

Project Report

Social Scientific Study on Promotion of Alternate Wetting & Drying Irrigation System (AWD) in Jhenaidah District, Bangladesh



Implemented By

Japan International Research Center for Agricultural Sciences (JIRCAS), Japan



&

Asia Arsenic Network (AAN)



Cooperated By

Department of Agricultural Extension (DAE), Jhenaidah



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1. Introduction

Jhenaidah district, located in the southwestern part of Bangladesh, belongs to the Ganges River basin, and its topography is mainly highlands and mid-highlands. There are few lowlands having baors and beels areas. The region, predominantly intensive agricultural area, cultivates rice in three seasons: Aus in the early rainy season, Aman in the late rainy season, and Boro in the dry winter season, along with various Robi crops, such as pulses, oilseeds, winter vegetables, and spices such as turmeric, onions, and garlic, as well as grains including wheat and maize. It is also suitable for cultivation of cash crops such as bananas, mangoes, sugarcane, betel nuts, and ornamental flowers. However, crop diversification has been limited due to the unavailability of high-quality and diverse Robi crop seeds at the required times, leading to a preference for dry-season rice cultivation.

Agricultural irrigation mainly relies on groundwater, and the groundwater level is highest (approximately 2 meters below ground) in the late rainy season (August-September), then gradually declines, and dropping to an alarming level in the late dry season (March-April). During the dry season, the use of large amount of groundwater irrigation through shallow and deep tube-wells limits the use of many drinking and irrigation wells. Furthermore, due to groundwater Arsenic content, it is a big concern, nowadays, about the impacts on soil and crops. In addition, the effects of abnormal weather such as drought and unseasonal rainfall due to climate change showing a negative impact on agricultural crops and making it difficult for farmers.

To address these issues, Asia Arsenic Network (AAN) has implemented two projects: (1) Promotion of Sustainable Agriculture Practice (SAP) with Water-saving Irrigation for the Fundamental Solution of Arsenic Pollution (SAP-I) during July 2017 to September 2020; (2) Promotion of Water Management and Climate Change Adaptation in Agriculture (SAP-II) during February 2021 to January 2024 funded by MOFA, Japan. The projects were carried out in collaboration with the Department of Agricultural Extension along with different government agencies and NGOs. The projects worked with targeted 3,000 farmers in 83 villages in six upazilas of the district. The results of the endline survey of SAP-II conducted in May and June 2023 suggested that AWD has been spreading not only in the targeted farmers but also to other farmers in surrounding areas.

In February 2024, "Japan International Research Center for Agricultural Sciences (JIRCS), planned to conduct a preliminary survey on farmers who have will to introduce AWD in Jhenaidah District. This is a preliminary rural survey to gain a comprehensive understanding of the rural area and stratify the villages in preparation for detailed interviews. AAN was commissioned to carry out this work and this report presents the details of that survey results.

2. Methods

The survey was conducted in 83 villages of Jhenaidah district where SAP-I and SAP-II projects were implemented (Figure 1). Thirty farm households were randomly selected from each village, and a total of 2,490 households were interviewed about irrigation water sources, decision of irrigation timing, awareness of water shortages, and AWD. Face to face interviews were done in February 2024 using a structured questionnaire. Before survey, the interviewers were training on the techniques and methods of data collection. The village list and other information including agriculture were collected from AAN previous database and other secondary sources.

The sampling households was calculated based on the interval between survey households by dividing the number of households in each village. However, the beneficiary households of SAP-I and SAP-II projects were excluded from the survey. In some cases, the interval households were less than 10 (e.g., every 3 or 4 households) due to lower number of households. Conversely, in large villages, we decided to collect samples at intervals of 10 households and then move to another household within the village. Sample households of the survey is shown in Figure 2.

Calculation method for the number of households in each village

$$\text{Sample household} = \frac{\text{Population as per 2011} \times 1.22 \text{ (Population growth rate)}}{3.85 \text{ (Average family size)}}$$

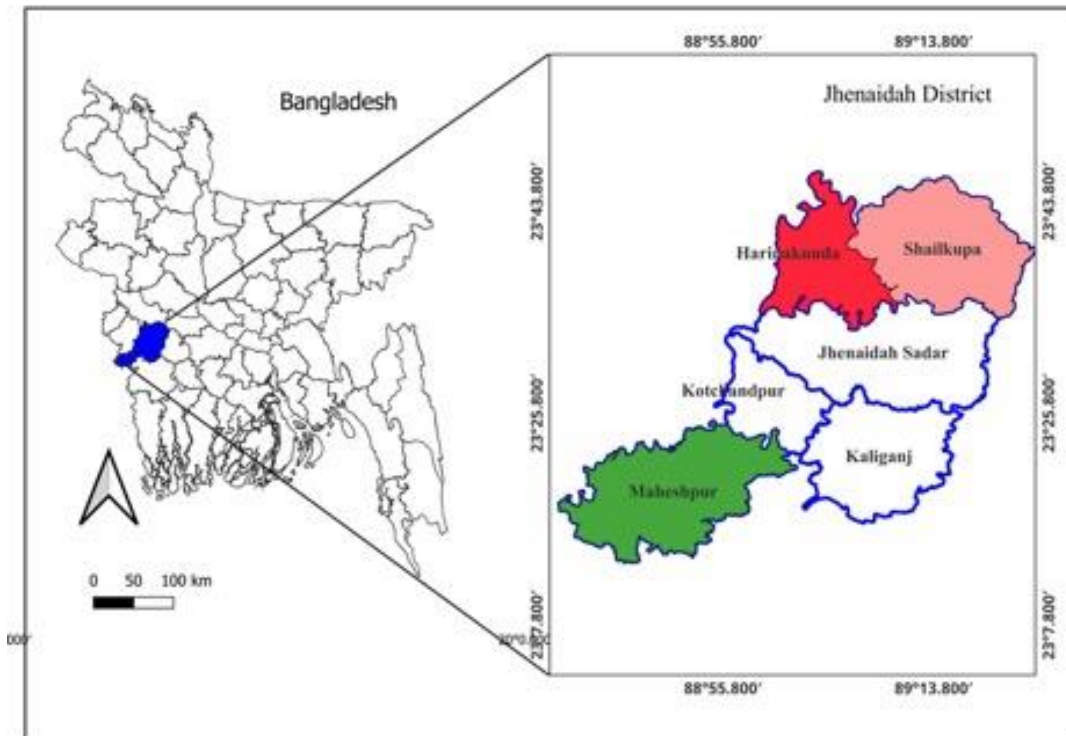


Figure 1. Map of Jhenaidah showing SAP-I and SAP-II project areas. (SAP-I: Jhenaidah Sadar, Kaliganj and Kotchandpur; SAP-II: Harinakunda, Maheshpur and Shailkupa).

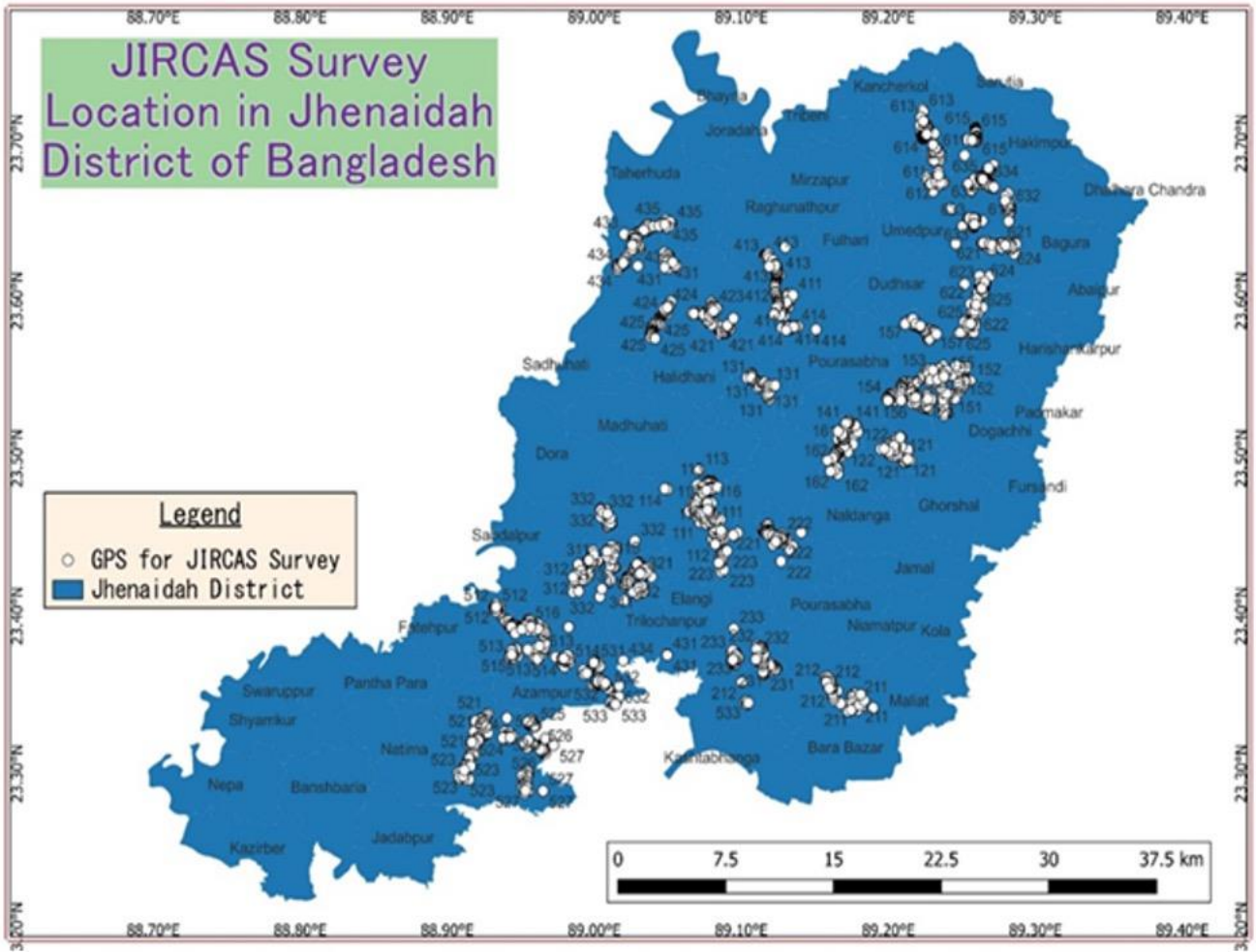


Figure 2. Survey households with village names in Jhenaidah district.

3. Survey Results

① Irrigation source

A total of 2,490 survey respondents were asked about their main irrigation water sources for crop cultivation (Table 1). Majority of the farmers (56%) used other people's wells for irrigation followed by personal wells for 1041 people (42%) and joint wells for 46 people (2%). Only one farmer used surface water (Canal/Pond/River Water in Maheshpur upazila for crop irrigation (Figure 3). Among the upazilas, most of the farmers of Maheshpur upazila (263 people, 55%) used their own wells for irrigation, while Kotchandpur had the highest percentage of other people's wells at 73% (233 people).

Table 1. Distribution of the respondents according to source of irrigation in different upazilas of Jhenaidah district

Upazila	Own	Joint	Others	Surface	Total
Jhenaidah Sadar	206 (34.3)	9 (1.5)	385 (64.2)		600 (100)
Kaliganj	107 (44.6)	20 (8.3)	113 (47.1)		240 (100)
Kotchandpur	79 (26.3)	1 (0.3)	220 (73.4)		300 (100)
Harinakundu	174 (41.4)	13 (3.2)	233 (55.4)		420 (100)
Maheshpur	263 (54.8)	2 (0.4)	214 (44.6)	1 (0.2)	480 (100)
Shailkupa	212 (47.1)	1 (0.2)	237 (52.7)		450 (100)
Total	1041 (42)	46 (2)	1402 (56)	1	2490 (100)

Figures in the parentheses represent the percent values.

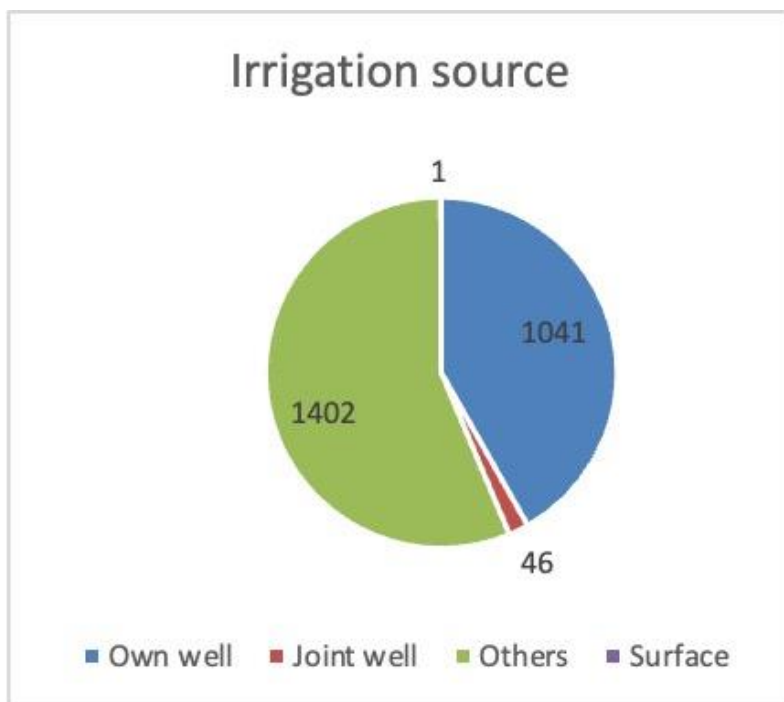


Figure 3. Sources of irrigation for crop cultivation.

② Decision making on irrigation timing

The respondents were asked about decision making on irrigation timing. About 44% respondents used other's well with other's decision for irrigation followed by own decision with own well (42.8%), won decision with other's well (11.8%) and own well but other's decision (1%) (Table 2). In Jhenaidah sadar and Kotchandpur upazilas, most of the respondents (57.3% and 70.7%, respectively) applied irrigation with other's well and other's decision, indicating they had no control on irrigation time. On the other hand, 46.7, 44.0, 57.1 and 46.7% respondents in Kaliganj, Harinakundu, Maheshpur and Shailkupa, respectively, applied irrigation by own well and own decision (Table 2).

Table 2. Distribution of the respondents according to the decision making on irrigation timing in different upazilas of Jhenaidah district

	Own well and own decision	Own well but other's decision	Other's well but own decision	Other's well and other's decision	Others (surface irrigation)	No answer	Total
Jhenaidah Sadar	203 (33.8)	8 (1.4)	45 (7.5)	344 (57.3)			600 (100)
Kaliganj	112 (46.7)	13 (5.4)	20 (8.3)	95 (39.6)			240 (100)
Kotchandpur	82 (27.3)	2 (0.7)	4 (1.3)	212 (70.7)			300 (100)
Harinakundu	185 (44.0)	1 (0.2)	132 (31.4)	99 (23.6)		3 (0.7)	420 (100)
Maheshpur	274 (57.1)	2 (0.4)	1 (0.2)	202 (42.1)	1 (0.2)		480 (100)

Shailkupa	210 (46.7)	-	93 (20.7)	147 (32.7)			450 (100)
Total	1066 (42.8)	26 (1.0)	295 (11.8)	1099 (44.1)	1	3 (0.1)	2490 (100)

③ Farmers' perception regarding water scarcity

We asked respondents (farmers) about their perceptions regarding water shortages. In February 2024, there were multiple rainfalls, and the temperature was low and evapotranspiration was slow. Perhaps this was due to the fact that many farmers answered "I don't feel water shortage". In order to find out the actual situation throughout the year other than the present, it was necessary to think about how to ask questions. for example, "Isn't there a water shortage even in the *Choitro* month (mid-March to mid-April)?" , "Do you feel water shortage compared to five years ago?".

Five years ago 89% respondents did not feel water shortage, which is 10% now. Only 10% did feel it lightly 5 years ago and it is 49% now. "I feel a little" – there was no respondent 5 years ago, but we found 16% now (Table 3). None of the respondent was suffering damage due to water shortage 5 years ago, but recently 8% experienced damage of crops due to water shortage, indicating that more people are feeling water shortage than before. The highest number of respondents (42%) in Kaliganj answered "I don't feel water shortage". In Shailkupa, 306 people (68%) said they were "worried about water shortages" and 38 people (8%) said "I'm suffering damage due to water shortage". A total of just under 80% respondents expressed a strong sense of crisis about water shortage.

Table 3. Farmers' perception regarding water scarcity

Upazilla	I don't face water shortage.		I feel it lightly		I'm a little worried.		I'm worried		I'm suffering damage.		No.of respondents
	5 years ago	Present	5 years ago	Present	5 years ago	Present	5 years ago	Present	5 years ago	Present	
Jhenaidah Sadar	497	54	101	111	1	189	0	118	1	128	600
Kaliganj	183	100	53	102	1	29	1	5	2	4	240
Kotchandpur	297	19	1	264	1	12	0	2	1	3	300
Harinakundu	412	62	6	321	0	13	2	4	0	20	420
Maheshpur	476	12	2	408	2	53	0	1	0	6	480
Shailkupa	350	1	94	3	3	102	1	306	2	38	450
Total	2215	248	257	1209	8	398	4	436	6	199	2490
	89%	10%	10%	49%	0%	16%	0%	18%	0%	8%	

④ Perception of Union chairman and farmers regarding water shortage (from Union survey)

This preliminary investigation also included interviews with 18 union leaders (UP Chairman). We asked the union chairman to name villages in the union that have water shortage. The union chairmans' and the farmers' perceptions of water shortage were analyzed.

As a result, out of the 83 villages surveyed, 52 villages were recognized by the UP Chairman as having water shortages, and the rest 31 villages were not named as areas with water shortages (Table 4).

Regarding the perception of water shortages among survey respondents, in "villages with water shortages," 1,340 people (85.9%) answered that they didn't feel water shortages five years ago, and 153 people (9.8%) answered that they currently do not feel water shortages.

In "villages without water shortages", 75 people (94.1%) answered "I did not feel water shortage 5 years ago" and 95 (10.2%) answered "I do not feel water shortage now" (Table 4).

Table 4. Perception of Union chairman and farmers regarding water shortage

Union chairman's answer	Number		The number of farmers who don't feel water shortage			
	Village	Farmer	5years ago		Current	
Villages reported water shortage	52	1560	1340	85.9%	153	9.8%
Villages No reported water shortage	31	930	875	94.1%	95	10.2%
Total	83	2490	2215	89.0%	248	10.0%

⑤ Irrigation category

Respondents (farmers) were asked what measures they were taking to deal with water shortages. Since they were not eligible for SAP support, most of them did not know the term "AWD," and the definition of AWD that does not use water level measuring pipes, which is called "AWD eye-estimation" among surveyors, was not clear. As a result, it became clear through the Japanese inspection that the practice of intermittent irrigation was being overlooked.

Through interviews with researchers and respondents, we found that both practices are common in farmers "intentional drying" called Pith/Pithan/Shaka (drying rice once or twice for 5 to 7 days

within 30 to 40 days after planting) and "Gradual AWD" (started watering after the water almost disappear and soil is visible).

Although the depth of the water was not included in the question, we heard from farmers that, in the past, water was kept at about 10 to 15 cm every day to maintain that condition, but in recent years, water has been added to a shallower depth of about 3 to 5 cm.

The difference between continuous flooding and "Gradual AWD" is that in continuous flooding, "water is supplied from above the remaining water in the rice field", while in "Gradual AWD", water is supplied from the top of the rice field. The level of soil dryness in "Gradual AWD" is not uniform and varies depending on the nature of the land/soil type, rainfall, temperature, amount of groundwater, etc.

In this survey, we asked questions about irrigation conditions, allowing multiple answers, and based on the results, we classified seven categories regarding rice irrigation: 1. Constant flooding, 2. Continuous flooding+Pith(intentional drying), and 3. AWD-eye (Gradual AWD) , 4. AWD eye+Pith, 5. AWD-pipe, 6. AWD-pipe+Pith, and 7. No irrigation for Boro (shifted to Robi totally).

Results showed that 1,866 people (74.9% of the total) practiced "pith", 1,797 (72.2%) practiced "AWD-eye", and 5 (0.2%) practiced "AWD-pipe". Therefore, all the respondents directly or indirectly practicing water saving techniques. However, very few farmers are practicing scientifically. About 196 people (7.9%) shifted from dry season rice cultivation to upland crop cultivation and did not use irrigation like rice cultivation (Table 5). Only 4.5% of the 113 people did not do any of these and constantly flooded their crop fields.

By category of rice cultivation irrigation, (1). 113 people (4.5%) with constant flooding, (2). 379 people with constant flooding + Pithan (15.2%), (3). 304 people with mild AWD (12.2%), (4). 1493 people with mild AWD + Pithan. (60.0%), (5). 2 people using AWD pipe (0.1%), (6). 3 people using AWD pipe + Pithan (0.1%), (7). 196 people no irrigation for Boro (shifted to field crop cultivation) (7.9%) (Table 5).

Table 5. Distribution of the respondents according to irrigation category

Practice	Practitioner		Category-1	Category-2	Category-3	Category-4	Category-5	Category-6	Category-7	Total
	Number	%	(1) C.Flooding	(2) Pit	(3) AWD-eye	(4) AWD-eye+Pith	(5) AWD-pipe	(6) AWD-pipe+pith	(7) No irrigation for Boro	Total
A) Continuous flooding	113	4.5	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>						
B) Occasional drying (1-2)	1,866	74.9		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		
C) Continuous "wetting and gradual drying"	1,797	72.2			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>				
D) Full AWD using magic pipe	5	0.2					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
E) No irrigation for Boro	196	7.9								
			113	379	304	1,493	2	3	196	2,490
			4.5%	15.2%	12.2%	60.0%	0.1%	0.1%	7.9%	100%

⑥ Irrigation category (Upazilla-wise)

In Jhenaidah Sadar, there was 1 case (0.2%) of C. flooding, while in neighboring Kaligonj there were the highest 65 cases (27%). Shailkupa, where serious water shortages are recognized, had the highest number of people switching to Robi at 179 (40%) (Table 6 and Figure 4).

Table 6. Upazila-wise distribution of the respondents on irrigation category

Upazilla	(1) C. Flood	(2) Pith	(3) AWD-eye	(4) AWD-eye+Pit	(5) AWD-pipe	(6) AWD-pipe+pith	(7) No irrigation for Boro	Total
Jhenaidah Sadar	1	114	49	428	0	0	8	600
Kaliganj	65	53	66	56	0	0	0	240
Kotchandpur	2	51	17	230	0	0	0	300
Harinakundu	26	113	110	160	2	0	9	420
Maheshpur	13	27	47	390	0	3	0	480
Shailkupa	6	21	15	229	0	0	179	450
Total	113	379	304	1493	2	3	196	2490

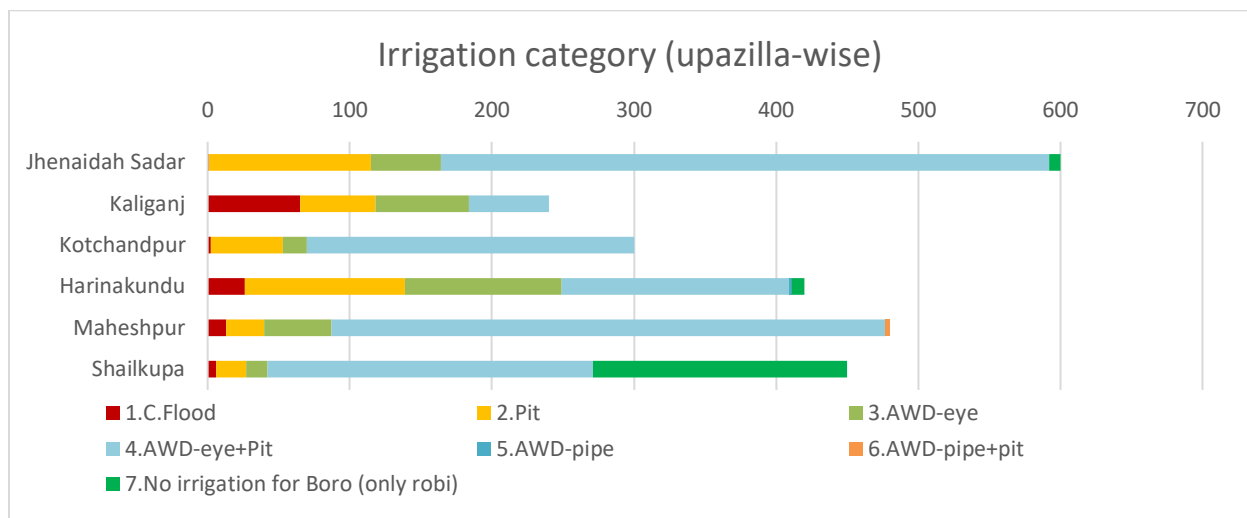


Figure 4. Upazila-wise distribution of the respondents on irrigation category.

⑦ **Category distribution by Farmers' perception regarding water scarcity**

Of the 113 people who practice continuous flooding, 65 people (58%), said they did not feel water shortages (Table 7). About 50% respondents expressed that they did feel water shortage slightly recent years (Figure 5).

Table 7. Distribution of the respondents based on the perception regarding water scarcity

	(1) C. Flood	(2) Pith	(3) AWD-eye	(4) AWD-eye+Pith	(5) AWD-pipe	(6) AWD-pipe+pith	(7) No irrigation for Boro	Total	%
I don't face water shortage	65	67	7	109				248	10%
I feel it lightly	36	179	200	778	2	3	11	1209	49%
I'm a little worried	6	55	53	241			43	398	16%
I'm worried	5	39	17	244			131	436	18%
I'm suffering damage	1	39	27	121			11	199	8%

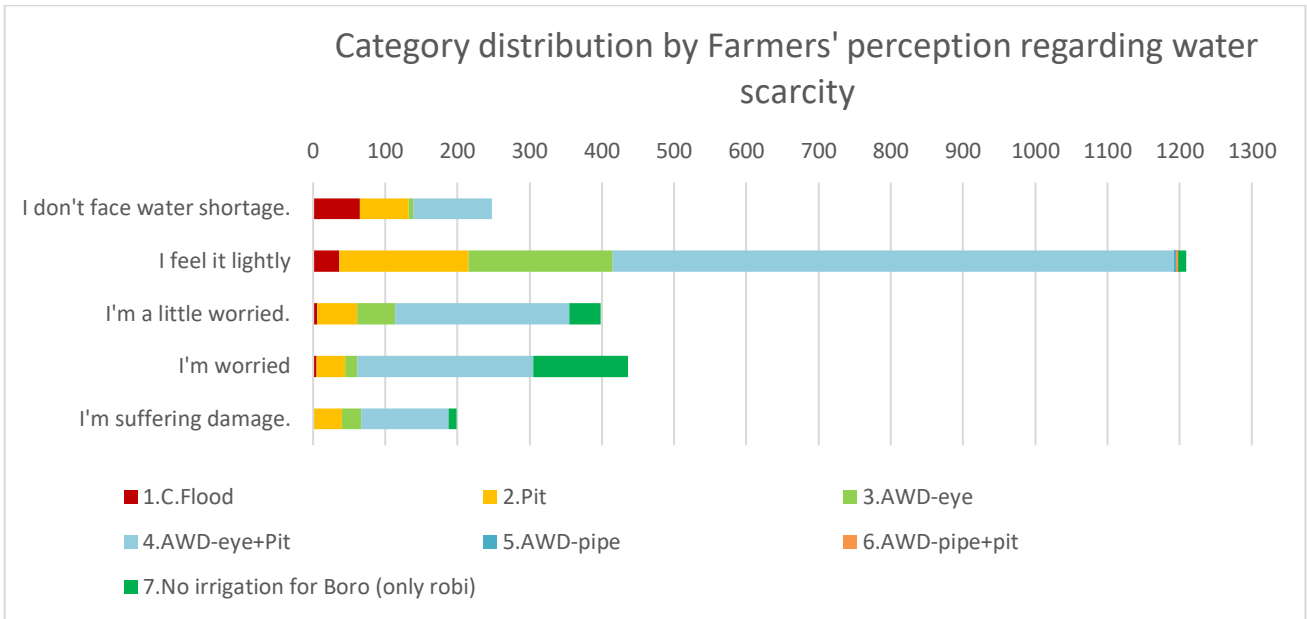


Figure 5. Distribution of the respondents based on the perception regarding water scarcity.

⑧ Category distribution by irrigation decision maker

The percentage of C. Flooding was 4.4% for both cases of “a well owned by me and decided by myself” and “a well owned by someone else and decided by someone else”. The percentage of people who have completely transitioned to upland farming was 84 (7.9%) for “I own a well and the decision was made by me” and 18 (1.6%) for “The well was owned by someone else, and the decision was made by someone else” (Figure 6).

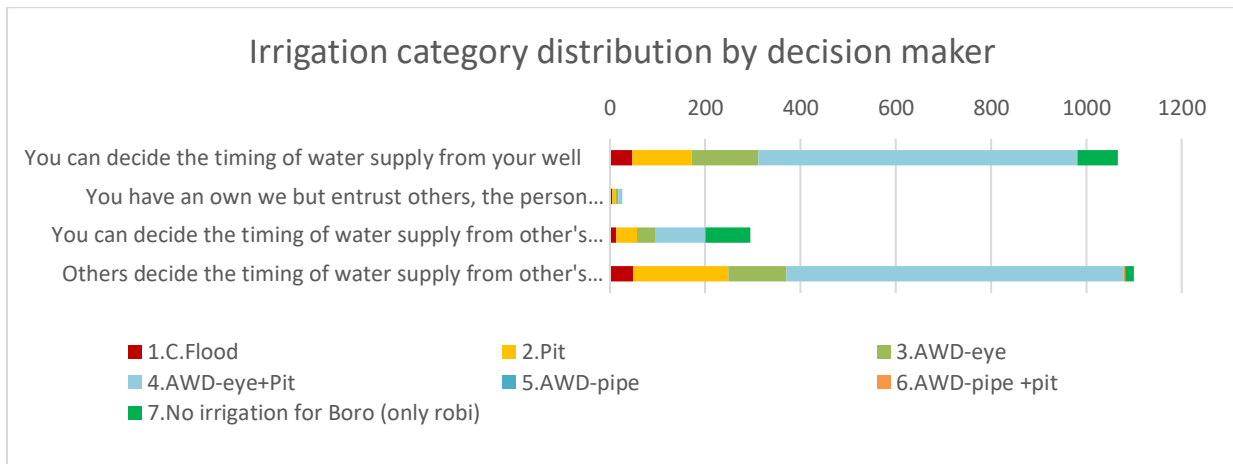


Figure 6. Distribution of the respondents based on irrigation category by decision maker.

⑨ Irrigation contract systems

We asked 1,397 respondents who use wells owned by others about their irrigation contract systems (hourly or seasonal contract). Of the 1,397 people using wells owned by others, 1,267 people (91%) were on seasonal contracts. The breakdown is: C. flooding 57 people (4.5%), Pith 246 people

(19.4%), AWD-eye 155 people (12.2%), AWD-eye+pith 804 people (63.5%), AWD-pipe 1 person (0.1%), AWD-pipe+pith 2 people (0.2%), No irrigation for boro (Shifted to Robi crops) 2 people (0.2%).

About 9% respondents of the 1,397 people who had hourly contracts, the most common one was No irrigation for boro (Shifted to robi crops) (Table 8). Among 110 (84.6%), of which 98 were in Shaikupa upazilla. Only 20 people were farming rice on hourly contracts, and 16 were using some form of intermittent irrigation.

Table 8. Distribution of the respondents according to irrigation contract systems

Contract	(1) C. Flood		(2) Pith		(3) AWD-eye		(4) AWD-eye+pith		(5) AWD-pipe		(6) AWD-pipe+pith		(7) No irrigation for Boro		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Hours	4	3.1	1	0.8	4	3.1	11	8.5		0.0		0.0	110	84.6	130	100
Seasonal	57	4.5	246	19.4	155	12.2	804	63.5	1	0.1	2	0.2	2	0.2	1267	100
Total	61	4.4	247	17.7	159	11.4	815	58.3	1	0.1	2	0.1	112	8.0	1397	100

⑩ The number of pith and perception on water shortage

1,880 people (75.5%) applied “intentional drying” called Pith/Pithan/Shaka to dry season rice cultivation. This is not what AAN and DAE were popularized through SAP, rather this is a traditional practice. The paddy field is dried once or twice (at most three times except in special cases) for about 5 to 10 days during the 30 to 50 days after planting. In interviews, the main reasons for intentional drying were: measures against bloodworms and algae, strengthening the rice, and promoting tillering. However, no one mentioned as measures against water shortage. It was also confirmed that around 70% of respondents carried out “intentional drying” regardless of their awareness of water shortages (Table 9). It is thought to be equivalent to Nakaboshi in Japan.

Table 9. Distribution of the respondents according to the number of pith and perception on water shortage

	1 time	2 time	3 time	4 time	5 time	No pith	Total
I don't face water shortage.	123	49	3	1		72	248
I feel it lightly	648	280	31	1	1	248	1209
I'm a little worried.	241	56	1			100	398
I'm worried	213	70	2			151	436
I'm suffering damage.	133	23	3	1		39	199
Total	1358	478	40	3	1	610	2490
%/total	55%	19%	2%	0%	0%	24%	100%

⑪ **Other measurements for water crisis**

We asked the respondents about “What measures do you take to deal with water shortages?” in addition to the above. A total 1,187 people (48%) said “Use of fita pipes”, 32 people (1%) said “Use of drought-tolerant species”, and 32 people (1%) said “Rice cultivation” (Table 10). A total 1,213 people (49%) answered, “I will reduce the amount of water and increase Robi cultivation”, and 119 people (5%) said, “I will adjust the planting time by predicting drying up” (Table 11).

Table 10. Distribution of the respondents according to the other measurements for water crisis (upazila-wise)

Upazila	Use pita pipe		Applying drought resilient variety		Boro rice partially replaced by Robi crop		Seasona Adjustment		Total	
	N	%	N	%	N	%	N	%	N	%
Jhenaidah Sadar	266	44%	0	0%	193	32%	0	0%	459	600
Kaliganj	88	37%	4	2%	56	23%	0	0%	148	240
Kotchandpur	63	21%	11	4%	182	61%	1	0%	257	300
Harinakundu	129	31%	14	3%	139	33%	3	1%	285	420
Maheshpur	196	41%	2	0%	407	85%	115	24%	720	480
Shailkupa	445	99%	1	0%	236	52%	0	0%	682	450
Total	1187	48%	32	1%	1213	49%	119	5%	2551	2490

Table 11. Other water saving measures and perception on water scarcity

Parameter	Use pita pipe		Applying drought resilient variety		Boro rice partially replaced by Robi crop		Seasona Adjustment		
	N	%	N	%	N	%	N	%	
I don't face water shortage	76	48%	6	4%	71	45%	4	3%	157
I feel it lightly	417	33%	22	2%	700	56%	114	9%	1253
I'm a little worried.	223	57%	2	1%	163	42%	1	0%	389
I'm worried	359	65%	1	0%	194	35%		0%	554
I'm suffering damage.	112	57%	1	1%	85	43%		0%	198
Total	1187	47%	32	1%	1213	48%	119	5%	2551

Reasons for applying water saving measures regardless of water shortage (174 respondents), we asked people who have installed AWD or pith even though they are not aware of water shortages and why they do so. The opinions of the respondents are presented in Table 12.

Table 12. Reasons for applying water saving measures regardless of water shortage

Upazila	1) Due to lack of drainage	2) It takes less time	3) Water is not wasted	4) Costs are reduced	5) Pest infestation is reduced	6) Crops are not damaged even if there is a shortage of water	7) Due to water shortage	8) Due to high land	9) Fertilizer can be reduced	10) Someone's advice	11) Others (Increase yield)	The no. respondents
Jhenaidah Sadar	9	15	15	15	34	0	1	5	2	12	0	50
Kaliganj	20	21	22	6	47	1	0	5	0	1	32	37
Kotchandpur	5	2	4	6	6	0	0	7	3	0	0	62
Harinakundu	15	12	17	14	27	0	2	21	0	0	26	13
Maheshpur	4	9	9	10	7	2	0	3	0	0	0	12
Shailkupa												
Total	53	59	67	51	121	3	3	41	5	13	58	174

⑫ How did you learn about water shortage countermeasures?

When asked about the source of information on how to deal with water shortages, the most popular answer was "other farmers" (1,964 people (79%)), followed by "family members" (1,603 people (64%)). Kotchandpur and Maheshpur had a large number of fertilizer dealers, and in these two upazilas the percentage of people who answered that they learned from family members was lower than in other upazilas (Table 13). A total 690 people (28%) answered SAAO. All 96 people who answered "Other" answered "Based on my own experience." Of these, 94 people answered that they had introduced Pith (32 people), AWD-eye (30 people), and AWD-eye+pith (32 people), and the remaining two people answered that they had reduced the dry season rice cultivation area and increased field cultivation (Figure 7).

Table 13. Distribution of the respondents according to the source of information for water shortage countermeasures (upazila-wise)

	SAAO	UAO /AEO	Other government /LGI	NGO staff	Other farmers	Media	Family /Relatives	Fertilizer dealers	Others	
Jhenaidah Sadar	76	14	0	12	518	19	494	1	0	600
Kaliganj	86	5	4	2	138	14	145	1	60	240
Kotchandpur	122	39	3	5	224	14	37	149	0	300
Harinakundu	116	5	0	38	363	3	341	2	36	420
Maheshpur	239	37	3	43	305	53	165	307	0	480
Shailkupa	51	0	0	46	416	1	421	0	0	450
Total	690	100	10	146	1964	104	1603	460	96	2490
	28%	4%	0%	6%	79%	4%	64%	18%	4%	100%

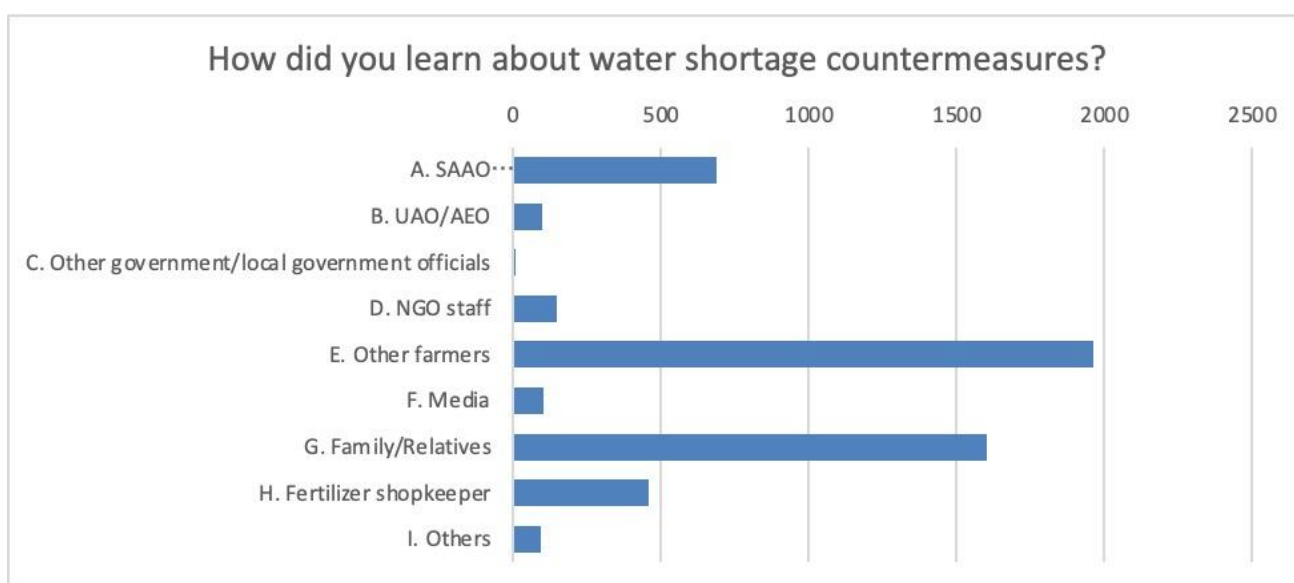


Figure 7. Distribution of the respondents according to the source of information for water shortage countermeasures (overall)

⑬ Timing of introduction and dissemination of water-saving practices (AWD and pit) in dry season rice cultivation

During the survey of Union Parishad (UP) Chairman, we asked about the timing of introduction and dissemination of water-saving practices in dry season rice cultivation. The result indicates that water saving technique was started in 1980 with a small-scale, but it spread from 1990 and in recent years, it is getting popularity (Figure 8).

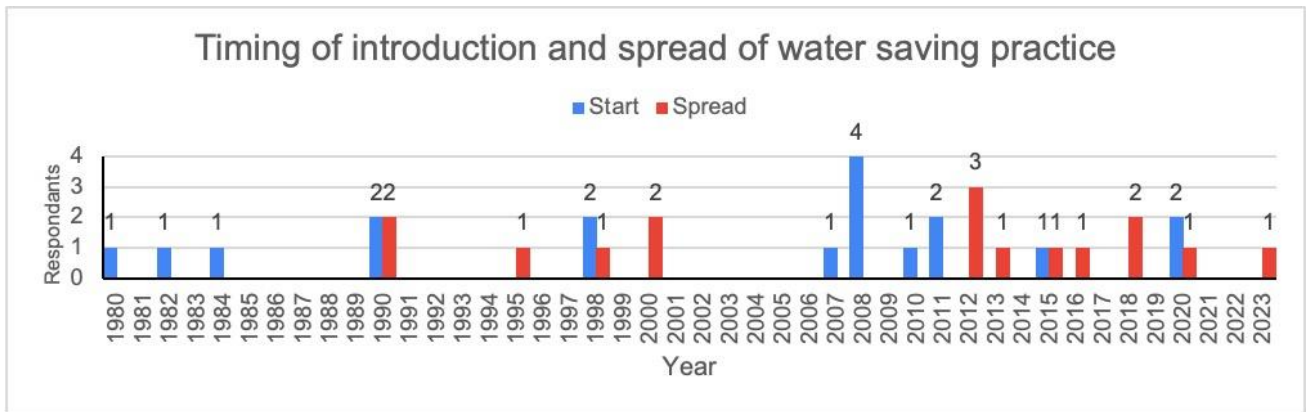


Figure 8. Distribution of the respondents (UP Chairman) according to the introduction and spread of water saving practices.

4. Summary and Conclusion

- A total 1,041 respondents (42%) used their own wells, 46 (2%) used community wells, 1,402 (56%) used other people's wells, and 1 (0%) used surface water as their source of irrigation water.
- 1,066 respondents (43%) made irrigation decisions, “I made the decision myself for wells I own”, 26 people (1%) said, “I made the decision myself for wells owned by others”, and 295 people (12%) said “I made the decision myself for wells owned by others”, 1,099 (44%) opined “It was decided by someone else because the well is owned by someone else”.
- Regarding the perception of water shortage, 89% respondents did not feel water shortage 5 years ago, but 49% feel lightly shortage now. Currently, 16% respondents were concerned on water shortage, while 18% was experiencing crop losses due to water shortages.
- Among the 83 villages, 52 villages were recognized by the UP Chairman to have water shortages, and 31 villages were not named as areas with water shortages. Regarding the awareness of water shortages among survey participants, in villages with water shortages, 1,340 people (85.9%) answered that they did not feel water shortages five years ago, and only 153 (9.8%) currently answered that they did not feel water shortages. In villages with no water shortages, 875 people (94.1%) answered that they did not experience water shortages five years ago, and 95 people (10.2%) currently answered that they did not experience water shortages (out of 930 people in 31 villages). Five years ago, the percentage of farmers who answered that they did not feel water shortage was slightly higher in villages where the UP Chairman recognized that there was no water shortage, but this has remained almost the same now, and there is no awareness of water shortage. It was confirmed that concerns about water shortages are widespread even in villages

where water shortages have not been implemented.

- In response to the question “What measures do you take to deal with water shortages?” - 1,866 respondents said “Pith” (74.9% of the total), 1,797 people said “AWD-eye” (72.2%), and 5 people “AWD-pipe” (0.2%). About 7.9% respondents mentioned that they had shifted from dry season rice cultivation to upland crop cultivation and did not use irrigation like rice cultivation (flood irrigation). In addition to this, 1187 people (48%) said “Fita pipe”, 32 people (1%) said “Use of drought tolerant seeds”, 1213 people (49%) said “Reduced rice production”, 1213 people (49%) said “Adjust planting time by predicting water drying”. Among the 113 people who responded to Continuous Flooding, 32 people used hoses, 2 people used drought-tolerant species, and 34 people expanded their field crops (multiple answers allowed), and 66 people did not take any measures to deal with water shortages (2.7%).
- The 2,490 people surveyed were divided into seven categories based on rice irrigation practices: (1). 113 people (4.5%) said continuous flooding, (2). 379 people (15.2%) said continuous flooding + pith, (3). AWD-eye. 304 people (12.2%), (4). AWD-eye + pith 1493 people (60.0%), (5). AWD-pipe 2 people (0.1%), (6). AWD-pipe + pith 3 people (0.1%) and (7). Dry season rice cultivation 196 people (7.9%) who did cultivate rice (shifted to field crops).
- From the Union survey, it can be seen that attempts were made to introduce water-saving practices in dry season rice cultivation along with the popularization of dry season rice cultivation using groundwater irrigation, but details including content and purpose are unknown. Extension of AWD as a water saving method in rice cultivation had been attempted several times in the past by different GOs and NGOs. In a previous study of AAN (baseline survey of SAP-II project, conducted during 2021), it was found that a total 333 farmers (out of 1500), (8 people in Maheshupur, 1% of those surveyed; 205 people in Harinakunda, 46% of those surveyed; and 120 people in Sailkupa, 27% of those surveyed) used AWD (mainly by eye estimation) as a water saving technique. The survey findings indicated that water saving for rice cultivation is a concern now and farmers are gradually adopting water saving methods. More in-depth surveys and research works are needed to find out the root causes of the problems and countermeasures need to take accordingly to popularize the AWD use.