Rice (*Oryza sativa* L.) Varietal Diversity, Uttar Dinajpur, West Bengal, India

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Abstract- A study has been carried out based on field survey at ground level and covered almost all the block and collected the varietal information as grown by the farmers, Uttar Dinajpur District, West Bengal with an objective to understand the present varietal status and rice diversity exist in the region, old alluvial Gangetic plain zone, West Bengal. Under the study covered in eight block of the district with 43 farmers and maximum farmers was from Itahar followed by Raiganj, Karandighi, Chopra, Chakulia, Hemtabad, Islampur and Goalpokhar. Under study, varieties were being grown by the farmers, Uttar Dinajpur District, whereas 62% high yielding varieties (HYV), 31 % local varieties and 7% Hybrids. The rice varieties grown by the farmers were Begun Bichi, Swarna, Kalirai, BB 11, Maharaja, Tulaipanji, Danga Basful, GB 2, Zeera, Khitish, SS 1, IR 64, Satabdi, Sampa, Josua, Arize 6444, IET 1444, Sourab, Yamuna, Hi Rice, Ranjit, Nilanjana, Kalo Nunia, MTU 1010, Gobindabhog, Niranjan and Kalabhat. Among the varieties most popular varieties were Swarna, BB 11 in *Kharif* whereas, Khitish, Satabdi, IR 64 in *Boro* on the other hand Tulaipanji is the most popular aromatic rice, Uttar Dinajpur District followed by Jasua, Gobindabhog and Kalabat and most popular hybrid was Arize 6444Gold. Some Varieties like Arize 6444, MTU 1010, Khitish and Zeera were grown in both the season. Good eating quality and milling (%) along with market popularity existed in the market with the varieties like Khitish, IR 64, Swarna and MTU 1010. According to global sustainability goal (GSG), conservation and maintenance of biological diversity is most importance for the future food for all, integrity in the competitive climate changing resource shrinking challenging world and futuristic livelihood.

Key Word: Rice – *Oryza sativa* L., Variety, Diversity, Uttar Dinajpur.

INTRODUCTION

Rice is one of the most important field crop grown by the farmers in Uttar Dinajpur District, West Bengal, India. The District comes under old alluvial gangetic plain Agro-climatic zone and with sandy-loam to clay –loam soils with the river Mahananda, Nagar, Sui and Kulik and virgin soils. Rice, Wheat, Maize, Jute, Indian mustard, Toria, Sesame, Flax, Urad, Lentil, Green Gram, Red Gram, Kulti Kolai, Lytharus were grown as major field crops. Tea, Makhana, Mango, Pineapple, Banana, Litchi, Sugarcane etc were also grown in the region. Rice, Jute, Wheat, Indian mustard and Maize crops were dominated and grown by the farmers. Presently, Tea in Chopra, Goalpokhar, Islampur, Maize in Karandikhi, Raiganj, Goalpokhar , Hemtabad and Jute in Kaliaganj and Itahar were popularly growing by the farmers. Rice had been growing during *Aus*, *Aman* and *Boro*, during all the reasons in the District pre-dominantly whereas, due to high adoption, high yielding varieties drastically change the availability of local rice or traditional cultivars in the region and day by day the availability of the traditional varieties had been reduced.

Table 1: Distribution of Area (1000 ha.) of Uttar Dinajpur District (2011-12)

Land use & land cover pattern of the district	Geographical area (‘000 ha)	Share (%)
Cultivable Area	248	79.23
Forest Area	0.9	0.29
Land use Under Non agricultural Use	32.1	10.26
Permanent Pasture	0.3	0.10
Cultivable Wasteland	9.5	3.04
Land under Misc. Tree Crops	3.2	1.02
Barren and Uncultivable Land	0.1	0.03

Land Current fallows	6.5	2.08
Other fallows	0.2	0.06
Total	313	

Rice is the major economic source in the farming families, Uttar Dinajpur District. Traditional cultivar Tulaipanji has been granted as geographical indication (GI) as well as under the scheme of one district one product (GoI, 2017). Old varieties are almost not available namely, Changa Dhan, Sasi-mohan, Kalirai, Bhadui, Soni Bhadui, Kuyajoli Bhadui, Motichur and others. Looking to the present rice varietal situation, a study has been conducted in the district to know the present rice varietal status for the benefit of farmers, different stakeholders and for better future in rice economy and genetic diversity of the region, Uttar Dinajpur, West Bengal.

Land use pattern of the Uttar Dinajpur (table -1), total land 313k hector, and cultivated area 248 k ha. (79.23%), followed by non agricultural use 32.1 k ha., cultivated wetland 9.5 k ha., fallows and 6.5 k ha., tree crops 3.2 k., ha., forest 0.9 k ha. and pastured land 0.3 k ha..Forest cover is increasing, Indian mustard and Maize somehow, on the same trend but decreasing the interest, rice farmer on rice cultivation and on the same or more pathetic on pulses cultivation in the district. Awareness on importance on cropping sequence and incorporation of leguminous crops has been declined among the farming community in Uttar Dinajpur, West Bengal.

Table 2. Rice Area, Production and Productivity, Uttar Dinajpur 2011-12

Name of Block	Aus			Aman			Boro		
	Area (ha)	Prod. (k. t.)	Yield (kg/ha)	Area (ha)	Prod. (k. t.)	Yield (kg/ha)	Area (ha)	Prod. (k. t.)	Yield (kg/ha)
Chopra	3	0.006	1863	12940	28.484	2201	475	1.368	2881
Islampur	-	-	-	16050	31.175	1942	3000	9.001	3000
Goalpokhar-I	140	0.261	1863	21471	45.679	2127	5790	15.333	2648
Goalpokhar-II	-	-	-	18142	49.543	2731	4943	13.773	2786
Karandighi	-	-	-	20726	55.182	2662	13891	38.280	2756
Raiganj	134	0.250	1863	29631	72.937	2462	7572	23.056	3045
Hemtabad	-	-	-	11837	41.750	3527	3889	14.270	3669
Kaliaganj	-	-	-	18141	50.059	2759	8185	26.671	3259
Itahar	-	-	-	24345	71.762	2948	14287	47.037	3292

Different seasonal rice area, production and productivity (Table – 2, Anonymous, 2012), Aus rice cultivation dominating clock were Raiganj, Goalpokhar I and Chopra followed by others block, whereas data was not available for other blocks. Aus rice productivity was 1863kg/ha in the producing block of the district. Aman rice cultivated in all the blocks with highest area in Raiganj (29631) followed by Itahar, Goalpokhar - I, Karandighi, Goalpokhar- II, Kaliaganj, Chopra and Hemtabad. Aman Rice productivity reported highest in Hemdabad (3527kg/ha) followed by Itahar, Kaliaganj, Goalpokhar –II, Karandighi, Raiganj, Chopra, Goalpokhar I and Islampur. Boro rice area was highest in Itahar (14287 k.ha.) followed by Karandighi, Kaliaganj, Raiganj, Goalpopkar –I, Goalpakhar II, Islampur and Chopra whereas, productivity was highest in Hemtabad (3669 kg/ha.) followed by Itahar, Kaliaganj, Raiganj, Islampur, Chopra, Goalpokhar II and Goalpokhar I. Total Aman rice area was 173283 ha. with productivity 2595kg/ha. Total Boro rice area was 63032 ha. with an average productivity ,3037kg/ha. whereas, Aus Rice area was 277 ha with an average productivity, 1863kg/ha. .Total Rice area was 235592 ha. Highest productivity was in Boro (3050kg/ha) followed by Aman (2595kg/ha) and Aus (1863kg/ha) in the Uttar Dinajpur District, West Bengal with respect to fertile sols and water resources availability as well as favorable weather conditions for the cultivation, Rice.

MATERIALS AND METHODS

To study the present varietal diversity, a survey has been designed with questionnaire module to collect the

general information on varietal diversity, Uttar Dinajpur District, West Bengal. The survey form was formed with the basic information of farmer's details, land status and crop and rice varieties grown by them in their field. Rice varieties according to season details with variety name, growing season, duration, grain type, disease, pest and market price whereas, all the information had been captured. The survey had been conducted in all the block of Uttar Dinajpur District with different progressive farmers. The collected data had been compiled and analyzed to draw the conclusion from the survey work on the varietal present status of Uttar Dinajpur, West Bengal.

During the survey, majority of the farmers responded from Itahar Block followed by Raiganj, Karandighi, Chakulia, Chopra, Hemabad, Islampur and Goalpokhar, Uttar Dinajpur District, West Bengal (Fig.- 1) . Survey work has been conducted in all the eight blocks with forty-three rice farmers, Uttar Dinajpur District, West Bengal.

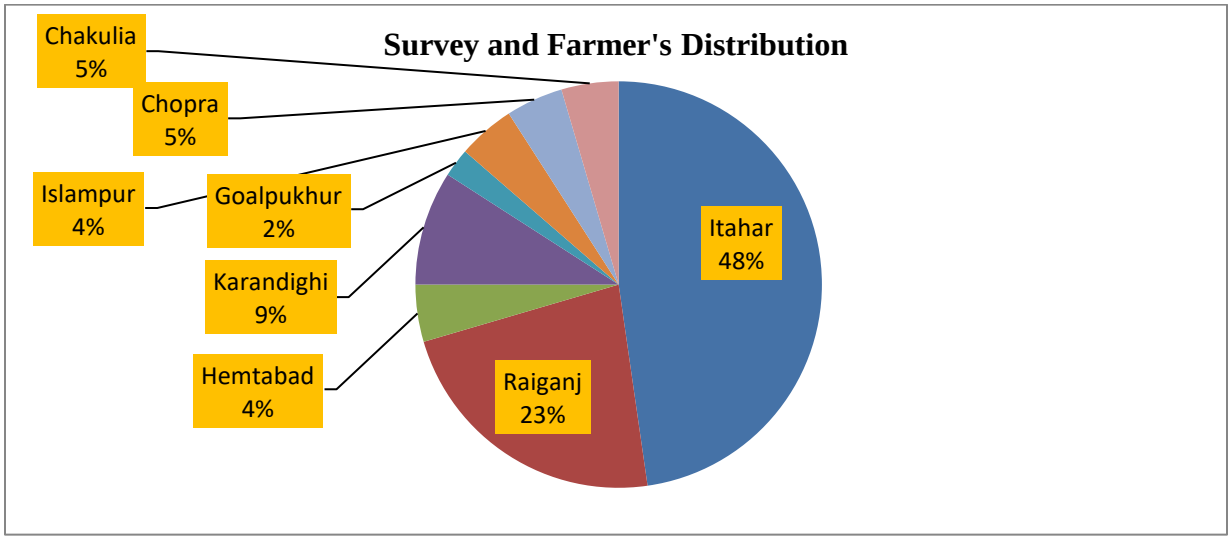

Fig. Farmer's Survey and Distribution

RESULTS AND DISCUSSION

Under the study found that on varietal survey forty three farmers were participated from different Blocks, Uttar Dinajpur District during 2021-22 and majority of the farmers were growing high yielding rice varieties (62%) followed by local varieties/traditional cultivar (31%) and Hybrid (7%) (Fig. 2).

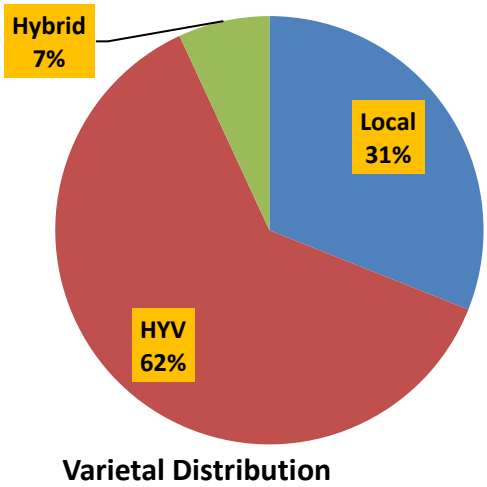

Fig. 2. Varietal Diversity of Uttar Dinajpur.

Twenty nine genotypes, diverse rice including high yielding varieties, traditional varieties and hybrids were being cultivated in Uttar Dinajpur District, West Bengal. Cultivated high yielding varieties were IR 64,

Satabdi, Sampa, IET 1444, Sourab, Gourab, Yamuna, Ranjit, Nilanjana, Niranjan, MTU 1010, Swarna, BB 11, Maharaja, GB 2, Zeera, Khitish, SS -1. Local cultivars, Bagan Bichi, Kalirai, Tulaipanji, Dangarful, Josua, Kalo nunia, G. Bhog and Kalaghat were being cultivated. Hybrids, Arize 6444, Arize 6444Gold, Hi-Rice were being cultivated (table-3).

Cultivars, IR 64, Satabdi, IET 1444, MTU 1010, Zeera, Khitish and Gourab were cultivated during *Boro* and all was long slender (LS) rice and cultivated under irrigated ecology with mid to mid –early duration high yielding varieties. Khitish, Satabdi were the most popular variety due to good yield consistency and eating quality, per-boiled rice preferred by the local people. IR 64 was the most popular variety for puff making quality adopted by the farmers with consistent yield performance and high milling. As per discussion with the farmer, MTU 1010 had been getting popularity among the farmers due to early duration matching with multiple cropping system and high yield under water stress up-land with low disease and pest pressure.

High yielding varieties (HYV), Sourab, Yamuna, Ranjit, Nilanjana, Niranjan, Swarna, BB 11, Maharaja, GB 2 and Swarna Sub -1 were being cultivated during kharif due to consistent higher yield and eating quality. Cultivars, Began Bichi, Kalirai, Tulaipanji, Danga Basful, Jasua, Kaalo Nunia, Gobinda Bhog and Kalabhat were being grown due to their special qualities and ecological suitability. Kalirai was the deep water rice grown in the low land ecology. Barik *et al.*, 2020 reported Samudrabali, /basnamundi, Gadaba, Surudaka and Dokarukuji were submergence tolerance landrance, Odisha.

Tulaipanji has been granted as Geographical Indication (GI) due to its special aroma and soft rice quality with respect to production with quality in the unified geography, Uttar Dinajpur, West Bengal and Government of India also declared under the one district one product to Tulaipanji Rice for Uttar Dinajpur, West Bengal (Mondal *et al.*, 2013). Tulaipanji, B. Bhog, B. Bichi, Kalo Nunia, Jasua, Danga Basful were the aromatic cultivar grown by the farmers of Uttar Dinajpur for different type of quality dist preparation along with cultural expression and the ritual celebration. Semwal,*et al*., 2014 reported Dangibasul was a drought tolerance landrace, West Bengal.

Old traditional, *Aus* cultivars were not found in the field but some short duration varieties like MTU 1010, Satabdi were being cultivated in *Aus* season in Uttar Dinajpur by very few farmers. MTU 1010 were grown in all the seasons by some farmers. Under the study, were found that some farmers also expressed their feeling with respect to old traditional cultivars with respect to their unique qualities and on ecological adoptability, seasonality, eating quality as well as health benefit, *Aus* rice like Bhadui cultivars. *Aus* cultivar, under Bhadui group like Kuajoli bhadui, Soni Bhadui, Motichur mostly were direct seeded and performed better under rainfed drought and weed competition with quality cook rice eating quality preferred by the farmers on that time. Bhadui group cultivar were performed better under least management as well as low input in natural farming system in Uttar Dinajpur District, West Bengal. Sinha, 2014, reported that landrace Jhulur, Kaloboro, Khandagiri,Moti -1, Sitapi, Triguna were drought tolerance. Under the climate changing world, farmers were expressed their importance in the present time to overcome the challenges with the old cultivars.

CONCLUSION

Majority of the *Boro* season varieties belong to the long slender (LS), non - aromatic, high yielding, irrigated were growing followed by medium slender (MS) , and medium bold (MB) in *Kharif*, in the Uttar Dinajpur District, West Bengal and looking to the yield, high yielding nutrient responsive varieties dominating in the market. On the other hand, looking to the important, local cultivars with their unique trait need to focus on the old traditional varieties and need to conserve and share with the farmers on the other hand need to under- stand better about the genetic variability and stress tolerance source. The utility and importance, each genotype in the ecosystem for the better farming with sustainability and conserving the local varieties along with possible value addition in their product and process with commercial feasibility like brown rice, aromatic rice, nutria –rich rice, black rice, special quality rice in participatory might be explored. Approaching, with the local people and motivate the local people or farmer for the cultivation of old traditional varieties for better and healthy and wealthy future and explore the varieties for defendant able biotic and abiotic stress to success the global

sustainable development goal(SDG) in the climate changing world.

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Table 3a. Rice Varieties Grown by the Farmers (2021-22), Uttar Dinajpur, West Bengal

Sl. No.	Name Variety	Paddy Type (HYV, Hybrid,Traditional)	Yield(t/ha)	Duration(Days)	Grain Type (MS,SB,MB, SS,LS, LB)	Height (Tall/ Mid/Dwarf)	Grain Color (White, Straw,Yellow,Red, Black)	Awn (Yes/ No)	Land (Up, Mid, Low)	Irrigated/Rainfed	Growing Season	Cooking and Eating Quality	Aromatic/non - Aromatic	Logging issue(Yes/No)	Disease Noticed (Blast,BLB,FS,PB)	Pest(Noticed, SB, LF, BPH,GM,GB)
1	Begun Bichi	Local	3.5	155	SB	Mid	Greenish, Straw, Black spotted tip,	No	Up-Mid	Irrigated/Rainfed	Kharif	Good	Aromatic	No	Blast	YSB
2	Swarna	HYV	4.5	145	MS	Mid	Dark Golden	No	Low	Irrigated/Rainfed	Kharif	Good	non	No	Blast, BLB,PB	LF,BPH,BLB
3	Kalirai	Local	3	165	MB	Tal	Straw	No	Low	Rainfed.Deepwater	Kharif	Good	non	Yes	NA	LF
4	BB 11	HYV	4.5	125	MB	Mid	Straw	No	Up - Mid	Irrigated	Kharif	Good	non	Yes	BLB	YSB,BPH
5	Maharaja	HYV	4.5	140	MS	Mid	White Straw	No	Mid	Irrigated	Boro/Kharif	Good	non	Yes	BLB	YSB, LF
6	Tulaipanji	Local	2.5	155	SS	Tal	Straw White	Yes	Up-Mid	Both	Kharif	Excellent	Yes	Yes	Highly Sensitive to Blast	YSB
7	Danga Basful	Local	3	155	SS	Tal	Dark Straw	Yes/Less	Up-Mid	Both	Kharif	Good	Yes	Yes	Blast, BLB	YSB

8	GB 2	HYV	4	130	MS	Mid	Red	No	Up-Mid	Both	Boro/Kharif	Good	non	No	Blast, BLB	YSB, LF
9	Zeera	HYV	4.5	135	SS	Mid	Light Straw	No	Up-Mid	Irrigated	Boro/Kharif	Good	non	No	Blast, BLB	YSB
10	Khitish	HYV	4.5	145	LS	Dwarf	Straw	No	Up-Mid	Irrigated	Boro	Good	non	No	BLB, Blast	YSB, LF
11	Swarna Sub -1	HYV	4.5	145	MS	Dwarf	Light Straw	No	Mid - Low	Irrigated	Kharif	Good	non	No	Blast, BLB, ShB	YSB, LF,BPH

Table 3b. Cont….

Sl. No.	Name Variety	Paddy Type (HYV, Hybrid ,Traditional)	Yield (t/ha)	Duration(Days)	Grain Type(MS,SB, MB ,SS, LS, LB)	Height (Tall/ Mid/Dwarf)	Grain Color(White, Straw, Yellow ,Red, Black)	Awn (Yes/ No)	Land (Up,Mid, Low)	Irrigated/Rainfed	Growing Season	Cooking and Eating Quality	Aromatic/non - Aromatic	Logging issue(Yes/ No)	Disease Noticed (Blast,BLB, FS,PB)	Pest(Noticed, SB, LF, BPH,GM, GB)
12	IR 64	HYV	4.5	150	LS	Mid	Straw	No	Mid	Irrigated	Boro	Good	non	No	BLB, Blast	YSB, LF, BPH
13	Satabdi	HYV	4.5	145	LS	Dwarf	Light Straw	No	Up-Mid	Irrigated	Boro	Good	non	No	Blast, BLB, ShB	YSB, LF,BPH
14	Sampa	HYV	4	135	MS	Mid	Light Straw	No	Up-Mid	Irrigated	Kharif	Good	non	No	Blast, BLB, ShB	YSB, LF,BPH
15	Josua	Local	2.5	140-145	SS	Tal	Light Straw	Yes	Up-Mid	Rainfed	Kharif	Good	Yes	Yes	Blast, BLB, ShB	YSB, LF,BPH
16	Arize 6444Gold	Hybrid	5.5	145	MS	Mid	Light Straw	No	Mid	Irrigated	Both	Poor	non	No	Blast	YSB, LF, BPH
17	IET 1444	HYV	4	150	LS	Mid	Light Straw	No	Mid	Irrigated	Both	Good	non	No	Blast, BLB, ShB	YSB, LF,BPH
18	Sourab	HYV	4.5	145	MS	Mid	Light Straw	No	Mid	Irrigated	Both	Good	non	No	Blast, BLB, ShB	YSB, LF,BPH
19	Gourab	HYV	4.5	145	MS	Mid	Light Straw	No	Mid	Irrigated	Kharif	Good	non	No	Blast, BLB, ShB	YSB, LF,BPH
20	Yamuna	HYV	4.6	155	MS	Mid	Light Straw	No	Mid-Low	Irrigated	Kharif	Good	non	No	Blast, BLB, ShB	YSB, LF,BPH
21	Hi- Rise	Hybrid	5.2	135	LS	Mid	Light Straw	No	Mid	Irrigated	Kharif	Good	non	No	Blast, BLB, ShB	YSB, LF,BPH
22	Ranjit	HYV	4.5	155	MS	Low	Straw	No	Low	SLL	Kharif	Good	non	No	BLB, ShB	YSB, LF,BPH
23	Nilanjana	HYV	4.3	145	MS	Mid	Golden	No	Mid	Irrigated	Kharif	Good	non	No	Blast, BLB, ShB	YSB, LF,BPH
24	Kalo Nunia	Local	2.5	155	SS	Mid	Black	No	Mid	Irrigated	Kharif	Good	Yes	No	PB	YSB, LF,BPH
25	Swarna Dheki	Local	3.5	155	MB	Low	Dark Straw	No	Mid	Rainfed	Kharif	Good	non	No	NA	YSB, LF,BPH
26	MTU 1010	HYV	4.5	135	LS	Mid	Golden	No	Up-Mid	Both	Both	Good	non	No	Blast, BLB, ShB	YSB, LF,BPH
27	Gobindabhog	Local	2.4	150	SB	Mid	Straw	No	Mid	Both	Kharif	Good	Yes	No	Blast, BLB, ShB	YSB, LF,BPH
28	Niranjan	HYV	4.5	145	MS	Mid	Dark Straw	No	Mid	Both	Kharif	Good	non	No	Blast, BLB, ShB	YSB, LF,BPH
29	Kalabhat	Local	4	160	LB	Low	Dark Straw	No	Low	Rainfed	Kharif	Good	non	Yes	FS	NA

SUPPLEMENTARY DATA:

Table 4a. List of Farmer List Surveyed

Madhyam Sarkar	Shibrampur	Timlna	Itahar	Uttar Dinajpur	733124
Narayan Chandra Ghosh	Bousha	Parergram	Itahar	Uttar Dinajpur	733143
Haran Mandal	Serenjabari	Bekidnga	Itahar	Uttar Dinajpur	733143
Rabin Sarkar	Deoga	Punia	Raiganj	Uttar Dinajpur	733129

Rakesh Mahato	Kamalabari	Mirual	Raiganj	Uttar Dinajpur	733130
Pinku Das	Parul	Sakunti	Goalpokhar	Uttar Dinajpur	733208
Sarat Barui	Matianda	Matianda	Islampur	Uttar Dinajpur	733202
Bhairab Singh	Telengadangi	Mongabhita	Islampur	Uttar Dinajpur	733201
Bikash Singha	Dighnagaon	Karandighi	Karandighi	Uttar Dinajpur	733215
Nabakumar Singha	Sadipur	Tungidighi	Karandighi	Uttar Dinajpur	733215
Satyajit Singha	Sadipur	Tungidighi	Karandighi	Uttar Dinajpur	733216
Kishor Kumar Das	Bhagiratha	Kantor	Raiganj	Uttar Dinajpur	733134
Stadal Tarafdar	Maharaja	Maharaja	Raiganj	Uttar Dinajpur	733134
Jit Roy	Kasimpur	Hemtabad	Hemtbad	Uttar Dinajpur	733130
Sibnath Singha	Jiudhi	Chakulia	Chakulia	Uttar Dinajpur	733209
Nityaranjan Mandal	Chakulia	Chakulia	Chakulia	Uttar Dinajpur	733208
Shyamal Kumar Ghosh	Chanditala	Raiganj	Raiganj	Uttar Dinajpur	733134
Parimal Singh	Halpur	Punia	Raiganj	Uttar Dinajpur	733156
Sudhangsu Kar	Durgapur	Chopra	Chopra	Uttar Dinajpur	733201
Tamay Barman	Maharaja	Maharaja	Raiganj	Uttar Dinajpur	733156
Arjun Yadab	Maharaja	Maharaja	Raiganj	Uttar Dinajpur	733156
Bishnu Ghosh	Bousha	Parergram	Itahar	Uttar Dinajpur	733143
Shyamal Saha	Parergram	Parergram	Itahar	Uttar Dinajpur	733143
Ashok Roy	Indrapur	Chitalghata	Chopra	Uttar Dinajpur	734426
Samiran Das	Hatia	Hatia	Raiganj	Uttar Dinajpur	733143
Pintu Barman	Kajol Bari	Swaminath	Itahar	Uttar Dinajpur	733143

Table 4b. List of Farmer List Surveyed.

Farmer's Name	Village	Post	Block	District	PIN
Biplob Thokdar	Banagram	Hatgachhi	Itahar	Uttar Dinajpur	733143
Balaram Barman	Kajal Bari	Swaminath	Itahar	Uttar Dinajpur	733143
Jayanta Sarkar	Hasua	Swaminath	Itahar	Uttar Dinajpur	733143
Nilay Das	Hatia	Hatia	Raiganj	Uttar Dinajpur	733123
Badal Debsharma	Kakarsingh Ghat	Hemtabad	Hemtbad	Uttar Dinajpur	733130
Dinesh Nunia	Durgabari	Hatgachhi	Itahar	Uttar Dinajpur	733143
Rakhal Ghosh	Bousha	Parergram	Itahar	Uttar Dinajpur	733143
Ram Chandra Ghosh	Bousha	Parergram	Itahar	Uttar Dinajpur	733143
Usmal Ali	Mahanandapara	Parergram	Itahar	Uttar Dinajpur	733143
Gonesh Basak	Chandigram	Hatgachhi	Itahar	Uttar Dinajpur	733143
Sitjanjan Basak	Chandigram	Hatgachhi	Itahar	Uttar Dinajpur	733143
Chandan Basak	Chandigram	Hatgachhi	Itahar	Uttar Dinajpur	733143
Manik Basak	Chandigram	Hatgachhi	Itahar	Uttar Dinajpur	733143
Susanta Mandal	Kharsata	Paraharipur	Itahar	Uttar Dinajpur	733143
Shukhankar Thokdar	Kharsata	Paraharipur	Itahar	Uttar Dinajpur	733143
Ansarul Islam	Bousha	Parergram	Itahar	Uttar Dinajpur	733143
Shyamal Choudhury	Borot	Marnai	Itahar	Uttar Dinajpur	733124