Appendix

List of Publications:

A) Journal articles:

1. Talukdar, O., Bhattacharya, S.S., Gogoi, N. (2022) Alternate wet and dry irrigation technology as a sustainable water management and disease vector control tool. *Environmental Quality Management*, http://doi.org/10.1002/tqem.21935.
2. Talukdar, O., Bhattacharya, S.S., Gogoi, N. (2025) A Special Insight on the Causal Agents and Mode of Occurrence of Japanese Encephalitis (JE) Infections in Rural Regions of Assam, India. *Zoonoses and Public Health*, 2025, 0,1–12 https://doi.org/10.1111/zph.13210

B) Conference papers:

1. Talukdar, O., Gogoi, N. (2022) Alternate Wet and Dry Irrigation (AWDI) technology as a sustainable water management tool. *International Conference on Advances in Energy, Environment for Sustainable Development (AEESD-2022),* SOA, DU, Bhubaneswar.
2. Talukdar, O., Gogoi, N. (2024) Evaluate Alternate Wet and Dry Irrigation (AWDI) as a vector management strategy in severely affected areas of Sonitpur district, Assam,India. *3rd International conference on Emerging challenges in the preservation and control of vector-borne diseases, CIMSER, Loyola College, Chennai.* pp:101 (proceedings ISBN No.: 978-93-341-6122-9)

Appendix

Supplementary table 1: Macro and micro nutrient composition in straw and grain in rice plant under different irrigation methods

Parameter	Treatment	Year 2020 Mean	2020 SD	2021 Mean	2021 SD	2022 Mean	2022 SD
K in straw (%)	B11 Conventional	21.75	2.01	24.90	1.98	26.54	0.11
	B11 AWDI	31.54	0.91	31.97	1.41	20.37	0.11
	Ranjit sub 1 conventional	21.94	2.09	28.60	0.16	25.64	0.11
	Ranjit sub 1 AWDI	29.66	1.80	31.69	1.13	24.79	0.11
K in grain (%)	B11 Conventional	13.09	1.09	15.46	0.78	19.00	0.62
	B11 AWDI	21.43	1.06	25.20	3.37	17.68	0.57
	Ranjit sub 1 conventional	15.19	2.58	14.47	0.60	16.47	3.61
	Ranjit sub 1 AWDI	25.99	2.21	24.39	0.37	21.66	0.11
P in straw (%)	B11 Conventional	0.75	0.04	0.87	0.02	1.03	0.01
	B11 AWDI	0.85	0.04	0.82	0.02	0.85	0.01
	Ranjit sub 1 conventional	0.75	0.07	0.83	0.03	0.92	0.01
	Ranjit sub 1 AWDI	0.87	0.04	0.94	0.05	0.94	0.01
P in grain (%)	B11 Conventional	1.17	0.07	1.68	0.04	1.21	0.07
	B11 AWDI	2.36	0.55	1.99	0.18	1.26	0.01
	Ranjit sub 1 conventional	1.49	0.12	1.55	0.14	1.18	0.01
	Ranjit sub 1 AWDI	2.27	0.32	1.92	0.19	1.92	0.01
N in straw (%)	B11 Conventional	0.55	0.21	0.37	0.01	0.65	0.06
	B11 AWDI	0.86	0.11	0.98	0.01	0.58	0.09
	Ranjit sub 1 conventional	0.82	0.08	0.78	0.05	0.87	0.01
	Ranjit sub 1 AWDI	0.64	0.10	0.55	0.10	0.52	0.02
Nin grain (%)	B11 Conventional	1.35	0.41	1.06	0.02	1.13	0.05
	B11 AWDI	3.26	0.15	2.70	0.46	1.84	0.01
	Ranjit sub 1 conventional	2.57	0.36	1.84	0.01	1.71	0.01
	Ranjit sub 1 AWDI	3.02	0.89	3.04	1.12	1.81	0.30

Cu in straw (%)	B11 Conventional	3.50	0.87	3.19	0.74	3.50	0.50
	B11 AWDI	4.00	1.00	3.67	0.58	3.50	0.50
	Ranjit sub 1 conventional	5.00	1.73	4.33	1.53	5.33	2.52
	Ranjit sub 1 AWDI	3.83	1.61	4.67	1.15	4.33	0.58
Cu in grain (%)	B11 Conventional	1.50	0.44	2.10	0.85	1.77	0.40
	B11 AWDI	2.83	0.29	2.07	0.12	2.09	0.08
	Ranjit sub 1 conventional	3.33	1.15	2.67	1.53	4.33	1.53
	Ranjit sub 1 AWDI	2.09	0.94	3.67	1.15	3.50	0.87
Mn in straw (%)	B11 Conventional	19.00	1.00	21.00	2.00	21.00	1.00
	B11 AWDI	20.33	1.15	22.00	1.00	22.00	1.00
	Ranjit sub 1 conventional	20.00	1.00	23.00	1.00	22.00	1.00
	Ranjit sub 1 AWDI	18.00	2.00	18.67	2.52	17.00	4.36
Mn in grain (%)	B11 Conventional	1.26	0.46	1.64	4.48	1.40	0.26
	B11 AWDI	0.95	0.37	1.30	8.76	1.08	0.29
	Ranjit sub 1 conventional	1.51	0.43	1.90	2.02	2.01	0.71
	Ranjit sub 1 AWDI	1.32	0.48	1.30	1.13	1.02	0.16
Zn in straw (%)	B11 Conventional	7.17	1.26	8.00	1.00	7.50	1.32
	B11 AWDI	6.00	1.00	7.00	1.00	6.67	1.15
	Ranjit sub 1 conventional	6.83	1.76	8.17	0.76	7.17	1.04
	Ranjit sub 1 AWDI	4.00	0.00	5.67	1.53	6.33	0.58
Zn in grain (%)	B11 Conventional	4.00	1.00	4.33	0.58	5.00	1.73
	B11 AWDI	3.33	0.58	5.00	1.00	4.67	1.15
	Ranjit sub 1 conventional	3.00	1.00	6.33	1.53	4.67	0.58
	Ranjit sub 1 AWDI	2.83	0.76	5.18	0.74	4.17	0.76
Total water use (m^3 hac^{-1})	B11 Conventional	329.7	37.8	382	59.48	329.43	51.51
	B11 AWDI	210.6	36	239.1	50.17	219.91	29.74
	Ranjit sub 1 conventional	363	21.8	358.2	42.86	329.43	28.57
	Ranjit sub 1 AWDI	201.1	37.8	210.5	35.95	229.43	14.29

Supplementary Table 2. The fluctuation in values of the various abiotic factors in field water

		2021		2022			
Parameters	**Treatments**	**Mean**	**SD**	**Mean**	**SD**	**$LSD_{0.05}$**	**P value**
Dissolved oxygen (mg L^{-1})	B11Conventional	5.94	0.14	6.59	0.28	0.04	<0.05
	B11 AWDI	6.07	0.04	6.01	0.32		
	Ranjit sub 1 Conventional	6.08	0.11	6.07	0.04		
	Ranjit sub 1 AWDI	6.17	0.03	6.13	0.12		
Nitrate nitrogen (ppm)	B11Con	5.01	0.72	5.61	0.22	0.07	<0.05
	B11 AWDI	4.67	0.80	3.77	0.18		
	Ranjit sub 1 Con	5.20	0.87	5.49	0.16		
	Ranjit sub 1 AWDI	4.25	0.08	3.79	0.16		
Temperature of field water (^{0}C)	B11Con	23.31	2.44	25.03	0.23	0.47	>0.05
	B11 AWDI	21.58	2.83	20.45	0.30		
	Ranjit sub 1 Con	23.31	2.70	24.71	0.18		
	Ranjit sub 1 AWDI	20.33	0.17	19.92	0.14		
Total Dissolved Solids TDS (ppm)	B11Con	35.70	0.56	34.70	0.78	0.84	<0.05
	B11 AWDI	29.53	0.12	29.33	0.58		
	Ranjit sub 1 Con	33.47	1.14	34.87	0.64		
	Ranjit sub 1 AWDI	25.73	1.62	25.53	1.36		
Salinity(ppt)	B11Con	0.85	0.01	0.85	0.10	0.03	<0.05
	B11 AWDI	0.39	0.07	0.53	0.03		
	Ranjit sub 1 Con	0.87	0.01	0.82	0.01		
	Ranjit sub 1 AWDI	0.76	0.01	0.70	0.01		
Inorganic Phosphorus (ppm)	B11Con	0.58	0.08	0.75	0.09	0.04	<0.05
	B11 AWDI	0.42	0.01	0.45	0.01		
	Ranjit sub 1 Con	0.66	0.02	0.68	0.02		
	Ranjit sub 1 AWDI	0.49	0.01	0.42	0.05		
Leaf Area Index (LAI)	B11Con	3.47	0.03	3.42	0.03	0.32	<0.05
	B11 AWDI	2.96	0.06	2.85	0.15		
	Ranjit sub 1 Con	4.19	0.04	4.17	0.09		
	Ranjit sub 1 AWDI	3.99	0.02	4.05	0.06		

Hydrogen-ion concentration (pH)	B11Con	7.57	0.23	7.71	0.04	0.09	>0.05
	B11 AWDI	7.35	0.15	7.27	0.05		
	Ranjit sub 1 Con	7.54	0.31	7.37	0.10		
	Ranjit sub 1 AWDI	7.69	0.10	7.62	0.13		
Plant height (cm)	B11Con	80.13	0.81	80.23	0.25	0.48	<0.05
	B11 AWDI	78.47	0.46	70.23	0.33		
	Ranjit sub 1 Con	70.93	1.03	69.60	0.53		
	Ranjit sub 1 AWDI	62.53	0.23	62.42	0.56		

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REVIEW ARTICLE

Alternate wet and dry irrigation technology as a sustainable water management and disease vector control tool

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Abstract

Rising population and demands for rice as a staple food have created severe stress on freshwater availability for paddy cultivation. The literature suggests that conventional irrigation techniques are inadequate to overcome the water constraints arising from drought and extreme weather conditions. In the past few decades, there is an upsurge of scientific exploration of agricultural techniques in reinventing traditional methods of irrigation. Recently, alternate wet and dry irrigation (AWDI) method has shown great promise regarding profitable rice cultivation with limited water supply. The AWDI method is a trending water management system, which inundates rice fields with intermittent wet conditions followed by a dry period. This not only ensures adequate water supply but increases crop yield and water productivity index (WPI). The AWDI also helps in reducing parasitic mosquito population in the rice fields by minimizing the field flooding period and curtailing a major part of their life cycles. This review proposes a novel approach of emphasizing AWDI method as an important agricultural tool for supplementing rice fields with limited freshwater, increasing crop yield, and monitoring parasitic mosquito populations. The major objective of this study is to report the state-of-the-art scenario of AWDI method, critically analyze the research gaps related to conventional methods of irrigation and appreciate the futuristic long-term benefits of AWDI method. Literature survey was performed using search engines like Scopus, PubMed, Google Scholar, Research Gate, Science Direct, and Google Scholar. Comprehensive appraisal of resources (both offline and online) and critical evaluation of AWDI technicalities revealed that the AWDI reduced water usage by 45%, enhanced crop yield and improved WPI in paddy fields in the Asian sub-continent. The AWDI also curtailed the propagation of lethal mosquito species (*Cx. tritaenorhynchus*, *Cx. vishnui*, and *Cx pseudovishnui*) in rice fields. Therefore, the current study endorses AWDI as a promising substitute of conventional irrigation and a novel approach towards fulfilling water constraints that may be practiced anywhere in the world.

KEYWORDS
alternate-wet-dry, crop-yield, irrigation, mosquito, sustainable

Zoonoses and Public Health

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ORIGINAL ARTICLE

A Special Insight on the Causal Agents and Mode of Occurrence of Japanese Encephalitis (JE) Infections in Rural Regions of Assam, India

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Keywords: eco-biology | epidemics | Japanese encephalitis (JE) | management | parasite

ABSTRACT

Introduction: Japanese Encephalitis (JE) is a life-threatening disease, especially in the Indian subcontinent. Knowledge about the nature and ecology of the dispersal of JE virus (JEV) vectors needs to be increased. This study mechanistically explores the ecology of JEV vectors and the mode and frequency of occurrence of Acute Encephalitis Syndrome (AES) and JEV infections.

Methods: We established a linear relationship between environmental variables and JEV infection by JEV vectors (mosquitoes)—*Culex tritaeniorhynchus, Culex vishnui,* and *Culex pseudovishnui*. The relative abundance of three mosquito species was evaluated, and the JE Sample Positivity Rate (SPR) and JE Case Fatality Rate (CFR) were computed.

Results: *Culex vishnui* had a high abundance in residential areas during the transition from hot-dry (77.34%) to hot-wet period (78.66%) at temperatures between 31°C and 34°C and relative humidity of 80%–85.3%; this period also coincided with occurrence of AES (39 cases in hot-dry and 88 cases in hot-wet period) and JE (8 instances in hot-dry and 31 cases in hot-wet period). JE infection dominated near rainfed rice fields (rainfall: $R = 0.67$ at $p < 0.05$; rainy days: $R = 0.74$, $p < 0.01$). SPR was up to 32.28%, and CFR was as high as 42.86%; JEV infection was concentrated in adult male humans near rice fields (15.66%).

Conclusions: Climate modulation over the years can influence the distribution of *Culex vishnui* and, hence, AES and JE cases. JEV infections tend to rise in JE hotspot regions, especially near rice fields. Thus, comprehensive epidemiological investigations will help prevent a silent outbreak of JE.

1 | Introduction

Japanese Encephalitis (JE) is one of the most lethal viral diseases, and every year, around 68,000 people get infected with JE virus (JEV), recording up to 10,000 fatal cases in 20 different countries (Campbell et al. 2011; Kulkarni et al. 2018; Tandale et al. 2023). JE is a zoonotic disease caused by a *Flaviviridae* virus, which propagates in a cyclic pattern in mosquitoes, that is, the primary vector (Kulkarni et al. 2018). The lifecycle of JEV vectors also includes water birds and pigs (Dutta 2011; Khan et al. 2021; Levesque et al. 2024). Epidemiological exploration of JEV infection shows that JE incidences in Southeast Asian countries are yet increasing, and fatality rates have been high for the past two decades (Tandale et al. 2021). The World Health Organisation's Vaccine-Preventable Communicable Diseases, India, reported 1320 JE cases in 2023. Since AES is a generic description of the clinical presentation of a disease characterised by elevated temperature, altered consciousness, etc., it is invariably related to JEV disease (Kakoti et al. 2014; Mehta et al. 2021). The National Center for Vector Borne Disease Control Programme