villages and SHGs							

Source: JICA Survey Team

8.3.3 Predicted Environmental Impact and Mitigation Measures

The potential environmental concerns/impacts and some suggested measures for their mitigation are presented in the table below.

Table 8.3.6 Potential Environmental Concerns and Mitigation Measures

Subprojects	Physical Target	Environmental Concerns/Impacts	Mitigation Measures
MDI (Individual farmer level for 0.1 ha area)	60,000 units	<ul style="list-style-type: none"> The environmental concerns in case of MDI are minimal and likelihood of facing the following concerns is very less. Efforts have been made here to flag off these concerns to help the Project Executing Agency to prevent them. It is well understood that the MDI shall reduce (i) the consumption of water and fertiliser, (ii) loss of soil nutrients, (iii) occurrence of diseases, and (iv) increase the productivity. Chemical and bacteriological contamination of water source/wells may affect the soil and the crop. Increased and consistent use of plastic for mulching may create the problems of pollution and waste disposal. There may be an increased use of fencing materials such as poles, bamboo, branches of trees as in many villages the animals are left free for grazing especially after the harvesting of <i>kharif</i> crop. The increased use of fencing materials may increase the pressure on the nearby forest. There may be instances of clearing of forest or felling of trees for increasing the area under agriculture. Inappropriate use of 	<ul style="list-style-type: none"> An overall strategy for environmental management needs to be developed for the project, which shall include efforts for water conservation, limited use of chemical fertilisers and pesticides, waste management and addressing other environmental concerns. Each district/cluster shall have to prepare an overall estimate of the use of water, fertilisers, plastics, and accordingly, develop strategy for resource conservation and management, protection of environment, and sensitisation of MDI farmers groups (MFGs) and SHGs on green environment. Adequate efforts need to be planned as part of the overall strategy to harvest the rain water, recharging the wells, groundwater and proper management of water resources. The Environmental Management Plan (EMP) shall be prepared as part of the MDI Plan to emphasise protection of environment and monitoring of different environmental features periodically. An environmental monitoring checklist shall be prepared to assist the community resource persons (CRPs) and MDI Farmers Group to monitor the maintenance of MDI, well/water source, farm, use of forest produce, or forestland, etc. Every year the CRPs shall collect the soil and water samples to test the quality of soil and water, and accordingly, corrective measures shall be taken up. MFG and SHGs shall monitor the use of fencing materials, felling of trees from the forest, and the farmers shall be motivated to use the weed and dried branches for fencing. MFG and SHGs shall be motivated to initiate protection of forest located close to their village/habitation. Farmers shall be motivated to plant trees and

Subprojects	Physical Target	Environmental Concerns/Impacts	Mitigation Measures
		<p>fertilisers and poor adherence to fertigation schedule may create adverse environmental impact as well as influence the productivity. The farmers have to travel far to purchase fertilisers for fertigation so when they are unable to procure it they use the fertilisers available in the local market.</p> <ul style="list-style-type: none"> Use of substandard pipe and other accessories may create environmental problems. 	<p>bamboo on their farmland/farm bunds/homestead so that they can get the fencing materials as well as fuel wood from their own land in the future.</p> <ul style="list-style-type: none"> The Project Staff including the CRPs shall ensure that the required fertilisers are available to the farmers on a timely manner and the CRPs shall monitor the adherence of fertigation schedule by the farmers. Norms and standards for MDI instruments and accessories shall be prepared, and accordingly the Contractors shall be asked to install the MDI. Training manual shall include all technical details of MDI installation, use, and maintenance. The CRPs shall be technically trained to supervise the process of installation. After the verification by CRPs and Field Organiser, the farmer shall certify the completion of installation.
PNH (Individual farmer level)	60,000 units	No negative impact on the environment is expected.	The farmers shall be motivated to maintain the poly nursery house properly and the SHGs as well as CRPs shall monitor it.
VCU (Individual farmer level)	60,000 units	No substantial negative impact on the environment is expected. Rather it would help in waste disposal – the unused leaf litter shall be used for vermin-compost. It would reduce the use of chemical fertilisers. The only concern is that there may be an increase in the use of plastic.	In case of use of plastic, the disposal of plastic shall be properly managed. SHGs have to monitor the disposal of plastic.
ZECC	2,400 sites	No negative impact on the environment is expected.	
Multi-purpose Community Centre (Cluster level)	38 sites	No negative impact on the environment is expected as these are very small construction activities (50 sq m) and a large part of the centre shall be kept as an open space for meetings. There may be some use of timber in the construction, which may or may not be collected from the nearby forest.	The MFG/SHGs shall ensure that there is no felling of trees from the forest for such construction activities.
Agriculture Tools (Village level)	1,200 sets	No negative impact on the environment is expected.	SHGs may propose for sprayers. The farmers may use sprayers for application of chemical fertilisers and pesticides. The SHGs with the help of CRP shall monitor the use of chemical fertilisers and pesticides.
Training and Capacity Development	All MDI farmers and SHGs supported by the project	No negative impact on the environment is expected.	
Market Centre (Godown cum Cold Storage)	1 site	No negative impact on the environment is expected as it is a small construction activity of 100 sq m	

Source: JICA Survey Team

Table 8.3.7 below presents the social concerns of the project.

Table 8.3.7 Social Concerns and Mitigation Measures

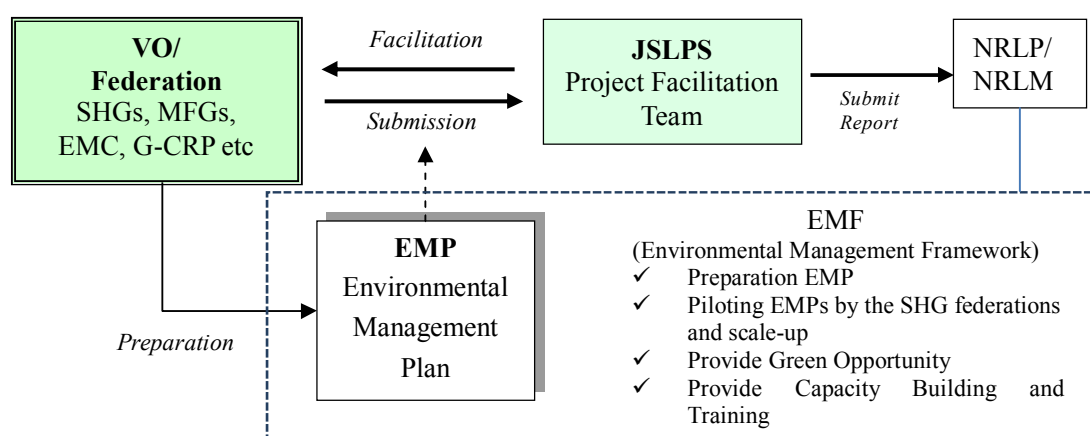
Subprojects	Physical Target	Social Concerns/Impacts	Mitigation Measures
MDI (Individual farmer level for 0.1 ha area)	60,000 units	<ul style="list-style-type: none"> Basic eligibility criteria for selection of MDI farmers shall exclude: a) small and marginal farmers/family members who are not part of any SHG, (i) small and marginal farmers who do not have wells and lifting devices, and (ii) marginal farmers who cannot afford to invest or take loan to pay for the contribution part. This would lead to exclusion of poor farmers, who are interested to go for vegetable farming. The elite and influential farmers may become the priority beneficiaries of the project. They may influence the decisions of the SHGs. SHGs are constituted by women and farmers who are largely men members of their families shall get the benefits. How far the SHGs shall have control over MDI Farmers' Group in a village to adhere to the environmental and social norms and standards is questionable. In some cases, forest dwellers, who subsist mostly on cultivation of forestland and/or collection and sale of forest produces, shall be excluded by the project. 	<ul style="list-style-type: none"> The eligible farmers who are not part of any SHG may be included in the existing SHGs or new SHGs may be formed under different schemes of JSLPS. So the project, in some cases, might have to support new SHGs or one year old SHGs. Necessary emphasis shall have to be given to these SHGs for institutional development. Adequate efforts have to be taken for social mobilisation and institutional development of SHGs to address the concerns of elite capture and effective coordination between the SHGs and MFG. The field organisers and CRPs have to consistently work with the SHGs and MDI Farmers Groups for institution development. For the small and marginal farmers, who do not have wells, the Executing Agency may help them to dig wells sourcing funds from other schemes such as Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA). Farmers, who don't have pumps, may be provided loan from the revolving fund or linked to the financial institutions/support agencies to procure pump. The CRPs and field organisers (FOs) may help the forest dwellers to access right over forestland under Forest Rights Act 2006 and then subsequently they may be supported under the project for vegetable cultivation. If the land is not suitable for MDI/ vegetable cultivation then the Executing Agency may help them access benefits from other projects and schemes. The forest dwellers who can't be associated with the project as MDI farmers may be given priority to work in the farms as wage labour; the project may promote them as entrepreneurs to supply different farm inputs and also help in primary processing and marketing; since the MFG shall have a better access to market it may help the forest dwellers to market their forest produces (NTFPs).
PNH (Individual farmer level)	60,000 units		
VCU (Individual farmer level)	60,000 units		
ZECC	2,400 sites		
Multi-purpose Community Centre (Cluster level)	38 sites	Community centre shall be constructed at the cluster level and if it is not properly managed it may not benefit the small and marginal farmers.	The Executing Agency needs to develop guidelines for construction and proper use of the community centres. It should be managed in such a way that the small and marginal farmers are benefited by these centres.
Agriculture Tools (Village level)	1,200 sets	SHG members other than MDI farmers may or may not be able to use the agricultural tools.	SHGs may develop rules to ensure that all the members who require the agricultural tools may use them.
Training and Capacity Development	All MDI farmers and SHGs supported by the project	Farmers other than MDI users may be left out by the project whilst organising any training and capacity building programme.	The Executing Agency may consider providing training to all interested farmers in addition to the MDI farmers, whilst the training programmes are organised within the village or in the cluster.
Market Centre (Godown cum	1 site	The detailed management of the infrastructure is yet to be articulated.	

Subprojects	Physical Target	Social Concerns/Impacts	Mitigation Measures
Cold Storage)			

Source: JICA Survey Team

8.4 Environmental and Social Management System (ESMS) Arrangement

The National Rural Livelihood Mission (NRLM) conducted a study on environmental management related to the project with the objective of understanding the environmental conditions and the related legal/regulatory framework in their target states. It presents an Environmental Management Framework (EMF) with a strategy to manage adverse environmental impact of livelihood activities and thereby secure livelihood for the poor. JSLPS does not have any separate division/wing to work on environmental aspects now but eventually it is planned to set up an Environmental Division. Therefore, JSLPS will largely follow the EMF of NRLM for the implementation of the I-HIMDI Project. The EMF will be applicable to subprojects to be implemented by MFGs. The EMF shall guide the preparation of EMP by the village organisation (VO) and MFG with the support of the Project Facilitation Team (PFT – Technical officer (TO), FO, and CRP). It will be prepared prior to the implementation of subproject. The role of each organisation/institution and ESMS flow is shown in Figure 8.4.1 below.



Source: JICA Survey Team

Figure 8.4.1 Environmental and Social Management System Flow in JSLPS

The EMP would identify resources, livelihoods, and potential environmental impacts; and indicate measures to secure these livelihoods. The EMP would be a dynamic plan which would be reviewed and modified periodically to incorporate new green solutions that may generate green enterprises and jobs (environmentally-friendly solutions).

This approach would not only shift the onus to the community to manage the environment but would also build their skills and knowledge even after project period. Thus, this strategy would result in a massive and wide-spread transfer of knowledge and skills in the area of environmental management.

A checklist on ESMS has been provided in Attachment 8.4.1. JSLPS and VOs/MFGs would modify and update these contents prior to this project and where necessary. The JICA's checklist on Environmental and Social Considerations in Agriculture has been provided in Attachment 8.4.2.

8.4.1 ESMS Activities and Time Frame

The basic objective of ESMS is to ensure that the environmental and social considerations are adequately addressed during the implementation of the project. The activities to be taken up under ESMS are given below.

- Preparation of overall strategies for addressing the potential environmental and social concerns.
- Drafting of guidelines for the preparation of EMP.
- Drafting of guidelines for the preparation of Forest Dwellers Development Plan (FDDP) (a separate note has been prepared on the FDDF).
- Capacity building of project staff as well as communities to identify potential concerns, preparation of EMP, monitoring of environmental and social safeguards, etc.
- Preparation of EMP at the village/habitation level and FDDP, if necessary.
- Periodical monitoring of environmental and social concerns and implementation of corrective measures, if needed.
- Facilitation of environmental audit with the help of specialized agencies.

The following Table 8.4.1 presents the project implementation schedule for ESMS.

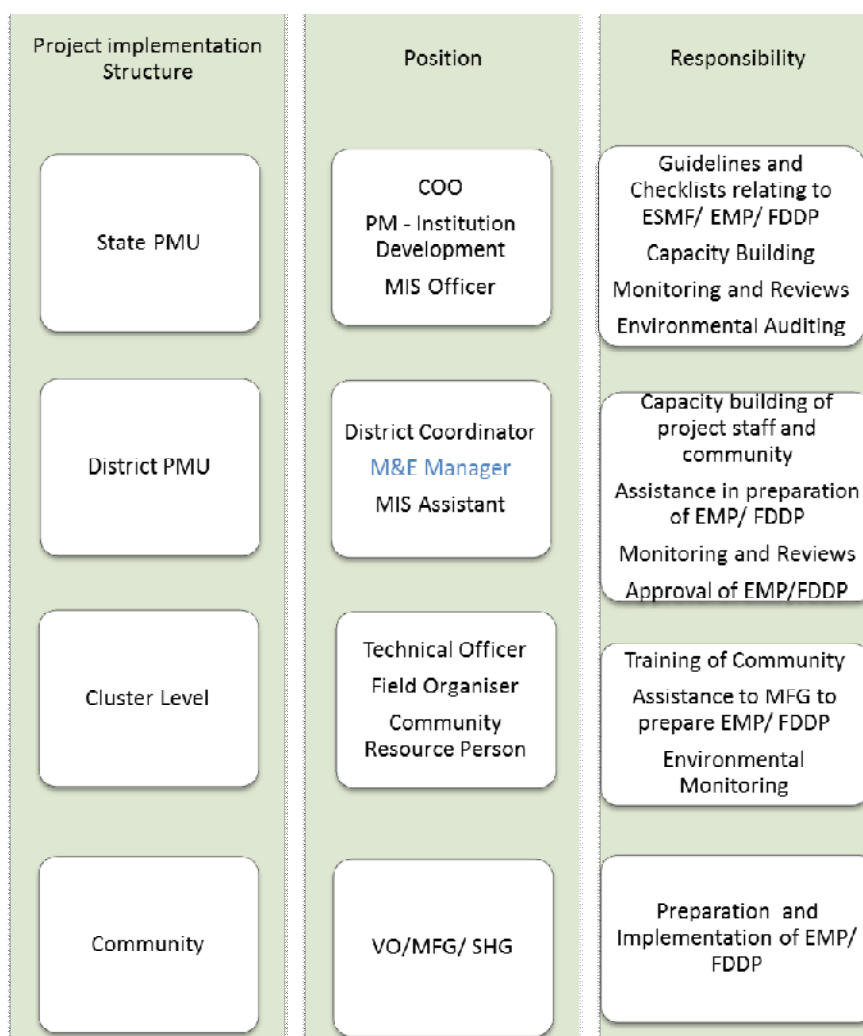
Table 8.4.1 ESMS - Activities and Time Frame

No.	Activity	Project Implementation Schedule						
		Yr1	Yr2	Yr3	Yr4	Yr5	Yr6	Yr7
1	Finalisation of the Environmental and Social Management Framework and the Strategies for Environmental and Social Considerations							
2	Guidelines including the format and checklist for the preparation of EMP and MDI Plan							
3	Training of project staff on the implementation of ESMF and preparation of EMP, environmental monitoring, and monitoring of social concerns, etc.							
4	Training of Community - VOs/ MFGs/ SHGs on the preparation and implementation of EMPs and MDI plans							
5	Preparation of overall strategy for environmental and social considerations at the district level - incorporation of the strategy in the project implementation plan (PIP) and annual action plans (AAPs)							
6	Preparation of EMP and MDI plans at the community level							
7	Monitoring of environmental and social concerns and reporting by the project staff and community							
8	Environmental auditing by specialized agencies							

Source: JICA Survey Team

8.4.2 Institutional Arrangement for the Implementation of ESMS

Institutional arrangement for the implementation of ESMS is shown in Figure 8.4.2 below.



Note: PMU = Project Management Unit, COO = Chief Operating Officer, MIS = Management Information System

Source: JICA Survey Team

Figure 8.4.2 Institutional Arrangement for Implementation of ESMS

The following table presents the responsibilities and functions of different institutions associated with the project with respect to the implementation of provisions of environmental and social considerations.

Table 8.4.2 Project Implementation Structure and Responsibilities

No.	Organisations/Agencies	Responsibility	Detailed Functions/Activities
1	I-HIMDI State PMU (SPMU)	<ul style="list-style-type: none"> Oversee the environmental and social considerations are built in to the State PIP and AAPs. Ensure that the Environmental and Social Management Framework and FDDF are implemented efficiently and 	<ul style="list-style-type: none"> Prepare overall strategy for addressing the environmental and social concerns. Prepare and circulate guidelines for the preparation of the EMP and FDDP. Organise adequate training programmes for DPMUs and other project staff on the preparation of EMP and FDDP. Prepare guidelines for the monitoring of environmental and social consideration including the checklist to be used in the different level of project implementation. Ensure inclusion of guidelines for environmental and

No.	Organisations/Agencies	Responsibility	Detailed Functions/Activities
		effectively.	<p>social considerations in the M&E Guidelines of the project.</p> <ul style="list-style-type: none"> • Ensure that the periodical progress reporting formats of the project include segregated data on environmental and social aspects. • Facilitate organisation of periodical environmental audit with the help of specialized agencies.
2	I-HIMDI District PMU (DPMU)	<ul style="list-style-type: none"> • Ensure ESMF and FDDF are implemented in the project area. • Ensure that the project staff are capacitated to implement ESMF and FDDF. • Ensure all the target villages prepare EMP and if necessary, FDDP and implement these plans. 	<ul style="list-style-type: none"> • Prepare AAPs incorporating the activities for EMSF and FDDF. • Organise training programmes for the project staff on ESMF and FDDF guidelines and on the preparation of EMP and FDDP. • Organise training programmes for leaders of the target communities on preparation of EMP and FDDP, and implementation of these plans. • Monitor the progress of the preparation of EMPs and FDDPs and organise necessary support services to the project staff in preparation of these plans. • Review the EMPs and FDDPs and provide necessary guidance for improvements and take necessary actions for approval of these plans. • Monitor the implementation of EMPs and FDDPs and suggest the corrective measures to be taken up and ensure that the corrective measures are implemented. • Periodically conduct environmental audits with the help of experts and provide necessary advisory to the project staff and VOs/MFG. • Prepare reports on environmental and social consideration aspects and submit them to the state PMU.
3	VO/ MFG	<ul style="list-style-type: none"> • Prepare and implement of EMP and FDDP. 	<ul style="list-style-type: none"> • Prepare the EMP and FDDP as part of their MDI Plan with the active participation of the SHGs and forest dwellers and with the help of CRP, FO, and TO. • Implement the EMP and FDDP with the help of CRP, FO, and TO. • Periodically conduct the environmental audits to find out the issues and corrective measures to be taken up. • Peer group monitoring of adherence to the environmental norms by the farmers. • Peer group pressure on the farmers to take up corrective measures. • Assist the project staff and experts in conducting environmental audits.
4	SHGs	<ul style="list-style-type: none"> • Ensure the preparation of EMP and FDDP. • Ensure proper selection of project beneficiaries following the environmental and social norms. • Ensure that the farmers adopt the environmental norms and standards. 	<ul style="list-style-type: none"> • Select the farmers for MDI package with the help of the project staff and with reference to the beneficiary selection criteria. • Emphasise due considerations to the environmental and social aspects in selection of beneficiaries. • Work with the MDI farmers group to prepare MDI plan including EMP and FDDP (wherever preparation of FDDP is necessary). • Periodically monitor the adherence of environmental norms and standards by the farmers. • Sensitise and motivate the farmers with the help of CRP and other project staff to adopt the environment friendly practices and norms. • Provide reports to the DPMU as and when required.

Source: JICA Survey Team

8.4.3 Capacity Development of Project Staff and Communities for Implementation of ESMS

Adequate efforts shall be made during the initial stage of project implementation to develop detailed guidelines and operational strategies for the implementation of ESMS. The orientation of project staff at

the state PMU and district PMU shall include sessions on environmental and social considerations. The orientation at the community level shall also include sessions on environmental and social considerations. The project staff shall be provided with guidelines and checklist for the preparation of EMP and FDDP, monitoring of environmental and social concerns, reporting, etc.

8.4.4 Preparation of the Environmental Management Plan

The project shall assist the community to prepare the EMP in order to address the potential environmental concerns. The EMP shall be part of the MDI Plan to be prepared by the MFG/ VO at the beginning of implementation of the project in a village/habitation. The CRP under the guidance of technical officer and field organiser shall facilitate the process of preparation of EMP. Different participatory and consultative tools shall be used to ensure participation of different stakeholders in the process of preparation of EMP. Efforts shall be made to make the community agree on the norms and standards to be followed for environmental protection – water conservation and use, application of fertilisers and agro chemicals, protection of trees and forest, planting of trees, waste management, etc. The EMP shall include the following:

- Scope and objectives of EMP;
- Inventory of environmental resources and their use in the village;
- Current challenges in the environmental protection;
- Potential environmental risks and impacts because of the implementation of the project;
- Norms and standards to be followed by the MDI farmers;
- Responsibility of VO, MFG, SHGs, and CRP in monitoring of environmental features;
- Monitoring, review, and reporting related to environmental management; and
- Cost estimates for implementation of EMP.

8.4.5 Environmental Monitoring and Auditing

JSLPS has its own monitoring and evaluation (M&E) system and procedures. M&E guidelines of the project shall be formulated in consistent with the existing systems and procedures of JSLPS. There will be no separate or stand-alone system for monitoring of environmental and social considerations; it shall be incorporated to the overall guidelines/M&E systems of the project. The baseline survey shall include collection of data on environmental and social aspects. Whilst impact assessment/project evaluation studies shall be conducted, SPMU shall ensure the inclusion of environmental and social consideration aspects in the scope and term of reference (ToR) of these assessment/evaluation studies.

In addition to the regular M&E activities, SPMU shall carry out environmental audits with the help of specialized agencies. It is suggested that the environmental audits shall be conducted during the 4th and 7th year. The environmental audits shall follow the environmental standards set by the national government and may refer to the guidelines for environmental audit followed by the Comptroller and Auditor General (CAG) of India. Detailed scope of work and ToR shall be prepared with the help of the I-HIMDI project consultant. The specialized agencies/contractors shall be procured following the JICA Procurement Guidelines. The environmental audit shall capture the issues as well as the achievements of the project in the context of implementing environmental safeguards.

Table 8.4.3 Environmental Monitoring Plan (at the Community Level)

No.	Environmental Features to be monitored	Aspects to be monitored	Frequency	Responsibility		
				Implementation	Supervision at the cluster level	Supervision at the district level
1	Water quality	<ul style="list-style-type: none"> Maintenance of the dug well Discharge of waste to the water bodies/well Sample water quality testing - water samples from the selected wells –pH, fluoride, arsenic, total dissolved solid Water availability Use of groundwater sources 	<ul style="list-style-type: none"> Monitoring shall be done whenever a farm is visited by the project staff Water sample shall be tested once in a year on a sample basis 	CRPs	FO/TO	M&E Manager
2	Soil quality/ Soil nutrient status	<ul style="list-style-type: none"> Maintenance of the farm – fencing, drainage, waste disposal, MDI system, etc. Application of organic manures Crop rotation/cropping pattern Sample soil testing – routine test – soil pH, nutrient status, organic matters, etc. 	<ul style="list-style-type: none"> Monitoring shall be done whenever a farm is visited by the project staff Soil sample shall be tested once in a year 	CRPs	FO/TO	M&E Manager
3	Application of fertiliser and pesticides	<ul style="list-style-type: none"> Use of fertilisers – type, ratio, etc., and fertigation schedules Use of pesticides and insecticides – type, doses, frequency – use of any non-permissible pesticides/insecticides Expenditure on the fertilisers and pesticides 	<ul style="list-style-type: none"> Monitoring shall be done whenever a farm is visited by the project staff Formal review once in 6 months 	CRPs	FO/TO	M&E Manager
4	Forest and tree felling outside the forest, biodiversity	<ul style="list-style-type: none"> Clearance of forest for agriculture Felling of trees outside the forest for agriculture Use of fencing materials from the forest – type, quantum and extraction practices Protection of forest Planting of trees on the farm bunds, homestead etc. Conservation of traditional seeds 	<ul style="list-style-type: none"> Whenever there is a meeting with the SHGs/MFG/VO – this shall be monitored Formal review at least once in a year 	CRPs	FO	M&E Manager

Source: JICA Survey Team

8.5 Gender Consideration

8.5.1 Overview of Gender Related Indicators in Jharkhand

Table 8.5.1 shows the status of Jharkhand State in Human Development Index (HDI) and gender related indicators. The status of HDI in FY2007-08 was 0.376, which ranked 19 out of 23 states. The

sex ratio of Jharkhand was 947 females per 1,000 males (2011 Census), which is above the national average, and the child (under 6) sex ratio (943) was higher than the national average (914). Its literacy rate was 67.63% (male 78.45% and female 56.21%) in 2011. Whilst female literacy rate in Jharkhand was still lower than the national average (total 74.04%; male 82.14% and female 63.46%), it increased from 39% in 2001 to 56% in 2011.

Table 8.5.1 HDI and Gender Related Indicators in Jharkhand

Indicators	Jharkhand	India
	2007-08	2007-08
1. HDI Value	0.376	0.467
2. HDI rank (out of 23 states)	19	
	2006	2006
3. Sex ratio (females per 1000 males)	947	940
4. Under 6 sex ratio (females per 1000 males)	943	914
5. Gender-related Development Index (GDI)	0.558	0.590
6. GDI Rank (out of 35 states*)	29	122
7. Gender Empowerment Measure (GEM)	0.435	0.497
8. GEM Rank (out of 35 states*)	26	
	2011	2011**
9. Inequality Adjusted Human Development Index Value (IHDI)	0.308	0.343
10. Inequality Adjusted Human Development Index Rank (out of 19 states)	14	
11. Loss in HDI due to inequalities (%)	33.67	32
12. Literacy Rate (%)	67.63	74.04
13. Male Literacy Rate (%)	78.45 Rural 72.86% Urban 88.44%	82.14
14. Female Literacy Rate (%)	56.21 Rural 46.62% Urban 67.76%	65.46

Note: * 35 comprise 23 states and 12 union territories.

** Value differs from India IHDI in Global Human Development Report (HDR) 2011 due to different data sources.

Sources: 1-2: India HDR 2011, Institute of Applied Manpower Research (IAMR) and Planning Commission

3-4: Census of India 2011, Provisional Tables, Registrar General of India

5-8: Gendering Human Development Indices: Gendering Human Development Indices: Recasting the Gender Development Index and Gender Empowerment Measure for India, Ministry of Women and Child Development, GOI

9-14: Inequality Adjusted Human Development Index for India's States 2011, the United Nations Development Programme (UNDP)

GDI and GEM were introduced by the United Nations Development Programme (UNDP) in 1995 in order to know the position of gender-related development. However, the Ministry of Women and Child Development (MWCD) asserted that the indices used by UNDP were developed from a northern perspective and did not incorporate the perspective of India. With this as the objective, MWCD decided to recast GDI and GEM for India and States Union Territories in 2005. The dimensions and indicators of GEM identified by MWCD are shown in Table 8.5.2.

The results indicated in Table 8.5.2 followed these dimensions and indicators. Jharkhand State marked 0.558 in GDI (ranked 29 out of 35 states) and 0.435 in GEM (ranked 26 out of 35 states) in 2006¹. The results indicated that Jharkhand State lagged a bit behind the other states in gender empowerment.

¹ There is no updated data.

Table 8.5.2 Dimensions and Indicators of Gender Empowerment Measure by MWCD

No.	Dimension	Indicators
1	Participation in Political Arenas and in Decision-Making by Women	a) Percentage share of parliamentary seats b) Percentage share of seats in legislature c) Percentage share of seats in Zilla Parishad d) Percentage share of seats in Gram Panchayats e) Percentage of candidates in electoral process in national parties f) Percentage of electors exercising their right to vote
2	Economic Participation and Decision-Making Power of Women	a) Percentage share in Indian administrative services and Indian forest service b) Percentage share of professionals graduating from medical and engineering colleges c) Percentage share of High Court judges
3	Power of Women over Economic Resources	a) Percentage of female/male operational land holdings b) Percentage of female/male availed of credit (accounts over Rs.200,000) c) Percentage of female/male estimated earned income share

Source: Ministry of Women and Child Development, Government of India

8.5.2 Gender Empowerment in the Target Areas

I-HIMDI will provide its services (provision of MDI facilities, technical assistance and others) for the poor households in rural area through SHGs. SHGs formed under NRLM and Sanjeevani Programme are exclusively female SHGs. Under Swarnajayanti Gram Swarojgar Yojna (SGSY) and other programmes, male SHGs and mix gender SHGs were formulated, but these numbers are less than 2% amongst existing SHGs in Jharkhand. Naturally, the main target group of I-HIMDI should be poor women living in the rural area.



A female farmer engaged in weeding (Ranch District)

Source: JICA Survey Team

In implementing the project activities, I-HIMDI will closely collaborate with NRLM. NRLM aims to “enable and empower the poor households to build-up their human, social, financial and other resources, solidarity, voice and bargaining power. They, in turn enable them to access their rights, entitlements, and opportunities.”

(1) Participation in Political Arenas and in Decision-Making by Women

Like other states, the existing *Gram Panchayats* (village institutions) in Jharkhand are educated male-dominated institutions. Thus, it is still a big challenge for poor women to express their needs and opinions to the *Gram Panchayat*. Despite this situation, some female SHG federations in Jharkhand have succeeded to do it.

These SHG federations are belonging to Partnership Block of NRLM where Professional Assistance for Development Action (PRADAN, NGO) has been supporting poor women for over a decade. At the first stage, PRADAN sensitised rural women to their issues, and supported them to form a SHG due to dealing with them. Then PRADAN provided the SHG members with various trainings like leadership, group management (i.e., conflict-resolution, negotiation, facilitation and so on), record of discussion, decision-making, and bookkeeping.

The members have accumulated various experiences and knowledge whilst they carry on their activities, and have been gaining confidence in their abilities about group management and

conflict-resolution. Following the advice from PRADAN, some SHGs in the same village came together and established their VO, where they tackle with some common issues; and then, they developed Cluster Level SHG Federations (CLF). Respective SHG comes up with their voice through the VO and/or CLF to *Gram Panchayat*. Also they conduct many events and/or campaigns about education, health, livelihood, social inclusion, and so on.

This is the same federal structure which the Society for Elimination of Rural Poverty (SERP) in Andhra Pradesh State and Bihar Rural Livelihood Promotion Society (BRLPS) in Bihar State developed under SGSY². Indeed, the SERP helped poor women to build their institutions beginning with SHGs at the grassroots up to district level organisation. Also the professional staff of SERP provided the women with various trainings for developing their management skills. NRLM adopted SERP's federal structure as a standard.

JSLPS invite some experienced CRPs from SERP and/or BRLPS (they are called as "external CRP/e-CRP") and deployed the e-CRPs to Resource Block. The e-CRPs nurture internal Community Resource Persons (i-CRP) through a 40-day training; the training strongly focuses on raising women's awareness about their own entitlements and self-esteem, and liberalising from male control. And then the trained i-CRPs go into the villages of Intensive Block. I-HIMDI will implement their activities on these foundations (human resource and federal structure) which JSLPS has built.

(2) Economic Participation and Decision-making Power of Women

In order for a woman to work independently, it is important that she has money which can be used freely (without any consultation to their husbands).

Poor farmer generally cannot open his/her bank account; but if more than ten people come together into a group, the group can open a bank account and utilise the services provided by the bank in India. SHGs save their money (i.e., weekly saving, revolving fund and/or community investment fund) into their bank account.

According to the sample SHG survey done by the JICA Survey Team, the weekly saving per SHG member is about Rs.15 on average. The amount is very small, but in a certain periodical time, they would be "corpus fund" for their inter-lending. Depending on the performance of SHG in inter-lending (management), JSLPS provides a "revolving fund (RF)" for good performers. The RF increases the amount of corpus and the members' availability of loan. Also SHG members (females) as an owner can make a decision on how to use their money. That would boost their self-esteem.

Lack of access of the poor to different kinds of markets is a major factor perpetuating the poverty of the rural poor. Federation of SHGs would enable the poor to overcome the market constraints and scale related problems they face. The federations could undertake collective procurement and marketing activities on behalf of the poor. I-HIMDI proposes to provide the MDI farmers with not only MDI facilities but also technical assistance on O&M of MDI facilities, horticultural production, marketing, and any other needed skills. As a result of it, the MDI farmers can be expected to increase the productivity of their products and market linkages, and to enlarge their decision-making power on the production and marketing.

² Department of Rural Development, MoRD (2009) "Report of the Committee on Credit Related Issues under SGSY"

(3) Power of Women over Economic Resources

The programmes of the Ministry of Rural Development (MoRD), Government of India, reformed Integrated Rural Development Program (IRDP) and transferred it into SGSY in 1999. The characteristic of SGSY was to organise the poor into SHGs. The institutions of the poor – SHGs, their federations, and livelihoods collectives – provide the poor the platforms for collective action based on self-help and mutual cooperation. They were expected to become a strong demand system on behalf of the poor; so that they would build linkages with mainstream institutions, including banks and government departments to address their livelihood issues and other dimensions of poverty.

Both SGSY and NRLM have strongly been focusing on the poor's financial inclusion, especially with formal financial institution. At the same time, National Bank for Agriculture and Rural Development (NABARD) provides various credit schemes for the institution of the poor; Assistance to Self Help Promoting Institutions (SHPI), Micro Enterprise Development Program (MEDP) and so on.

JSLPS has organised female SHGs predominantly because the performance of female SHGs in SGSY was better than male SHGs in terms of organisational operation. On one hand, the success of female SHGs has made a good impact on women's self-confidence, family welfare, and child education. On the other hand, poor females are vulnerable in male dominant society. For instance, in Jharkhand, the ownership of almost all land and houses belong to male member of the household regardless of the *Jaati*. So JSLPS deploys field staff like community facilitators, CRPs, active women, master bookkeepers and/or bookkeepers, and supports female SHGs until the members are empowered enough.

8.5.3 Points to Note from Gender Perception in the Implementation of I-HIMDI

In the implementation of I-HIMDI, some following points should be noted:

- (i) The members of MDI Farmer Group will be the members (females) of eligible SHGs and their spouses. Considering many farming activities done by both males and females, trainings conducted by I-HIMDI should include all MFG members together.
- (ii) I-HIMDI proposes to select CRPs in O&M of MDI facilities, horticultural production, marketing, management of O&M fund, and other aspects within the target villages. It should be considered appropriate measures in selecting CRPs, since some societies dislike that males get trainings from females due to their custom.
- (iii) The borrowers of the loan regarding MDI facilities are MDI farmers with the membership of SHG. Thus, the amount of loan and repayment schedule should consider the availability of the borrowers (i.e., moratorium of repayments maybe three months due to the timing of first income from vegetable production period.)
- (iv) The training contents conducted by I-HIMDI should be designed based on the existing gender roles in agricultural activities and/or need analysis. In Jharkhand, literacy rate of female in rural area is 46.62% although that of male is 72.86%. To consider the gap, training materials developed for I-HIMDI should be in audio and visual materials



A home-made nursery in the backyard of farmer's house (Palamu District)
Source: JICA Survey Team

and/or materials containing a lot of pictures and figures for better understanding of female farmers.

- (v) In general, raising seedlings is a role of female farmers in the rural area. They are raising seedlings whilst taking care of the houseworks and children. Originally, JSLPS proposed one large-sized poly nursery house per village. For easy access to nursery for female farmers from their house, the JICA Survey Team recommended a small-sized poly nursery house installed at each household to ease female farmers' burden. The JICA Survey Team also recommended small-sized Vermin Compost Unit for the same reasons.
- (vi) During summer season, majority of male farmers work as seasonal migrant workers outside the village because of poor farming opportunities in their area. Through the installation of MDI facility, seasonal migration might be mitigated because of generation of working opportunity in horticulture in villages and to ease the burden of female farmers in horticulture production.
- (vii) In Jharkhand, landless farmers account for 9.3% in population. They work as employed workers in farm and/or market in rural area. Landless male farmers mainly engaged in transporting and measuring of transacted products in the markets. Landless female farmers mainly engaged in grading and binding products. Through I-HIMDI, it may be prospected that their working opportunity might be increased.
- (viii) MFG consists of both genders. I-HIMDI, in close collaboration with JSLPS, has to enhance female participation in the management including planning and decision making at MFG, and also has to ensure fair income distribution with the households as MFG members.



Micro poly nursery house which can be installed in each household
 Source: JICA Survey Team



Female workers engaged in grading of tomatoes at the market (Lohardaga District)
 Source: JICA Survey Team

8.6 Forest Dwellers Development Framework

FDDF is an instrument for the Project Executing Agency to ensure protection of interests of the forest dwellers in the project design as well as its implementation. A note on FDDF has been provided in the Attachment 8.6.1. FDDF has been prepared based on the JICA's Guidelines for Environmental and Social Considerations and with reference to the World Bank's Operational Manual – OP 4.10 for the Indigenous Peoples (the World Bank Safeguards Policy). The framework shall guide the project staff to prepare FDDP as part of MDI Plan, wherever the forest dwellers are going to be significantly affected by the project.

CHAPTER 9 PROJECT COST AND IMPLEMENTATION SCHEDULE

9.1 Basic Conditions for Cost Estimate

The basic conditions and assumptions employed for the project cost estimate are as follows:

- (i) Prices as of July 2014 are referred to.
- (ii) The following exchange rate is applied for the cost estimate:
US\$1.0 = Rs.60.1 = JPY 101.72
- (iii) Unit prices of labour, construction materials, engineering works, etc., are collected from major national suppliers.
- (iv) Project costs are divided into foreign currency portion (F/C) and local currency portion (L/C). Ratios of F/C and L/C are estimated based on each unit price analysis and by referring to similar types of projects in India.
- (v) Price escalation rates are assumed to be 2.0%/annum for F/C and 4.2%/annum for L/C.
- (vi) Physical contingency is 5.0% for direct costs and 5.0% for consulting services.
- (vii) Taxes are 5.0% for value added tax (VAT) and 12.36% for services tax according to government regulation.
- (viii) Project administration cost is 5.0% of the direct cost.
- (ix) Interest during construction is 1.4% for works of the accumulated loan portion, and similarly 0.01% for the consulting services.
- (x) Front-end fee is 0.2% of the accumulated loan portion.
- (xi) The project costs are categorised into F/C portion and L/C portion, as follows:
F/C portion:
 - Foreign currency portion of the consulting services.
L/C portion:
 - Institutional building programme,
 - Farmers support programme,
 - Agriculture infrastructure development programme,
 - Project administration,
 - Local currency portion of the consulting services, and
 - Taxes, duties, and front-end fee.

9.2 Summary of Project Cost

The total project cost is estimated at Rs.5,016 million (equivalent to JPY 8,477 million) consisting of Rs.4,274 million for the L/C portion and JPY 1,255 million (equivalent to Rs.743 million) for the F/C portion. The total project cost is shown in Attachment 9.2 and summarised in Table 9.2.1.

Table 9.2.1 Summary of Total Project Cost

No.	Item	F/C (JPY million)	L/C (Rs. million)	Total Cost (JPY million)	Total Cost (Rs. million)
(1)	Institution Building Programme	0.0	218.5	369.2	218.5
(2)	Farmers Support Programme	0.0	291.7	493.0	291.7
(3)	Agriculture Infrastructure Development Program	0.0	2,266.3	3,830.1	2,266.3
Subtotal of Items (1) - (3)		0.0	2,776.5	4,692.3	2,276.5
(4)	Price Escalation	0.0	618.1	1,044.5	618.1
(5)	Physical Contingencies	0.0	169.7	286.8	169.7
Subtotal of Items (1) - (5)		0.0	3,564.3	6,023.7	3,564.3
(6)	Consulting Service	726.3	237.1	1,127.0	666.9
Subtotal of Items (1) - (6) (Eligible Cost)		726.3	3,801.5	7,150.7	4,231.2
(7)	Administration	0.0	211.6	357.5	211.6
(8)	Taxes and Duties	0.0	260.6	440.5	260.6
(9)	Interest during Construction Period	514.3	0.0	514.3	304.3
(10)	Front-end Fee	14.3	0.0	14.3	8.5
Total		1,254.9	4,273.7	8,477.4	5,016.2

Source: JICA Survey Team

The eligible portion of the yen loan is estimated at JPY 7,150.7 million (equivalent to Rs.4,231.2 million), which accounts for 84.4% of the total project cost. The balance, JPY 1,326.7 million (equivalent to Rs.785 million), is the non-eligible portion of the yen loan.

9.2.1 Direct Cost for Institution Building Programme

The cost and activities of the institution building programme includes: (i) cost for the Project Management Unit (PMU), (ii) capacity development, (iii) manage information system (MIS) development, (iv) procurement of equipment and tools for PMU, and (v) State PMU (SPMU) office rental cost. The institution building programme cost is estimated as shown in Attachment 9.2 and summarised in Table 9.2.2 below.

Table 9.2.2 Summary of Cost for Institution Building Programme

No.	Item	F/C (JPY million)	L/C (Rs. million)	Total Cost (JPY million)	Total Cost (Rs. million)
(1)	Cost for PMU	0.0	139.4	235.6	139.4
(2)	Capacity Development	0.0	3.9	6.6	4.1
(3)	MIS Development	0.0	0.4	0.7	0.4
(4)	Procurement of Equipment and Tools to PMU	0.0	68.0	115.0	68.0
(5)	SPMU Office Rental Cost	0.0	6.7	11.4	6.7
Total		0.0	218.5	369.2	218.5

Source: JICA Survey Team

9.2.2 Direct Cost for Farmers Support Programme

The farmers support programme includes: (i) cost for field service, (ii) training on horticulture and marketing, (iii) training on micro drip irrigation (MDI) operation and maintenance (O&M), (iv) exposure visit, and (v) training materials. The summary of farmers' support programme cost is estimated as shown in Table 9.2.3 (refer to Attachment 9.2 and 9.2.1 for details).

Table 9.2.3 Summary of Cost for Farmer Support Programme

No.	Item	F/C (JPY million)	L/C (Rs. million)	Total Cost (JPY million)	Total Cost (Rs. million)
(1)	Cost for Field Service	0.0	260.5	440.2	260.5
(2)	Training on Horticulture and Marketing	0.0	2.1	3.6	2.1
(3)	Training on MDI Operation and Maintenance	0.0	10.0	17.0	10.0
(4)	Exposure Visit	0.0	4.7	7.9	4.7

No.	Item	F/C (JPY million)	L/C (Rs. million)	Total Cost (JPY million)	Total Cost (Rs. million)
(5)	Training Materials	0.0	14.4	24.3	14.4
	Total	0.0	291.7	493.0	291.7

Source: JICA Survey Team

9.2.3 Direct Cost for Agriculture Infrastructure Development Programme

The estimated costs of infrastructure by component are summarised in Table 9.2.4 and detailed in Attachment 9.2.

Table 9.2.4 Cost Estimate for Procurement and Works

Item	F/C (JPY million)	L/C (Rs. million)	Total Cost (JPY million)	Total Cost (Rs. million)
(1) MDI System	0.0	1,446.0	2,443.7	1,446.0
(2) Poly Nursery House (PNH)	0.0	606.0	1,024.1	606.0
(3) Vermin Compost Production Unit (VCU)	0.0	108.0	182.5	108.0
(4) Agriculture Tools	0.0	60.0	101.4	60.0
(5) Multipurpose Community Centre (MCC)	0.0	32.3	54.6	32.3
(6) Market Centre (Godown cum Cold Storage)	0.0	3.2	5.4	3.2
(7) Zero Energy Cool Chamber (ZECC)	0.0	10.8	18.3	10.8
Total	0.0	2,266.3	3,830.1	2,266.3

Source: JICA Survey Team

9.2.4 Consulting Services

The cost for the consulting services is estimated based on the draft terms of reference (ToR) shown in Attachment 6.5.2, which consists of remuneration for international and national experts and direct costs such as transportation, communication, office operational cost, office furniture and equipment, and report preparation. The cost estimate is shown in Attachment 9.2 and summarised in Table 9.2.5 below.

Table 9.2.5 Summary of Cost for Consulting Services

No.	Item	F/C (JPY million)	L/C (Rs. million)	Total Cost (JPY million)	Total Cost (Rs. million)
(1)	Base Cost	639.9	189.8	960.6	568.4
(2)	Price Escalation	51.8	36.1	112.7	66.7
(3)	Physical Contingency	34.6	11.3	53.7	31.8
	Total	726.3	237.1	1,127.0	666.9

Source: JICA Survey Team

9.2.5 Administration and Other Costs

The non-eligible portion of the yen loan shall be funded by the Government of India. This portion includes administration cost, taxes and duties, interest during construction, etc. The non-eligible cost is summarised in Table 9.2.6.

Table 9.2.6 Summary of Administration and Other Costs

No.	Item	F/C (JPY million)	L/C (Rs. million)	Total Cost (JPY million)	Total Cost (Rs. million)
(1)	Administration Cost	0.0	211.6	357.5	211.6
(2)	Tax and Duty	0.0	260.6	440.5	260.6
(3)	Interest during Construction	514.3	0.0	514.3	304.3
(4)	Front-End Fee	14.3	0.0	14.3	8.5
	Total	528.6	472.2	1,326.6	785.0

Source: JICA Survey Team

9.3 Annual Disbursement Schedule

Annual disbursement schedule is prepared using JICA's calculation tool and in accordance with the staffing plan of PMU, training programme, MDI installation plan, and so on. The detailed disbursement schedule is shown in Attachment 9.3.1 and summarised in Table 9.3.1.

Table 9.3.1 Summary of Annual Distribution Schedule

Year	Total Cost (JPY million)	JICA Loan (JPY million)	Others (JPY million)
2015/16	36.7	20.1	16.6
2016/17	359.1	309.4	49.7
2017/18	910.5	805.1	105.3
2018/19	1,798.7	1,594.3	204.4
2019/20	2,322.4	2,047.0	275.4
2020/21	2,436.4	2,126.2	310.2
2021/22	360.2	248.6	111.6
2022/23	84.4	0.0	84.4
2023/24	84.4	0.0	84.4
2024/25	84.4	0.0	84.4
Total	8,477.4	7,150.7	1,326.6

Source: JICA Survey Team

9.4 O&M Cost and Replacement Cost

The operation cost of MDIs is deemed to be included into the production cost of horticultural crops. Since the lifetime of MDIs is relatively short, six years for MDI systems and three years for PNHs and VCUs, the annual maintenance cost cum replacement cost is assumed to amount to the installation costs of MDIs divided by the lifetime of each facility. As for MCCs and market centre (godown cum cold storage), the annual O&M cost is estimated at 2% of the construction cost, and the replacement cost is projected assuming that these facilities would be rebuilt every ten years. The unit costs for O&M and replacement are summarized in Table 9.4.1 below:

Table 9.4.1 Unit Costs for O&M and Replacement

Component	Life Time (Year)	Unit Price (Rs.)	Unit Cost	
			Annual O&M Cost (Rs.)	Replacement Cost (Rs.)
1. MDI	6	24,100	4,017	-
2. PNH	3	10,100	3,367	-
3. VCU	3	1,800	600	-
4. ZECC	3	4,500	1,500	-
5. MCC	10	850,000	17,000	850,000
6. Market Centre (Godown cum Cold Storage)	10	3,243,000	65,000	3,243,000

Source: JICA Survey Team

9.5 Implementation Schedule

The yen loan will be provided for a period of ten years, consisting of one year for pre-arrangement, six years for project implementation, and three years for contingencies.

As the Jharkhand State Livelihood Promotion Society (JSLPS) has insufficient project staff and district offices are not established yet, the first year will be dedicated for organisational setup and PMU staff recruitment. Simultaneously, necessary equipment for institutional reinforcement will be procured, and the consultant will be selected and contracted in this period. The consulting services are

supposed to start in the second year after the selection and contracting procedures in the first year, and last for six years, as shown in Figure 9.5.1.

Item	1st Year	2nd Year	3rd Year	4th Year	5th Year	6th Year	7th Year	8th Year
1. Establishment of PMU	12 months							
2. Selection of Consultants	10 months							
3. Consulting Services		72 months						
4. Institution Building Programme		72 months						
5. Farmers Support Programme		72 months						
6. Agriculture Infrastructure Development Programme			52 months					

Source: JICA Survey Team

Figure 9.5.1 Overall Project Implementation Schedule

As shown in Figure 9.5.2, from the third year, MDI, PNH, and VCU installation will be carried out in the following cycle:

- 1) The target farmers for MDI installation in the next year will be selected. The required field staff (technical officers (TOs) and field organisers (FOs)), together with community resource persons (CRPs) will be recruited. Training materials will be prepared in this year so that implementation can be executed in the next year.
- 2) Next year, actual implementation will be carried out. For the procurement of MDI, PNH, and VCU, the procedures such as preparation of specifications and bid documents, bid call, evaluation, negotiation, contracting, fabrication, delivery, and installation will require almost a whole year.

As it is supposed that PMU will need experience in this installation cycle, the number of MDI systems to be installed is programmed at 5,000 in the first cycle, and increases year by year at 15,000, 20,000 and 20,000, for a total of four cycles.

For each cycle, technical support will be provided for the district project management unit (DPMU), CPRs, and MDI farmers, as new staff are employed every year. Upon installation of the MDI systems, a baseline survey will be conducted, and the activities will be monitored throughout the project implementation period. At the end of the implementation period, the project's impacts will be evaluated.

MCCs will be constructed when MDI production grows and the need for this facility arises. Twelve centres, one in each district, will be constructed in the fourth year, and the remaining 26 in the fifth year. Similarly, a market centre (godown cum cold storage) will be constructed when the project becomes mature, i.e., in the fifth year.

The work schedule is illustrated in Figure 9.5.2.

Work Component	Q'ty	1st Year	2nd Year	3rd Year	4th Year	5th Year	6th Year	7th Year
1. Micro Drip Irrigation (MDI)	60,000			5,000	15,000	20,000	20,000	
2. Poly Nursery House (PNH)	60,000			5,000	15,000	20,000	20,000	
3. Vermin Compost Unit (VCU)	60,000			5,000	15,000	20,000	20,000	
4. Agriculture Tools	1,200			100	300	400	400	
5. Multipurpose Community Center (MCC)	38				12	26		
6. Market Center (Godown cum Cold Storage)	1					1		
7. Zero Energy Cool Chamber (ZECC)	2,400			200	600	800	800	

Source: JICA Survey Team

Figure 9.5.2 Work Schedule

9.6 Procurement Methods

The procurement methods for MDIs and agricultural support facilities are summarised in Table 9.6.1 and the details are given in Attachment 9.6.1.

Table 9.6.1 Summary of Procurement Methods

Item	Procurement Method	No. of Tender Lots
1. MDI system	SCB, by district	48 (=12 lots x 4 years)
2. PNH	SCB, by district	48 (=12 lots x 4 years)
3. VCU	SCB, by district	48 (=12 lots x 4 years)
4. Agriculture Tools	SCB, by district	48 (=12 lots x 4 years)
5. MCC	SCB, by district	24 (=12 lots + 12 lots)
6. Market Centre (Godown cum Cold Storage)	SCB	One in Ranchi District
7. ZECC	Reimbursement by PMU	2,400 units

Note: SCB=State Competitive Bidding

Source: JICA Survey Team

Materials, products and designs for the agriculture infrastructures shall be compliant with the Indian Standards (IS). In this project, the procurement method will be state competitive bidding (SCB), and the tender will be performed district-wise. The PMU is the employer for contracts of the above works except a few cases, such as Item 7 and seed supply for Item 2.

As for ZECC (Item 7), a ceiling amount of Rs.4,500 per unit will be disbursed to the applicant MDI farmer by the PMU only after successful completion of the ZECC. Similarly, the seeds for Item 2 will be first purchased by the applicant MDI farmer with a ceiling amount of Rs.500 per unit, and thereafter the cost will be reimbursed to the farmer upon submission of receipts to the PMU.

9.7 Cost Reduction Measures

Generally in competitive bidding, the more number of products to be bid, the lower the unit bid prices become. In this sense, the bidding lot in size should be larger, however, one lot for the whole state may cause a monopoly, and the supply capacity of the firm would be insecure. It is considered therefore that a district-wise lot division may be balanced and suitable for the procurement of MDI, PNH, and VCU.

The durability is assumed to be six years for MDI and three years for PNH and VCU. To reduce the replacement cost, it is essential to operate and maintain well the equipment. For example, keeping the drip lines unbent under the shade, and keeping the PNH clean when unused are effective ways to

prolong the product life. In fact, an MDI system can be used for over ten years with proper O&M according to information from suppliers. Hence, proper O&M of equipment should be strictly instructed by the CRPs to MDI farmers.

9.8 Alternative Study for Technical Support by JICA Technical Assistance

JICA has a special support scheme to speed up loan projects or to enhance development effects of loan projects. This support scheme is so-called “technical assistance (TA) related to the Japanese ODA (Yen) loan project”. TAs for “Crop Diversification in Himachal Pradesh (2011-2016)” in India and “Project for improving livelihood of small-scale farmers in Cajamarca (2011-2016)” in Peru are major examples in the agriculture sector. These are cases wherein the TA has preceded the loan project for the purpose of establishing an appropriate development model applicable to the upcoming loan project.

In this section, both the necessity of TA for the project (I-HIMDI) and scope of TA shall be examined from the aspect of speedy and efficient implementation of I-HIMDI.

9.8.1 Necessity of JICA Technical Assistance

In Jharkhand, horticulture intensification by MDI is not yet getting popular although it has been introduced to the state since 2006. This is mainly due to undeveloped technical model and extension system suitable for MDI horticulture in addition to budgetary constraint of the state. Judging from past work experience and available human resources, JSLPS has good performance records in the field of social mobilisation and institutional capacity building; however, JSLPS has a serious shortage of technical staff who have sufficient skills and knowledge on O&M of infrastructure and farm management.

JSLPS, as an executing agency, is currently operating the National Rural Livelihoods Mission (NRLM) with social mobilisation and capacity building of self-help groups (SHGs). As a part of livelihood promotion for SHGs, NRLM has a plan to coordinate with I-HIMDI for the horticulture intensification programme. Therefore, it is urgently required to establish an appropriate technical support system including recruitment of sufficient number of capable staff.

On the other hand, it takes two or more years for employment of the project consultant taking into account the loan agreements in recent yen loan projects. In the case of I-HIMDI, the commencement of the consulting services will be in 2017, assuming that it takes at least six months for conclusion of the loan agreement from fact finding and another two years for employment of the project consultant. If so, I-HIMDI will miss the opportunity to work with NRLM and eventually it cannot contribute to the State Twelfth Five-Year Plan.

I-HIMDI can be divided into two major schemes, i.e., (i) project management and infrastructure development, and (ii) institutional capacity building and human resources development. With the objective of smooth implementation and ensuring sustainability of the project, it is the most efficient and effective approach to implement (i) institutional capacity building of the PMU, (ii) establishment of a technical support system, and (iii) human resources development to disseminate the system by TA, in advance of (iv) infrastructure development by the yen loan project so that outputs of TA could be fully utilised.

9.8.2 Scope of JICA Technical Assistance

In the technical assistance (TA), the project goal is set as “livelihood of target MDI farmers has been improved through promotion of horticulture intensification by MDIs in the project area (Phase I area of the yen loan project)”. As already discussed in the previous section, TA will be implemented for institutional capacity building and human resources development (skills and know-how on O&M of MDIs, farm management for horticulture with MDI, and processing and marketing of horticultural products) in advance of the yen loan project. Accordingly, the target group is set for the PMU to be established in JSLPS under the yen loan project, SHGs and MDI farmers group (MFG, approximately 5,000 farmers) in the project area. The outputs and activities of TA are designed as follows:

(1) Output 1: Planning and operational capacities of JSLPS and PMU are strengthened.

The PMU staff understands the purpose and scheme of the TA and yen loan project, and acts to achieve the project goals efficiently and effectively as a result of the following activities:

- 1-1 Orientation workshop to the PMU staff;
- 1-2 Training to the PMU staff and exposure visits to similar projects;
- 1-3 Screening and appraisal of target MDI farmers;
- 1-4 Preparation of action plan for the project; and
- 1-5 Establishment of project MIS.

(2) Output 2: Training programmes for institutional capacity building and promotion of horticulture intensification by MDI are formulated.

For MDI farmers in the area of Phase 1, training programmes and operational plan for farmers' training are formulated through the following activities:

- 2-1 Preparation of materials for public dissemination and awareness;
- 2-2 Preparation of training modules and materials for each scheme;
- 2-3 Preparation of audio-visual training materials;
- 2-4 Development of evaluation method for trainings;
- 2-5 Training of Trainers (TOT) training to TOs, FOs, and CRPs; and
- 2-6 Preparation of training programme for MDI farmers by trainers.

(3) Output 3: Skills and know-how of MDI farmers on horticulture intensification are improved.

Skills and know-how of MDI farmers in the Phase 1 area are improved by means of the following activities:

- 3-1 Public dissemination and public consultation meeting;
- 3-2 Training of SHGs/MFG and exposure visits to similar projects;
- 3-3 Training on O&M of MDIs and exposure visits to similar projects;
- 3-4 Training on horticulture farming technology and exposure visits to similar projects;
- 3-5 Training on processing and marketing of horticultural products and exposure visits to similar projects;
- 3-6 Field experiment and demonstration in sample areas;
- 3-7 Monitoring and evaluation of activities in sample areas; and
- 3-8 Follow-up workshops.

Draft project design matrix (PDM) of TA is shown in Attachment 9.8.1.

CHAPTER 10 PROJECT EVALUATION

10.1 Economic Evaluation

10.1.1 Economic Evaluation Methodology and Assumptions

The economic evaluation of the micro drip irrigation (MDI) programme is carried out in order to assess the economic viability of the project. The economic viability of the proposed project is found by estimating the economic internal rate of return (EIRR), cost-benefit ratio (B/C), and net present value (B-C) with the conditions and assumptions mentioned below. Sensitivity analysis is made in order to elucidate the economic viability of the project against adverse changes such as over running the project cost, and decrease in expected benefits. Financial analysis is carried out by analysing the capacity to pay for the operation and maintenances of the MDI infrastructure and repayment of loan that MDI farm households are expected to borrow for installation of MDI facilities or to buy agricultural inputs. The indirect benefits and socioeconomic impacts from the implementation of the project are also studied. The basic assumptions for economic evaluation are as follows:

- (i) The economic life of the MDI project is 20 years.
- (ii) The exchange rate of US\$1.00 = JPY 101.72 = Rs.60.1 (Rs.1.0 = JPY 1.69) in July 2014 was applied.
- (iii) A discount rate of 10% is applied for the calculation of B/C and B-C.
- (iv) Only economic benefits from vegetable production are counted in the economic evaluation. Economic benefits generated from fruit production, livestock production, employment generation, nutrition supplements, health, education, etc. are not taken into account.
- (v) Transfer payments (taxes and subsidies) as well as the price escalation and interest are excluded for the calculation of economic cost.
- (vi) The standard conversion factor is estimated at 0.967 (refer to Table 10.1.1).
- (vii) The shadow wage rate for agricultural labour works is estimated at 0.584 (refer to Table 10.1.2).

(1) Evaluation of Economic Factors

(a) Standard Conversion Factor (SCF)

In order to evaluate the MDI system costs and benefits with respect to world market prices, SCF of 0.967 is applied. This figure is calculated on the basis of export and import statistics for the years 2008/9 to 2012/13, as shown in Table 10.1.1.

Table 10.1.1 Calculation of SCF from Foreign Trade Figures of India

Item / Year	2008/9	2009/10	2010/11	2011/12	2012/13
Export (E)	8,408	8,455	11,429	14,660	16,353
Import (I)	13,744	13,637	16,835	23,455	26,731
Export Subsidy (Es)	0	0	0	0	0
Export Tax (Et)	0	0	0	0	0
Import Subsidy (Is)	0	0	0	0	0
Import Tax (It)	602	976	1,056	1,155	1,320
(Customs/Duties)					
SCF*1	0.974	0.958	0.964	0.971	0.970

Item / Year	2008/9	2009/10	2010/11	2011/12	2012/13
			5 Year's Average		0.967
Shadow Exchange					
Rate Factor (Y)	1.03	1.04	1.04	1.03	1.03
Y=1/CF			5 Years' Average		1.034

Note: *1) Calculated from trade statistics applying the following formula

$$SCF = (E+I) / \{(E+Es-Et) + (I-Is+It)\}$$

Source: Prepared by JICA Survey Team based on data of Reserve Bank of India

(b) Shadow Wage Rate

The existence of unemployment and underemployment of unskilled workers in Jharkhand State's economy means that the opportunity cost of unskilled labour can be considered to be lower than its wage rate. Shadow wage rate for agricultural labour is estimated as shown below in Table 10.1.2. As shown in the table, the average wage for unskilled agricultural labour in the study area was estimated at Rs.150 per day. The minimum wage rate for other industrial labour in Jharkhand was at Rs.257 per day. Based on this figure, the shadow wage conversion factor was estimated at 0.584 as shown in Table 10.1.2.

Table 10.1.2 Shadow Wage Rate

Casual Agricultural Labour wage (L)	Rs./day	150
Wage of Unskilled Labour in other Industries (M)	Rs./day	257
Shadow Wage Rate Factor (Y) (Y=L/M)		0.5837

Source: For State Level, GoI, Ministry of Labour and Employment Office of the Chief Labour Commission, No. 1/11 (1,5)/2013-LS II, September 2013 and for the Study Area Hearing Survey, May, 2014

10.1.2 Project Cost

The project cost broadly comprises MDI and agricultural support facilities, institutional building programmes, training on operation and maintenance (O&M), horticulture and marketing as well as O&M equipment, engineering services, administration, and physical contingencies. The financial costs are converted into the economic costs by applying the SCF for each of the major components. As shown in Table 10.1.3, the project cost is estimated at Rs.3,448 million at economic prices.

Table 10.1.3 Project Cost in Financial and Economic Prices

Items	Foreign Currency Portion (Rs. Millions)		Local Currency Portion (Rs. Millions)		Total Amount (Rs. Millions)	
	Financial Prices	Economic Prices	Financial Prices	Economic Prices	Financial Prices	Economic Prices
1 Institution Building Programme	0	0	219	211	219	211
2 Farmers Support Programme	0	0	292	282	292	282
3 Agriculture Development Programme	0	0	2,266	2,191	2,266	2,191
Price Escalation	0	0	618	0	618	0
Physical Contingency	0	0	170	164	170	164
4 Consulting Services	379	379	190	190	568	568
Price Escalation	31	0	36	0	67	0
Physical Contingency	21	20	11	11	32	31
5 Land Acquisition	0	0	0	0	0	0
6 Administration Cost	0	0	212	0	212	0
7 VAT & Service Tax	0	0	261	0	261	0
8 Interest During Construction	304	0	0	0	304	0
9 Front End Fee	9	0	0	0	9	0
Total	743	398	4,273	3,049	5,016	3,448

Source: JICA Survey Team

Replacement, operation, and maintenance costs are estimated at Rs.570 million per annum in economic

prices as shown in Table 10.1.4. MDI equipment will be replaced every six years, and poly nursery house (PNH), vermin compost production unit (VCU), zero energy cool chamber (ZECC) facilities will be replaced every three years. The Multipurpose Community Centre (MCC) and market centre will be replaced every ten years.

Table 10.1.4 Replacement, Operation and Maintenance Costs

(Unit: Rs. million)

Item / Irrigation Area	500 ha	2,000 ha	4,000 ha	6,000 ha	Remarks
< Annual O&M Cost >					
MDI System	20	80	161	241	Every 6 years
PNH	17	67	135	202	Every 3 years
VCU	3	12	24	36	Every 3 years
ZECC	8	30	60	90	Every 3 years
MCC		0.20	0.23	0.23	2% of const. cost
Market Centre (Godown cum Cold Storage)			0.065	0.065	2% of const. cost
Total	47	190	380	570	
< Replacement Cost >					
Multipurpose Community Centre	32.3	Replaced in every 10 years			
Market Centre (Godown cum Cold Storage)	3.2	Replaced in every 10 years			
Total	35.5				

Source: JICA Survey Team

10.1.3 Project Benefit

The direct benefit to be expected in the project area is derived from the increased horticultural crop production attributed to a stable irrigation water supply through MDI systems. Different cropping patterns were developed for each agro-climatic region and for the benefit estimation. The cropping pattern for Region I (Ranchi and Khunti districts), where more than 25% of the potential MDI farm households with more than 1,580 ha of potential land are located, was taken. As shown in Table 10.1.5, tomato (Kharif), French beans (Rabi), and cauliflower (Summer) are chosen for benefit calculation. However, fruits like papaya, guava, and others which are expected to generate more income, are excluded from the benefit calculation.

Table 10.1.5 Agro-climatic Region Wise Cropping Pattern

Agro-climate Region / Season	Kharif	Rabi	Summer	Fruits
Region I (Ranchi, Khunti)	Tomato	French Beans	Cauliflower	Papaya
Region II (P. Singhbun, S. Kharsawan)	Brinjal	French Beans	Cucumber	Guava
Region III (Latehar, Palamu)	Cucumber	Peas	Brinjal	Papaya
Region IV (Ranchi, Khunti)	Brinjal	Potato	Cucumber	Banana
Region V (Giridih, Hazaribagh)	Chilli	Peas	Cucumber	Papaya
Region VI (Gumla, Pakur)	French Beans	Brinjal	Muskmelon	Papaya

Source: JICA Survey Team

To estimate the benefits from crop production under MDI conditions, costs and benefits for each crop are calculated with and without MDI conditions in economic prices as shown in Table 10.1.6. For the detailed crop budget at financial and economic prices, with and without MDI conditions, refer to

Attachment 10.1 and 10.2.

Table 10.1.6 Summary of Economic Crop Budget

Crop	Unit Price (Rs./kg)	Unit Yield (kg/0.1ha)	Total Income (Rs./0.1ha)	Production Cost (Rs./0.1ha)	Net Return (Rs./0.1ha)
<Without MDI Condition>					
Peas	11.6	700	8,123	5,378	2,745
Tomato	5.8	2,500	14,505	6,526	7,979
Chilli	19.3	2,499	48,331	11,766	36,564
Cucumber	6.8	4,520	30,596	7,022	23,574
Bitter Gourd	11.6	2,250	26,109	11,657	14,452
Muskmelon	17.4	1,319	22,959	10,624	12,335
Cauliflower	4.8	3,957	19,132	8,486	10,646
French Beans	9.7	1,624	15,704	6,804	8,900
Potato	11.6	2,110	24,484	10,025	14,459
Brinjal	7.7	5,332	41,248	12,731	28,517
<With MDI Condition>					
Peas	11.6	800	9,283	4,439	4,845
Tomato	5.8	6,000	34,812	15,197	19,615
Chilli	19.3	3,500	67,690	20,954	46,736
Cucumber	6.8	6,000	40,614	10,797	29,817
Bitter Gourd	11.6	2,600	30,170	11,031	19,140
Muskmelon	17.4	1,800	31,331	9,630	21,701
Cauliflower	4.8	5,500	26,593	10,566	16,026
French Beans	9.7	2,500	24,175	9,178	14,997
Potato	11.6	2,800	32,491	10,136	22,355
Brinjal	7.7	5,750	44,482	10,208	34,274

Source: JICA Survey Team

The balance of the total amount of economic net return obtained from crop production between the future of with and without MDI conditions is the direct benefit, and is summarised in Table 10.1.7. All MDI planned areas, with a total of 6,000 ha, are projected to be under MDI in the fourth year and full benefit is expected from the seventh year. The per annum incremental net benefit is estimated at Rs.1,386 million.

Table 10.1.7 Estimated Project Benefit (Economic Prices)

Season	Area (ha)	Without MDI (Rs. million)	With MDI (Rs. million)	Incremental Net Return (Rs. million)
Kharif (Tomato)	6,000	479	1,177	698
Rabi (French Beans)	6,000	534	900	366
Summer (Cauliflower)	6,000	639	961	322
Total	-	1,652	3,038	1,386

Source: JICA Survey Team

10.1.4 Evaluation Results

EIRR is calculated based on the flow of economic benefits and costs for the whole project area. As shown in Table 10.1.8, EIRR is estimated at 26.5%, B/C ratio is 1.38 and B-C of the net benefit is estimated at Rs.1,747 million. It shows that the MDI project is economically viable. For the economic costs and benefit stream refer to Attachment 10.3.

Table 10.1.8 Economic Evaluation Results

EIRR	26.5%	Net Present Value (Rs. million) (at 10% Discount Rate)			B/C Ratio
		Benefit (B)	Cost (C)	B - C	
		6,304	4,557	1,747	

Source: JICA Survey Team

A sensitivity analysis is made to evaluate the soundness of the project against unexpected adverse changes in the future for the following cases:

- If the project cost runs over the price by 5% and 10%
- If the expected benefit decreases by 5% and 10%
- If the benefit decreases by 5% and cost increases by 10%
- If the benefit decreases by 10% and cost increases by 5%
- Combination of (a) and (b)

As shown in Table 10.1.9, the analysis indicates that the project, even under adverse cases of a combination of cost increase by 10% and benefit decrease by 10%, it is still viable with the EIRR at 16.6%. For detailed results refer to Attachment 10.3.

Table 10.1.9 Sensitive Analysis of the Project

		Cost		
		Base	5% UP	10% UP
Benefit	Base	26.5%	23.8%	21.5%
	5% DOWN	23.7%	21.3%	19.1%
	10% DOWN	21.1%	18.7%	16.6%

Source: JICA Survey Team

10.2 Farm Economic Analysis

The financial evaluation of the proposed project is undertaken in terms of financial viability from an individual farmer's perspective, focusing on the beneficiary farmer's capacity to pay. According to the Potential SHG Profile Survey (JICA Survey Team, April/May 2014), the average land holding size per household in the study area was estimated at 0.45 ha. The MDI project aims to bring about 0.1 ha of land per household under MDI systems where cropping intensity is expected to increase to 300%. The proposed I-HIMDI project will work on encouraging farmers to get a loan and repay conveniently. This way of project implementation is new in the state. As shown in Table 10.2.1, a typical farm household cultivating tomatoes in Kharif, French beans in Rabi, and cauliflower in summer seasons under MDI conditions is expected to generate Rs.21,624 per annum as an incremental net income. According to the SHG Profiling Survey (JICA Survey Team, April/May 2014), other sources of income were labour work in mining, construction, and other industries. The analysis shows that farm households growing vegetables in 0.1 ha of land under MDI conditions will be able to bear the instalment of Rs.15,000 for operation and maintenance of MDI facilities.

Table 10.2.1 Net Farm Income per 0.1 ha (at Financial Prices)

(Unit: Rs./0.1 ha)

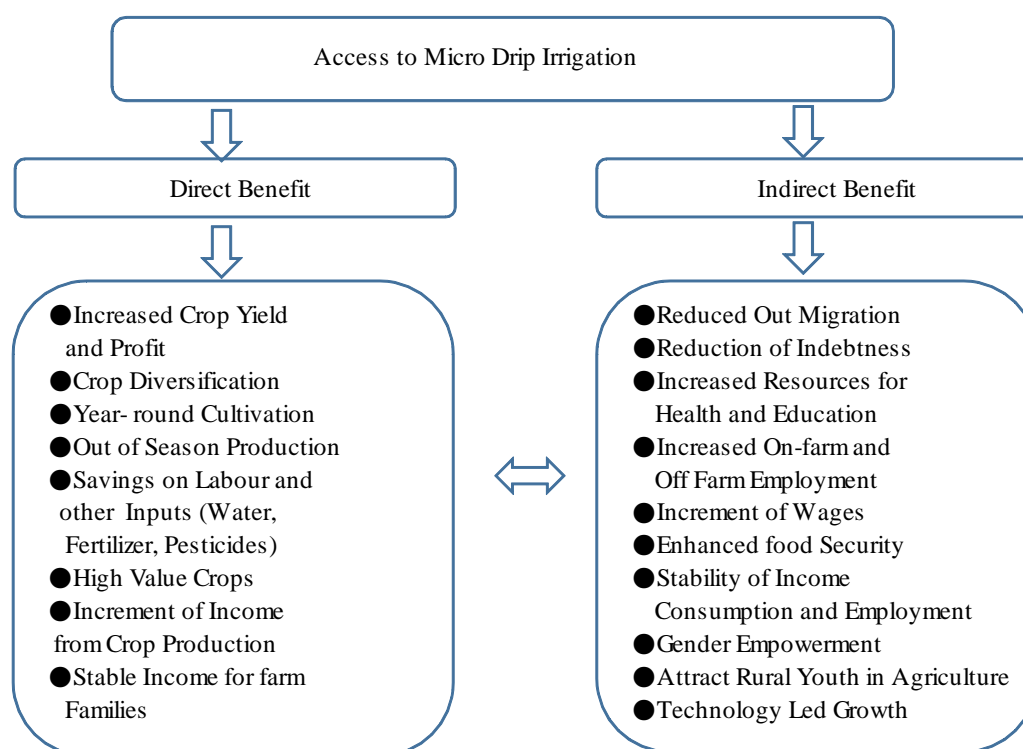
Crop	Without MDI			With MDI			Incremental Net Return
	Kharif	Rabi	Summer	Kharif	Rabi	Summer	
Tomato	6,196	-	-	16,003	-	-	9,807
French Beans	-	7,457	-	-	13,221	-	5,764
Cauliflower	-	-	8,530	-	-	14,583	6,053
Total (Annual)	22,183			43,807			21,624

Notes: 1) Average family size= 5, 2) Average land holding size= 0.45 ha, 3) Estimated MDI area per household= 0.1 ha
4) Supplemental income from fruit crops is not included in the calculation

Source: Prepared by JICA Survey Team based on the field survey results

10.3 Indirect Benefits

There are various indirect benefits and impacts expected from the introduction and expansion of the MDI system in the study area. Major indirect benefits and impacts expected after the implementation of the project are described below and summarised in Figure 10.3.1.



Source: JICA Survey Team

Figure 10.3.1 Some Major Direct and Indirect Benefits of MDI

10.3.1 Increasing in Water Productivity

The most significant benefit of MDI is the increase of water productivity. Table 10.3.1 shows the rates of water saving and increase of crop yield in comparison between flood method of irrigation (FMI) and drip method of irrigation (DMI), which have been demonstrated in different parts of India.

Table 10.3.1 Water Saving Effect and Increase of Crop Yield

Name of Crops	Water Consumption (mm/ha)		Crop Yield (MT/ha)		Water Saving over FMI	Yield Increase over FMI
	FMI	DMI	FMI	DMI	(%)	(%)
<Vegetables>						
Tomato	498	107	6.18	8.87	79	43
Chili	1,097	417	4.23	6.09	62	44
Cauliflower	389	255	8.33	11.59	34	39
Potato	200	200	23.57	34.42	Nil	46
Brinjal	900	420	28.00	32.00	53	14
<Fruits>						
Papaya	2,285	734	13.00	23.00	68	77
Banana	1,760	970	57.50	87.50	45	52

Source: *Natural Resource Management for Horticulture Development*, Satish Serial Publishing House, India

As indicated in the above table, the impact of DMI is great: for example, water consumption is only 21% and the yield is 1.43 times that of FMI for tomato. Similarly, water consumption is only 32% and the yield is 1.77 times that for papaya. Thus, MDI could result to a great impact toward water saving as well as increase of yield.

10.3.2 Improvement of Living Standards

As shown in Figure 10.3.1, with the introduction of MDI, indirect benefits such as reduced out-migration for employment, increment of on-farm employment, and employment opportunities due to intensified and diversified horticultural crops cultivation, and increased marketing activities. MDI will contribute significantly to poverty reduction, food security, and improving the quality of life of the rural population.

The increase of vegetable production will generate a considerable amount of net profit for farmers. Hence the farmers will be in a position to have substantial surplus. This might give them an opportunity to renovate and reshape their houses, which the MDI farmers have already done. They can spend more on their clothing, health care, sanitation, education, etc. This will improve social and cultural amenities of villages and give an impetus for further development in the area.

10.3.3 Food Availability throughout the Year

The MDI system will intensify crop production; food will be available throughout the year and there is a chance of a more balanced food intake on household level especially for the children. According to the Jharkhand Food Security Atlas 2008 (UN World Food Program), after Madhya Pradesh, Jharkhand has the highest proportion of children who are underweight. Cultivation of vegetables will elevate nutritional standards of farm households. The MDI programme will improve the human carrying capacity of the area, where the population pressure is increasing.

10.3.4 Gender Empowerment

The project targets at members of SHGs (female groups), and provides MDI systems and other agriculture support facilities with technical support to promote horticulture intensification as good measures for their livelihood improvement. It is expected by the project that female members could

gain governance, right, entitlement and opportunities in economic and social activities.

10.4 Operation and Effect Indicators

Indicators are a way to measure the progress of MDI towards the achievement of the goal. Indicators define the progress quantitatively and qualitatively. The progress of MDI will be measured using the indicators discussed below.

10.4.1 Operation Indicators

Operation indicators to be monitored by the project are set at number of beneficiary farmers, cultivation area, cropping intensity, number of training participated, rate of MFG formulation and rate of instalment of O&M funds as shown in Table 10.4.1.

Table 10.4.1 Operation Indicators

No.	Indicators	Present Condition(YR2014)	Target(YR2022)
1	Nos. of MDI beneficiary farmers	-	60,000
2	Vegetable cultivation area	-	6,000 ha
3	Cropping intensity	-	300%
4	Nos. of trainings	-	937 times
5	Rate of MFG formation	-	95%
6	Rate of instalment of O&M funds	-	95%

Source: JICA Survey Team

Incidentally, the operation indicator is set at 95% for items (5) and (6) taking into account the past experience of JSLPS operation and micro-financing schemes in India.

10.4.2 Effect Indicators

As discussed in Section 10.1.3, a large variety of horticulture crops are cultivated in Jharkhand. Although the cropping intensity is set at 300% for the project, there may be various combinations of crops by season and also agro-climatic region. Here, a cropping pattern of Agro-climatic Region 1 (Tomato-French Beans-Cauliflower) is tentatively taken up to estimate present and target values as a most typical case. Effect indicators to be monitored by the project are set as shown in Table 10.4.2 below.

Table 10.4.2 Effect Indicators

No.	Indicators	Present Condition (YR2014)	Target (YR2022)
1	Total Vegetable Production (MT/year)		
	- Tomato (Kharif)	150,000	360,000
	- French Beans (Rabi)	97,440	150,000
	- Cauliflower (Summer)	237,420	330,000
2	Average Unit Yield (kg/ 0.1 ha)		
	- Tomato (Kharif)	2,500	6,000
	- French Beans (Rabi)	1,624	2,500
	- Cauliflower (Summer)	3,957	5,500
3	Average Net Return (Rs/ 0.1 ha/year) ^{*1}	22,183	43,807

Note: ^{*1}) Calculated based on three main crops (Tomato, French Beans and Cauliflower)

Source: JICA Survey Team

10.4.3 Procedures for Monitoring and Evaluating of Operation and Effect Indicators

Operation and effect indicators of the project are first to confirm present values at the time of MDI planning as discussed in Section 5.5, and secondly to monitor actual values by MIS proposed in Section 6.4.2. When necessary, it will be reinforced by the follow-up survey. The outputs will be arranged in the baseline survey report and/or follow-up survey report. The reports shall evaluate successful cases and difficulties encountered during the implementation to feed back those to the next phase operation. At the end of the project, terminal impact assessment will be carried out in order to confirm the project impact including operation and effect indicators.

10.5 Adaptation Measures for Climate Change

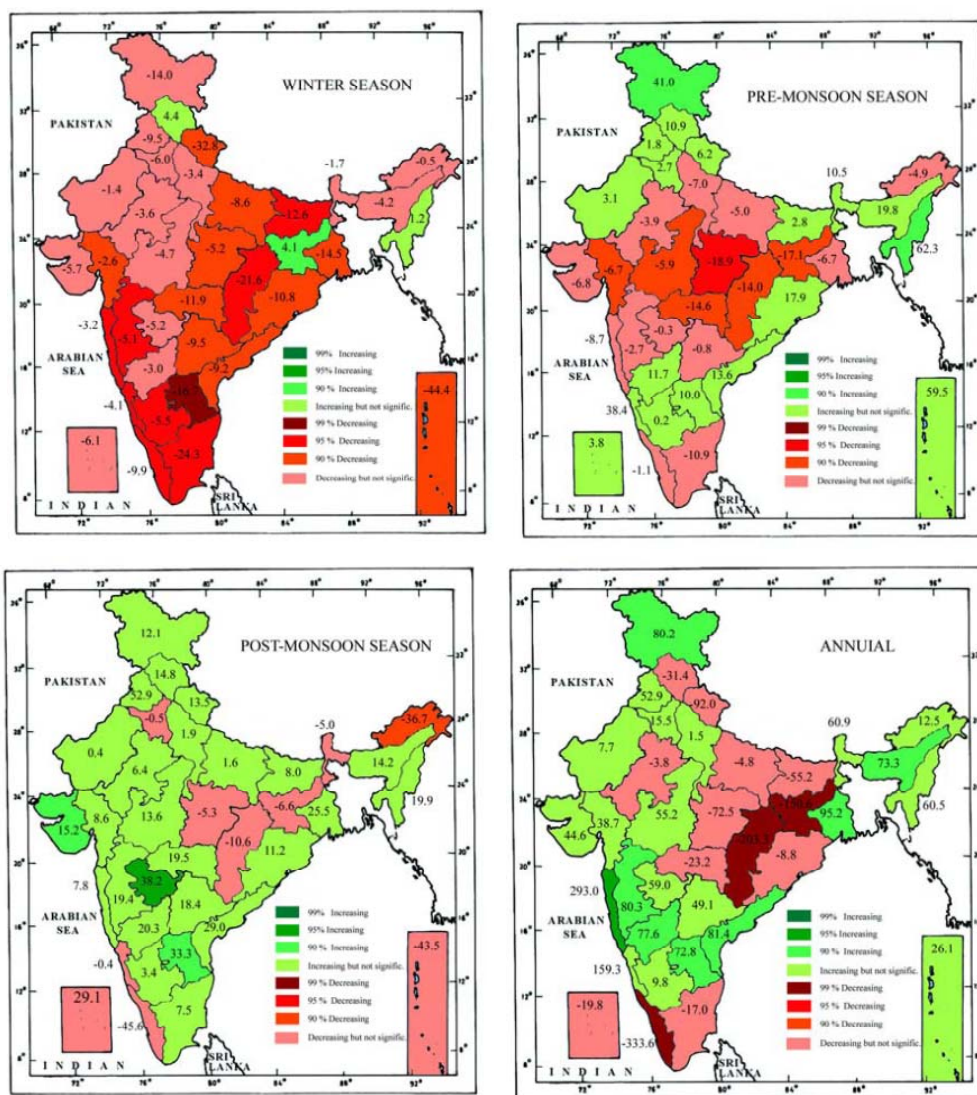
10.5.1 Climate Change in Jharkhand

Jharkhand has been experiencing climate change in the past decades. Annual precipitation has decreased significantly, especially monsoon rains have gone down. On the other hand, winter rains have increased slightly and insignificantly. The trends of rainfall are summarised in Table 10.5.1 on the right side, and visualised in Figure 10.5.1 below, which is for the whole country. While rainfall has decreased in the last 100 years, temperature has increased within the recent 50 years. According to the “State Level Climatic Change in India” published by the Government of India (GoI), Jharkhand is one of the states where annual and seasonal mean maximum temperatures as well as mean temperature have increased significantly. Variations in temperature are largest in the post-monsoon season. Annual and seasonal mean minimum temperature would not shift significantly. These trends of temperature changes are shown in Table 10.5.2.

Table 10.5.1 Trends of Rainfall in Jharkhand for the Last 100 Years

Season	Variation (mm)
Monsoon	- 95.7
Winter	+ 4.1
Pre-Monsoon	- 17.1
Post-Monsoon	- 6.6

Source: Trends in the rainfall pattern over India, National Climate Centre, 2006.



Source: Trends in the rainfall pattern over India, National Climate Centre, 2006.

Figure 10.5.1 Trends of Rainfall Variation for the Last 100 Years

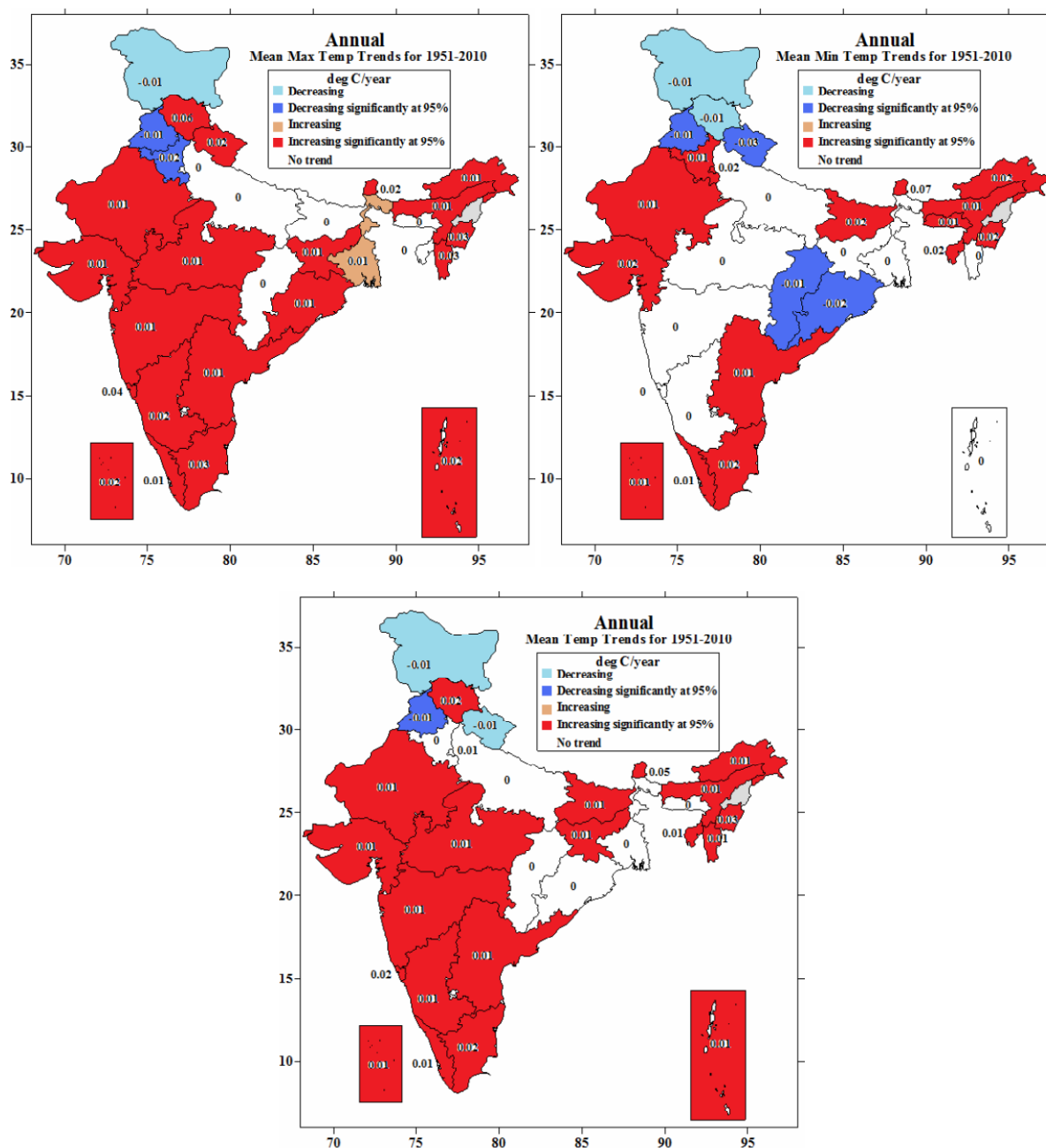
Table 10.5.2 Trends of Temperature in Jharkhand for the Last 50 Years

(Unit: °C/year)

Item	Annual	Winter	Summer	Monsoon	Post-Monsoon
Mean Temperature	+ 0.01	+ 0.01*	No Trend	No Trend	+ 0.02
Mean Maximum Temperature	+ 0.01	+ 0.01	No Trend	No Trend	+ 0.03
Mean Minimum Temperature	No Trend	No Trend	No Trend	No Trend	+ 0.01*

Note: “*” means not significant

Source: State Level Climate Change Trends in India, Ministry of Earth Sciences, 2013



Source: State Level Climate Change Trends in India, Ministry of Earth Sciences, 2013

Figure 10.5.2 Trends of Temperature Variation in India for the Last 50 Years

10.5.2 Adaptation Measure of the Project for Climate Change

According to the JICA Climate Finance Impact Tool for Adaptation (June 2011), the basic concept of adaptation for a sub-sector of irrigation and drainage is “securing and improving agricultural productivity through capacity development of farmland management and flood control against drought, flood, and fluctuation and temperature”. In addition, vulnerability and adaptation measures are summarized as below.

Table 10.5.3 Vulnerability and Adaptation Measures for Sub-sector of Irrigation and Drainage against Climate Change

Vulnerability	Adaptation Measure
<ul style="list-style-type: none"> - Decrease in precipitation and shift of rain pattern - Increase in air temperature, precipitation, rain intensity, and frequency, intensity, and duration of natural disaster (e.g. cyclone, drought) - Rise in sea level 	<ul style="list-style-type: none"> - Development and rehabilitation of facilities for water storage (<i>Well construction funded by GoI</i>) - Development and rehabilitation of facilities for irrigation and drainage (<i>Installation of MDI and related facilities</i>) - Application of water saving irrigation (<i>MDI</i>) - Development of drain (<i>including furrowing</i>) - Capacity development for water management (<i>Training</i>) - Participatory development of irrigated agriculture (<i>Participation of SHG/MFG</i>)

Source: Prepared by JICA Survey Team based on JICA Climate Finance Impact Tool for Adaptation (June 2011)

As shown in Subsection 10.5.1, the largest threat caused by climate change would be a reduction of annual rainfall by more than 100 mm. The influence of this phenomenon will soon appear in not only surface water but also in shallow groundwater as the water level of rivers and shallow wells decrease, which might result in drought in the area. It means that the availability of water for irrigation will be low. On the other hand, the results of the self-help group (SHG) sample survey shows that one of the popular farming problems they are facing is water shortage (refer to Section 5.8). If the effects of climate change are apparent, the water availability for agriculture will be lower than its current situation, and unless they prepare adequate adaptation measures, it is inevitable for farmers to minimize their agricultural activity. A threat of climate change in agriculture sector in India and a potential of I-HIMDI as an adaptation measure against climate change are tabulated as following.

Table 10.5.4 Threat of Climate Change for Agriculture Sector and Adaptation Measures by I-HIMDI

Threat	Adaptation Measures
Decrease in crop yield and production	<ul style="list-style-type: none"> - Arrangement of farming calendar - Application of hybrid seeds - Improvement of agricultural productivity through training of horticulture
Escalation of crops due to decrease of production	<ul style="list-style-type: none"> - Contribution in food self-sufficiency by enhancing capacity of food production through MDI and agricultural extension service
Degradation of crop quality by fluctuation of precipitation and temperature	<ul style="list-style-type: none"> - Designing proper cropping pattern suitable to climate and geography of Jharkhand - Improvement of crop quality by agricultural extension service
Irruption of pest insect by change of temperature and humidity	<ul style="list-style-type: none"> - Adoption of tolerant variety - Collaborative pest control
<ul style="list-style-type: none"> - Destabilisation of agriculture by frequent natural disaster - Impoverishment by decline of agricultural income 	<ul style="list-style-type: none"> - Stabilisation of agricultural activity and increase of agricultural income through MDI and improvement of flood control by furrowing

Source: Prepared by JICA Survey Team based on Natural Resource Management for Horticulture Development, Satish Serial Publishing House, India

I-HIMDI is aiming livelihood improvement of small and marginal farmers by enhancing productivity and crop production with MDI. It is widely recognized and expected to perform as an adaptation measure against climate change as mentioned.

10.6 Involvement of Japanese Private Firms and NGOs in the Project

According to the field survey in Jharkhand and interviews in Japan, it should be considered that each organisation has their own activity and marketing strategy in businesses in India. Many Japanese private companies have their business plans mainly focusing on New Delhi, Mumbai, Chennai, and Bangalore. In this regard, it is said that the geographic location of Jharkhand may be one of the disadvantages in its involvement in I-HIMDI. The results of the analysis on the possibility of involvement of Japanese private firms and NGOs into I-HIMDI are summarised in Table 10.6.1 below.

Table 10.6.1 Possibility of Involvement of Japanese Private Firms and NGOs in I-HIMDI

Category	Current Situation of Japanese Firms	Possibility on Involvement into I-HIMDI
MDI Facility	In Japan, MDI on open field is less popular than in India because of its requirement under higher humid climate conditions in Japan.	It may be difficult for Japanese firms and NGOs to be involved in I-HIMDI due to the lack of their business and activity experience and technical advantage on MDI in India and Jharkhand
Horticulture Production and Extension	There are three seed companies, Sakata Seed Corporation, Takii Seed Company and Tokita Seed Co., Ltd, that are operating their marketing offices in India. As of May 2014, Sakata Seed Corporation has been doing their business in Jharkhand dealing with high quality vegetable seeds with high yield and high resistance against pest and disease in the area. The Japanese subsidiary company Universal Sompo General Insurance has a branch office in Ranchi, doing business mainly for life insurance, while crop insurance is currently under consideration.	It is possible to introduce their high quality vegetable seeds to farmers in the area by showing its characteristics in training and demonstrations in I-HIMDI. Problems of horticulture in Jharkhand are mainly water shortage as well as pest and disease control. If farmers recognise the advantage of their seeds with comparison of cost and benefit, it may be possible to improve farmers' income through their seeds in I-HIMDI. Micro insurance is a hot issue in India. If GoI will provide subsidy to crop insurance for small and marginal farmers, there might be a potential for I-HIMDI.
Processing, Marketing, and Logistics	There are many Japanese companies doing their businesses in processing, marketing, and logistics in India especially in Delhi, Mumbai, Chennai, and Bangalore. A few companies are doing business under such sectors in Jharkhand. In the suburban area of Ranchi, the Jharkhand Mega Food Park is under development as described in Section 3.8.1. The Mega Food Park has land provision for 33 processing units, and provision for common facilities including dry warehousing, cold storage, flour mills, and packaging units. Currently, the park is under construction and it is yet to be operational.	Further survey is required to consider a concrete business partnership among them in connecting farm products in I-HIMDI to the value chain effectively. It should especially survey the legal requirements for Japanese firms, institutional arrangement with Indian firms, development of logistics flow using the train and highway network connecting Jharkhand to large cities such as Delhi, Mumbai and coastal cities which have large ports to export overseas including Japan. Furthermore, the possibility of doing processing operations in the Mega Food Park for Japanese firms should be surveyed especially on detailed procedure for participation, the legal status required to participate that scheme and requirements to receive government subsidies and so on.

Source: JICA Survey Team

CHAPTER 11 CONCLUSION

11.1 Project Purpose

The purpose of the Project is to improve livelihoods of small and marginal farmers in Jharkhand by off-season vegetable production using micro drip irrigation systems (MDI) with intensive technical support for enhancement of productivity and marketability of horticulture crops. Consequently, the Project could contribute toward activation of agriculture sector, poverty alleviation and empowerment of female farmers by enhancement of their participation in economic activities through horticulture production as well.

11.2 Necessity and Rationality of the Project

11.2.1 Relevance

(1) Consistency with the Twelfth Five Year Plan of India

The National Twelfth Five Year Plan emphasises that the growth must not only be rapid but also more inclusive and environmentally sustainable. The inclusiveness is a multidimensional concept, i.e., (i) to reduce poverty, (ii) to improve regional equality across states and within states, (iii) to improve conditions of the Scheduled Castes (SCs), Scheduled Tribes (STs), Other Backward Classes (OBCs) and minorities, (iv) to close the gender gap, and (v) to generate attractive employment opportunities for the youth. Meanwhile, the plan must also focus on other priorities such as resource use efficiency and technology to ensure sustainability of natural resources, adaptation to climate change, and improvements in total factor productivity. Therefore, it is noteworthy to implement this project.

(2) Consistency with the State Policy and Plans of Jharkhand

Major policy of agriculture sector under the Jharkhand State Twelfth Five Year Plan emphasises (i) increase in agriculture production through diversification of vegetables, (ii) shift from traditional mono-cropping to horticulture and area expansion under commercial horticultural crops, (iii) increase in irrigation coverage through a mix of major, medium, minor, and groundwater schemes, (iv) increase irrigated area further by 10% to 15% through proper water management and so on. In compliance with this policy, National Rural Livelihood Mission (NRLM) and National Horticulture Mission (NHM) are executing in Jharkhand. This project, which is also consistent with the state development policy, is significant to be implemented. Therefore, it can be said that the Project is consistent with the policy and plans.

(3) Necessity of poverty alleviation in comparison of status among other states in India

As mentioned in Chapter 3, poverty alleviation project is necessity in terms of the following aspects to catch up with other states of India.

- Ratio of the poor in rural area is relatively high. Poverty line of Jharkhand is Rs.749 per capita which ranks the third from the bottom among the states. Population of the poor is 10.4 million which ranks the seventh and the ratio of the poor ranks the third from the bottom. ¹
- Monthly income per capita is Rs. 2,197 which ranks the second from the bottom and population

¹ Press Note on Poverty Estimates, 2011-12, Government of India Planning Commission, July 2013

ratio of BPL is 13.6% which ranks the sixth from the bottom. ²

- ST ratio is 26.2% which is higher by 17.6 point than the national average of 8.6%. ³

(4) Necessity of gender development in comparison of status among other states in India

Gender Development Index (GDI) and Gender Empowerment Measure (GEM) are indicators which show the status of female in society. The results of the survey of GDI and GEM mentioned in Section 8.5.2 indicated that Jharkhand marked 0.558 in GDI (ranked 29th out of 35 states) and 0.435 in GEM (ranked 26th out of 35 states) in 2006. The results indicated that Jharkhand State lagged a bit behind the other states in gender empowerment. ⁴

State-wise literacy rate in India and the status of Jharkhand is given in the table below. It shows that Jharkhand is at fourth rank from the bottom in literacy rate and at third rank in female literacy rate from the bottom. Especially, Jharkhand ranks at the bottom in gap between male and female literacy rates. (refer to Section 8.5 also)

Table 11.2.1 Literacy Rate in India and Rank of Jharkhand

Literacy Rate - Worst 10 States -		Male Literacy Rate - Worst 10 States -		Female Literacy Rate - Worst 10 States -		Gap between Male and Female Literacy Rate - Worst 10 States-	
State	%	State	%	State	%	State	Point
Bihar	63.82	Rajasthan	67.51	Rajasthan	52.66	Jharkhand	22.24
Arunachal Pradesh	66.95	Bihar	73.39	Bihar	53.33	Chhattisgarh	20.86
Rajasthan	67.06	Arunachal Pradesh	73.69	Jharkhand	56.21	Dadra & Nagar Haveli	20.73
Jharkhand	67.63	Andhra Pradesh	75.56	Jammu & Kashmir	58.01	Madhya Pradesh	20.51
Andhra Pradesh	67.66	Meghalaya	77.17	Uttar Pradesh	59.26	Jammu & Kashmir	20.25
Jammu & Kashmir	68.74	Jammu & Kashmir	78.26	Arunachal Pradesh	59.57	Bihar	20.06
Uttar Pradesh	69.72	Jharkhand	78.45	Andhra Pradesh	59.74	Uttar Pradesh	19.98
Madhya Pradesh	70.63	Assam	78.81	Madhya Pradesh	60.02	Haryana	18.61
Chhattisgarh	71.04	Uttar Pradesh	79.24	Chhattisgarh	60.59	Odisha	18.04
Assam	73.18	Madhya Pradesh	80.53	Odisha	64.36	Uttarakhand	17.63
All India	74.04	All India	82.14	All India	65.46	All India	16.68

Source: Census of India 2011

Although the literacy rate does not mean the social status directly, it may show gender status of Jharkhand indirectly. Gender development to fill the gap between the status of male and female is necessity for the balanced development in rural area in Jharkhand.

(5) Consistency with JICA's policy and development assistance plan to India

It also coincides with JICA's country analysis paper for India, stating that poverty alleviation and food security are the main issues of the agriculture sector in India, which are to be overcome by means of (i) countermeasures for water shortage, (ii) development of rural infrastructure, and (iii) investment on research and development of agriculture technology. Besides, JICA's development assistance plan to India puts emphasis on eradication of poverty and improvement of the environment. Income and employment generation of the local poor is top priority. Thus, the project is justifiable to apply for the Japanese ODA.

² Planning Commission (2011) 'Poverty Mapping using Clustering'

³ Census 2011

⁴ Gendering Human Development Indices: Gendering Human Development Indices: Recasting the Gender Development Index and Gender Empowerment Measure for India, Ministry of Women and Child Development, GOI

11.2.2 Effectiveness

(1) Effectiveness of MDI for promotion of horticulture

In Jharkhand, annual mean rainfall is approximately 1,400 mm. But 80% of rainfall concentrates in the monsoon season from June to September causing limited availability of water for irrigation purpose. Major water source for irrigation is open well which account for 29%, followed by pond of 19% and canal of 18%⁵. Therefore, MDI to improve water availability of open well is one of the important measures for effective irrigation water use throughout a year. In general, proper use of MDI can save water by 70% and increase crop yield by 40% compared to traditional furrow irrigation (refer to Section 10.3.1).

The result of the SWOT analysis of MDI in Jharkhand is shown in the figure below. In the Project, enhancement of its strength and opportunities and mitigation of threat and weakness could be effective method.

	Helpful	Harmful
Internal Origin	<p>Strengths</p> <ul style="list-style-type: none"> ■ MDI can economize the use of water, fertilizers, seed, electricity & labour, etc. ■ Required period for planning of MDI is shorter with lower installation cost and lower environmental impact compared to large and middle sized gravity irrigation facilities. ■ MDI system can be customized for each farmer's condition such as location, size and purpose. ■ In general, organizational management is not required because MDI can be managed by individual farmers. ■ Natural influences caused from topography, soil and climate are less than rainfed farming. ■ Environmental impact such as salt damage and soil erosion is less. ■ MDI can mitigate weed germination due to spot irrigation. ■ MDI can reduce workload of farmers for irrigation and applying fertilizer. 	<p>Weaknesses</p> <ul style="list-style-type: none"> ■ Frequent maintenance and replacement are necessary in O&M, especially replacement of filter, repairing and replacement of pipe. ■ Replacement of filter may be required due to clogging of filter depending on water quality. ■ Depending on the condition, it may be difficult to use farm machineries in case that pipelines are spread and fixed on field.
External Origin	<p>Opportunities</p> <ul style="list-style-type: none"> ■ Jharkhand is topographically and climatically suitable for horticulture production. ■ Awareness among the farmers about crop diversification is increasing rapidly. ■ Awareness among farmers about intensive farming is increasing rapidly. ■ Demand of horticultural crops is increasing and vegetables especially tomato & potato are exported to other states and overseas. ■ There are a lot of potentials in livelihood enhancement by the installation of MDI because current practice in the area is primitive. ■ In general, the accessibility of farmers to existing middle or large irrigation systems is limited. MDI can be installed anywhere in the condition that water source such as well is available, and enhance their livelihood. 	<p>Threats</p> <ul style="list-style-type: none"> ■ The labour force availability per ha is low in the State. ■ The State has mostly drought prone districts in which rain-fed farming is prevalent. ■ Access to irrigation sources among the small and marginal farmers is very limited. ■ Majority of small farmers don't have access to credit, crop insurance, market, etc. ■ Majority of small farmers have poor access to information and technologies. ■ Literacy rate is relatively low in the State, which is a hindrance in agricultural development ■ The network of the MDI suppliers and support systems are insufficient.

Source: Final Report (Version II), Survey for Horticulture Intensification by Micro Drip Irrigation (MDI), JICA and JICA Survey Team

Figure 11.2.1 Result of SWOT Analysis for Extension of MDI Systems in Jharkhand

(2) Effectiveness of off-season vegetable cultivation for enhancement of farmers' income

The Project targets commodity flows by way of assembly markets to connect production areas and large potential markets in off-season in and around Jharkhand. It can secure large market demands enough to supply vegetables produced by off-season cultivation in the Project. An image of the target commodity flows in the Project is illustrated in the following figure.

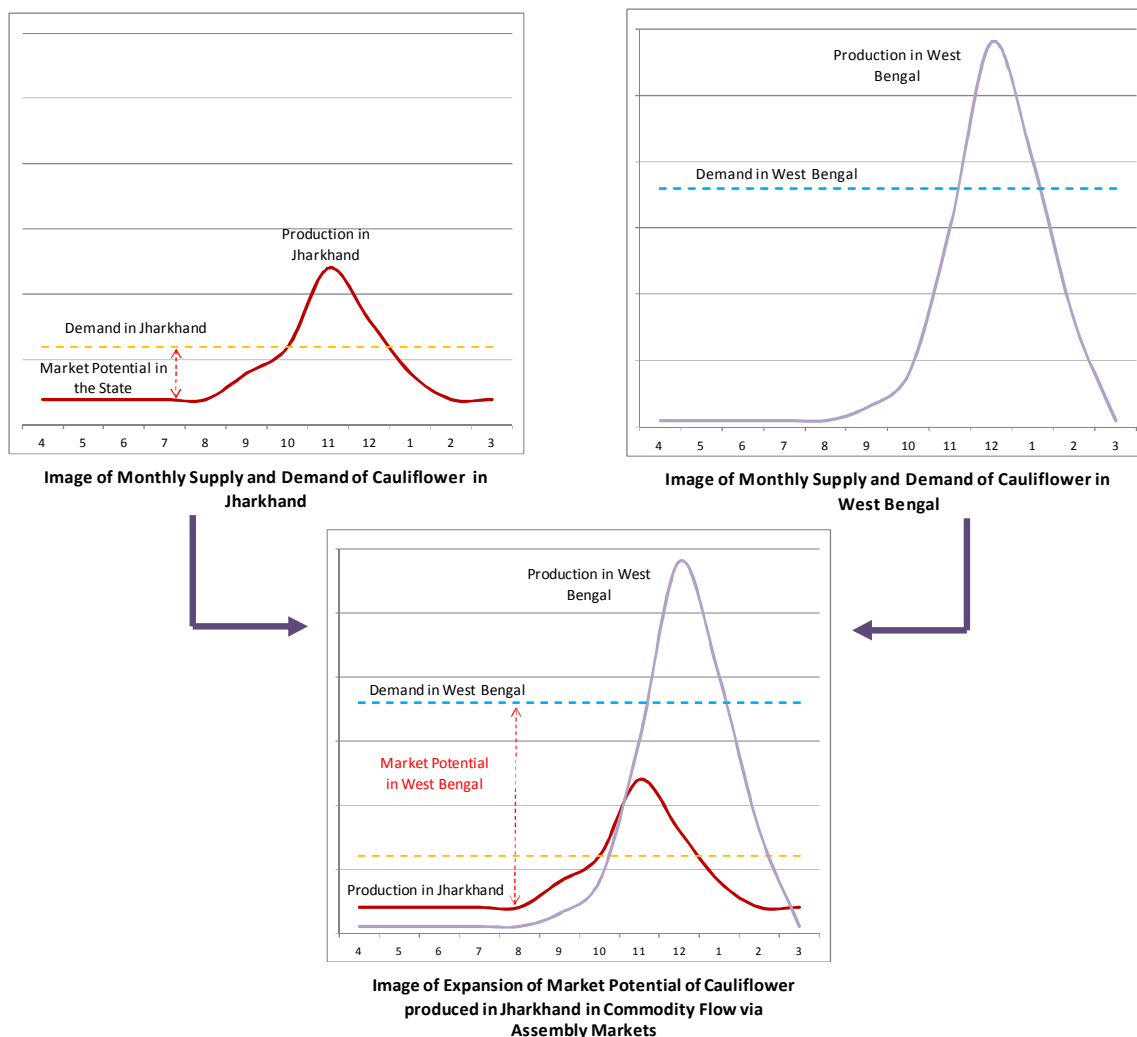
⁵ Final Report (Version II), Survey for Horticulture Intensification by Micro Drip Irrigation (MDI), Indian Society of Agribusiness Professionals



Source: JICA Survey Team

Figure 11.2.2 Image of Commodity Flow via Assembly Market targeted in the Project

The off-season is defined as a time of year when vegetables can be sold at better prices due to higher demands in between seasons. The following figures show an example of connectivity between cauliflower supply from Jharkhand and demand in West Bengal. Farmers can sell their products to large market in off-season, if they produce during off-season of target potential market in and around Jharkhand to utilize its climate differences.



Source: JICA Survey Team

Figure 11.2.3 An Example of Connectivity between Vegetable Supply from Jharkhand and Demand in West Bengal

The Project sets out shipping of vegetables at better price in a time of high market potential through off-season cultivation by MDI. Linkage between farmers in the Project areas and distributors coming from megacities in off crop season at assembly markets makes a win-win solution in business on the both sides. It is quite possible for assembly markets in Jharkhand, where traders and middlemen get together, to secure shipping of vegetables to nearby megacities especially in off-season. It is a great advantage that Jharkhand has six agro-climate regions. Taking the above into account, the Project targets the farmers who could easily access to assembly markets. Moreover, the Project will provide training programmes to MDI farmers for making cultivation plans based on market needs (crops, varieties, quantities, quality, time, etc.) of traders and middlemen. It will be effective to enhance farmers' incomes.

(3) Effectiveness of MDI for livelihood enhancement

Tendency of land holding in Jharkhand in last decade are as follows.

- The Figure 3.7.4 in Section 3.7.2 shows the typology of land holding in Jharkhand. According to the figure, sub-marginal farmers (less than 0.4 ha) show the highest ratio at 49.8% followed by marginal farmers (0.4 ha -1.0 ha) at 22.8%. Ratio of landless farmers is 9.3%.
- The Tables 3.7.3 and 3.7.4 in Section 3.7.2 show detailed data of the distribution of operational land holding in Jharkhand in 2000-01 and 2010-11. According to the tables, the average size of an operational land holding in 2010-11 was 1.17 ha which has decreased from 1.45 ha in 2000-01 (Section 3.7.2). It also suggests an effective land use in individual farm land might be necessary in uplifting agricultural production in Jharkhand.

Micro drip irrigation could be a effective measure for enhancement of horticulture production in such small and scattered farmlands in Jharkhand.

(4) Effectiveness of MDI Package composed of MDI, PNH and VCU

The MDI package which is to be installed by the Project is composed of micro drip irrigation (MDI), poly nursery house (PNH) and vermin compost unit (VCU). All of them are commonly dealt with in Jharkhand and India. Therefore, dealers can easily secure required number of those facilities in time.

Micro drip irrigation could save irrigation water effectively and supply moderate water volume timely to farmers' field. PNH can help raising healthy seedlings which is most effective for the improvement of quality of vegetables and yield by keeping moderate humidity around seedlings. In addition, increasing soil fertility is also important through VCU by improvement of physical and chemical conditions of soil.

Therefore, the MDI package could be effective to increase vegetable yield and to improve quality of products to meet market demands, followed by livelihood improvement of farmers.

(5) Effectiveness of organisational arrangement and operation

As mentioned in Section 6.3 and 7.1, the SPMU (State Project Management Unit) is to be established at the state level as an independent unit under the Project Cell of JSLPS. The SPMU is responsible for the overall implementation of the Project, and accountable directly to the Chief Executive Officer (CEO) of JSLPS. The SPMU will work in close consultation and collaboration with the Project managers in their relevant fields of expertise. Since the Project will employ a large number of staff at the district and field levels, support staff as listed in Figure 7.1.2 and Table 7.1.4 in Section 7.1, who

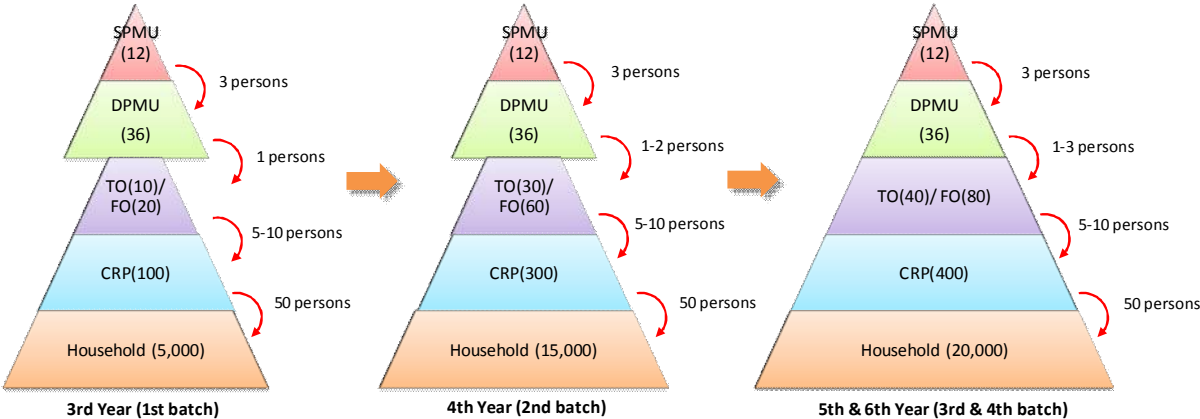
would exclusively handle administrative and financial transactions related to the Project, in line with the services of the existing JSLPS staff in relevant sections such as administration and logistics, MIS, monitoring and evaluation (M&E), finance, and procurement.

At the district level, DPMU is to be established within the existing offices of the District Mission Management Unit (DMMU) of NRLM. It would also serve as a common platform, to provide administrative support such as financial transaction and information management. Currently, the DMMU offices are established only in a few districts. However, the DMMU offices are to be established in other districts as JSLPS (State Rural Livelihood Mission, SRLM) plans to expand the intensive blocks over the state under the phasing plan of the NRLM to cover all districts by 2018-19. The targets of the NRLM phasing plan are as shown in Table 7.1.3 in Section 7.1, with which the phasing plan of the Project should carefully be aligned, and the target districts of the Project should be prioritised.

There would be several field staff to be employed by I-HIMDI, to work in close coordination with the beneficiaries in the communities, under the supervision of DPMU and I-HIMDI DCs. TO would be assigned per approximately 500 MDI farmers, whose primary role is to provide technical guidance in terms of the MDI system operations, horticultural production techniques, and marketing. These TOs are also expected to act as intermediaries to facilitate coordination amongst beneficiary farmers and concerned parties, including MDI suppliers and other technical resources persons in the locality.

As to the organisational management of the beneficiaries’ groups, FOs are to be employed to cover 250 MDI farmers per one FO. The FOs are tasked to provide routine supervision of groups’ activities and guidance in terms of group operations, including financial management such as loan repayments and savings, so as to help the groups to enhance their capacity to properly operate as a community group.

Staff number in organisational structure and its transition in the course of the Project implementation is shown in the figure below. It shows that it is possible for staffs at each level to manage the staffs in lower level of the organisational structure for operation of the Project.



Source: JICA Survey Team

Figure 11.2.4 Staff Number in Organisational Structure and its Transition in the Course of the Project Implementation

At field level, one CRP will be attached to one village (about 50 farmers), one FO will cover five villages (5 CRPs) and one TO will cover 10 villages (10 CRPs) in a cascade manner. Thus, the proposed organisational arrangement and operation are quite reasonable and also cost effective.

(6) Financial viability of the Project

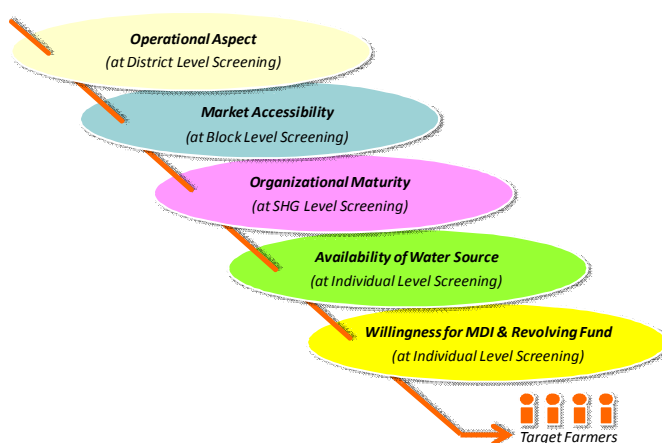
As mentioned in Section 10.1.4 in Chapter 10, EIRR of the Project was calculated based on the flow of economic benefits and costs for the whole project area. EIRR was estimated at 26.5%, B/C ratio was 1.38 and B-C of the net benefit was estimated at Rs.1,747 million. It shows that the Project is financially viable. Net farm income is expected to increase from 22,183 Rs./year per 0.1 ha to 43,807 Rs./year by the Project.

11.2.3 Efficiency

(1) Efficiency by the selection of target areas by criteria

Willingness of farmers to improve their livelihood through I-HIMDI is a prerequisite among other conditions. It shall be confirmed in the course of selection process of target MDI farmers in the beginning of the Project.

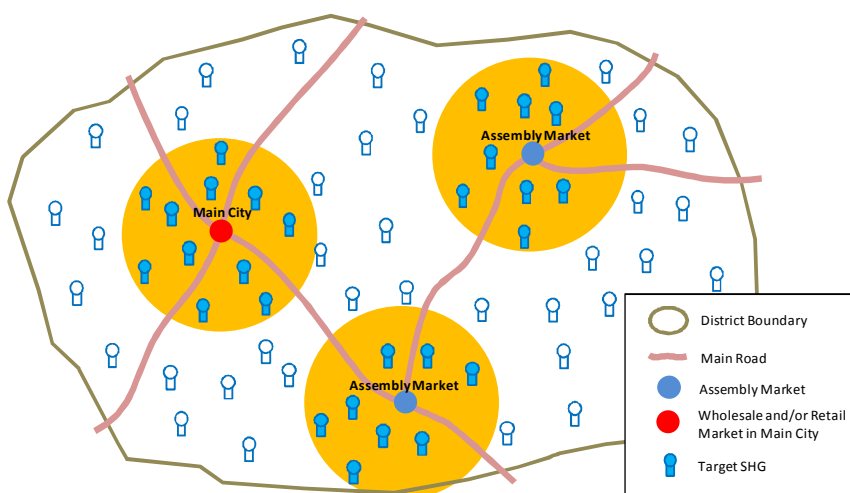
In the planning of I-HIMDI, there may be five important factors to be considered, i.e., (i) Operational Aspect, (ii) Market Accessibility, (iii) Organisational Maturity, (iv) Availability of Water Source, (v) Willingness for MDI and O&M Fund as illustrated in Figure 5.2.1 in Chapter 5.



Source: JICA Survey Team
Figure 11.2.5 Selection Concept of Target MDI Farmers

It is most essential to select target MDI farmers from intersection area of six factors.

The total number of target MDI farmers is planned to be 60,000. To narrow down the target MDI farmers from total farmers in Jharkhand, a step by step approach will be applicable; in this case, macro to micro, in other words, (i) District by project purpose, (ii) Block by market accessibility (iii) SHG by organisational maturity (iv) Farmers by eligibility and willingness.



Source: JICA Survey Team
Figure 11.2.6 Image of Cluster Approach in the Selection of Target MDI Farmers

(2) Effective operation and monitoring through cluster approach

In the selection of target SHGs, a cluster approach will be essential, which has various advantages, as follows:

- To maximise function and benefit derived from MDIs,
- To make monitoring by JSLPS easier,
- To make technology transfer by community resource person (CRP) easier,
- To make follow-ups by MDI suppliers easier,
- Agriculture input shop starts dealing with MDI spare parts and liquid fertilisers because regular demand is generating in the particular area, and
- SHG clusters to make use of market infrastructure installed in I-HIMDI can be made.

(3) Efficiency by the selection of capable and motivated SHGs and households

After the selection of the target blocks, SHGs will be evaluated by the selection criteria of organisational capacity, availability of water source for MDI and willingness. As a result of the survey, number of potential household was estimated to 86,000 in the 1st priority blocks and 59,000 household in the 2nd priority blocks. The selection criteria of farmers' organisations and households are mentioned in Section 5.7 in Chapter 5. In addition, 376 households were interviewed to confirm their willingness to participate to the Project after knowing the condition of O&M fund and obligation of repayment. As a result of the survey, 370 farmers express their willingness to participate the Project. A manual of the interview survey and form are attached in Attachment 5.9.1 and 5.9.2. The result of the survey are summarised in Attachment 5.9.3.

(4) Efficiency by adaptation of female farmers' opinion

In the implementation of I-HIMDI, some following points should be noted (refer to Section 8.5):

- (i) The members of MDI Farmer Group will be the members (females) of eligible SHGs and their spouses. Considering many farming activities done by both males and females, trainings conducted by I-HIMDI should include all MFG members together. (refer to Section 8.5)
- (ii) I-HIMDI proposes to select CRPs in O&M of MDI facilities, horticultural production, marketing, management of O&M fund, and other aspects within the target villages. It should be considered appropriate measures in selecting CRPs, since some societies dislike that males get trainings from females due to their custom.
- (iii) The borrowers of the loan regarding MDI facilities are MDI farmers with the membership of SHG. Thus, the amount of loan and repayment schedule should consider the availability of the borrowers (i.e., moratorium of repayments maybe three months due to the timing of first income from vegetable production period.) To participate the Project, agreements of all family members are required.
- (iv) The training contents conducted by I-HIMDI should be designed based on the existing gender roles in agricultural activities and/or need analysis. In Jharkhand, literacy rate of female in rural area is 56.21% although that of male is 78.45%. To consider the gap, training materials developed for I-HIMDI should be in audio and visual materials and/or materials containing a lot of pictures and figures for better understanding of female farmers.
- (v) In general, raising seedlings is a role of female farmers in the rural area. They are raising

seedlings whilst taking care of the housework and children. Originally, JSLPS proposed one large-sized poly nursery house per village. For easy access to nursery for female farmers from their house, the JICA Survey Team recommended a small-sized poly nursery house installed at each household to ease female farmers' burden. The JICA Survey Team also recommended small-sized Vermin Compost Unit for the same reasons.

- (vi) MFG consists of both genders. I-HIMDI, in close collaboration with JSLPS, has to enhance female participation in the management including planning and decision making at MFG, and also has to ensure fair income distribution with the households as MFG members.

11.2.4 Impact

- (1) Positive impact on the adaptability to climate change

In India, annual mean rainfall has decreased by 95.7 mm in last 100 years and temperature has slightly raised in all over the country in last 50 year (refer to Section 10.5.1). MDI is generally recognised as a measure of adaptability to climate change.

- (2) Avoidance of resettlement and land acquisition as negative impact

In general, one of the major problems in middle and large irrigation development project is negative impact caused by resettlement and land acquisition. But, MDI normally does not cause those negative impacts. It is a remarkable advantage of the Project compared to other projects.

- (3) Positive impact on the enhancement of horticulture production

In general, horticulture is one of the important crops in Jharkhand. The Table 3.7.5 in Chapter 3 shows the distribution of gross cropped area across different crops of Jharkhand in 2004-05 as compared with all-India. As a result of comparison, share of total cropped area of horticulture is 10.59% in Jharkhand and 2.86% in all-India.

Farmers are utilising its characteristic climatic condition to produce horticulture crops and sell to internal and external markets of Jharkhand. The series of charts in Figure 3.7.22 in Chapter 3 shows the position of Jharkhand in some major horticulture crop productions of India. The figure shows the importance of Jharkhand in horticulture crop production in the entire India despite its small geographical area of 2.4% in the total country area. Therefore, large positive impact on bottom-up of horticulture production is expected through the Project.

- (4) Positive impact on the improvement of status of female farmers

As a result of sample survey in the Project, it was observed that seasonal migration in summer season is common in the rural area in Jharkhand due to lack of irrigation water for farming. Therefore, male farmers work out of village during summer season for the seasonal migration. Especially, 80% of male farmers work out of village in May which is the middle of summer season (refer to Attachment 5.8.5).

In the Project, it is expected that income is improved by off-season horticulture production by female farmers. It may improve the status of female farmers due to income generation by female farmers themselves. To ensure that positive impact, the Project support female farmers through an affordable interest ratio of O&M fund, three months grace period after first harvest in the repayment to O&M fund, agreement of all family members to share the obligation of repayment duty and a series of intensive trainings composed of horticulture production and marketing etc. (refer to Section 7.2)

11.2.5 Sustainability

(1) Sustainable facility use by O&M fund

In the Project, O&M fund will be established in SHG account to secure a fund to be used for operation and maintenance of installed facilities in the Project. Concretely, farmers repay an amount which is equivalent to 60% of MDI cost to O&M fund established in SHG's account. The fund is exclusively used for replacement of parts and facility of MDI to sustainable income generation to enhance farmer's benefit. By involvement of SHGs in a repayment process, peer pressure among the MDI farmers can be expected. (refer to Chapter 7)

(2) Sustainable extension by CRP at grass root levels

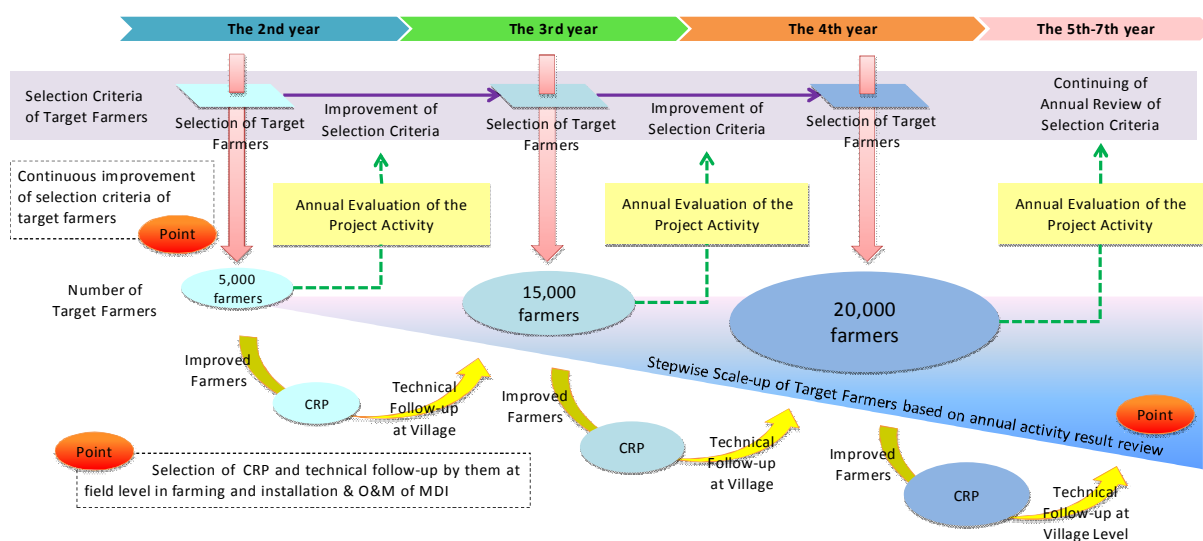
CRP will hold demonstration of field practice in their farm land to disseminate farming techniques to farmers instead of travelling extension. It is important for sustainability of CRP's activities that CRP always exist in village as a consultant when farmers have any questions on field practice. (refer to Chapter 7)

(3) Sustainability by gradual scale-up of the Project

Major points to ensure project sustainability will mainly depend on (i) selection criteria of target groups and farmers, (ii) project scale (number of target farmers), and (iii) extension services and O&M training to farmers. (refer to Chapter 5)

The following points shall be considered to ensure the sustainability of the Project:

- To modify selection criteria and method for target groups and farmers every year based on the annual evaluation of the project activities in the previous year.
- To scale up the number of target groups and farmers year by year based on the annual performance review.
- To establish a follow up system for extension services and O&M of MDI systems at field level by progressive farmers certified as “model farmers” and “CRP” for technical follow up in the area.



Source: Prepared by JICA Survey Team

Figure 11.2.7 Methodology to ensure the Sustainability of the Project

11.3 Recommendations

(1) Coordination with other programmes of the Government of Jharkhand relevant to I-HIMDI

Prioritised blocks in the target districts of I-HIMDI have been selected and approved by JSLPS (refer to Section 5.6). To maximise synergistic effects between I-HIMDI and other government programmes, JSLPS shall initiate necessary coordination with relevant government departments so that they put their preference on the priority blocks of I-HIMDI in the following activities:

- Social mobilisation and capacity building of self-help groups (SHGs) under the National Rural Livelihoods Mission (NRLM);
- Well construction being promoted by the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA);
- Watershed management and conservation being promoted by the Integrated Watershed Management Programme (IWMP).

It is strongly recommended to implement the above programmes preferentially in those blocks for synergistic convergence.

(2) Arrangement of office space for I-HIMDI by JSLPS

JSLPS is currently making necessary arrangements for establishing offices as well as for recruitment of staff at different levels in accordance with the phasing plan of NRLM (refer to Section 7.1). The JSLPS district offices in the target districts of I-HIMDI listed above shall become operational before the commencement of I-HIMDI. Some working space in the relevant district offices shall be allocated to I-HIMDI by JSLPS.