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Research Article

STUDY ON THE PERCEPTION OF RICE FARMERS TOWARDS THE EFFECTIVENESS OF INDIGENOUS WETLAND AGRICULTURAL PRACTICES

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Abstract: The study was undertaken to understand the perception of rice farmers towards the effectiveness of Indigenous Wetland Agricultural Practices. A sample of 30 farmers from three districts of North Eastern Agro climatic zone of Tamil Nadu was taken up for the study. The study revealed that out of the forty IWAPs that were adopted by more than fifty percent of the farmers, 38 IWAPs were perceived as effective by them. All the 25 crop production IWAPs and 13 out of 15 crop protection IWAPs were perceived as effective. Fourteen IWAPs were perceived as most effective *i.e*., with MPEI above 2.50. Trait wise analysis revealed that 11 IWAPs had effectiveness scores above the average possible scores in more than 10 traits. Those practices that were very common and integral part of the cultivation practices in wetland rice cultivation were perceived as more effective and adopted by a greater number of farmers. Higher or sustainable yield alone was not the major criteria but the farmers considered different dimensions while considering the effectiveness of an IWAP.

Keywords: *Indigenous practices, Indigenous wetland practices, Perception, Perceived effectiveness, Wetland practices in rice*

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Introduction

Rice, the major staple food of more than half of the humanity is mostly grown in wetlands. Wetlands ecosystems cover about six percent of the total global land area [1]. The wetlands possess an array of Indigenous Wetland Agricultural Practices (IWAPs), which are cost effective and eco-friendly. The benefits of IWAPs to multiple stakeholders' *viz*., nature, farmers and consumers would result in sustainable agriculture and rejuvenation of agriculture in these wetlands.

Farmers' perception about the technology / practices has a major influence on its adoption. The perceived effectiveness of an IWAP could be judged by the farmer possibly by adopting the practice or through the years of experience. The wisdom gained over years of farming might be helpful in judging the effectiveness of the IWAP, merely by knowing the practice. Many times, by actual adoption of the practice the farmers are able to judge the effectiveness of the practice.

Hence, these IWAPs need to be standardized and blended with technological recommendations to promote their use among the farmers. If utilized sensibly, they could become an effective strategy in combating the negative factors and reviving agriculture in wetlands. Keeping this in view, the study was carried out with the following objectives:

To analyse the perception of farmers towards the effectiveness of IWAPs in rice.

To investigate the trait wise performance of the effective IWAPs.

Material and Methods

The study was conducted in the North-Eastern Agro climatic zone of Tamil Nadu with the prime objective of documenting the Indigenous Wetland Agricultural Practices (IWAPs). This area was selected because it has a large acreage under agriculture with large extent under wetland farming. Out of the six districts in the zone, Kancheepuram, Thiruvallur and Thiruvannamalai were selected purposively because rice was the major crop cultivated in these three districts and with higher percentage of wetland area under rice cultivation.

Block wise information on area under rice cultivation obtained from the office of the Joint Director of Agriculture of the respective districts helped in identifying ten blocks based on the total acreage under rice cultivation and area under wetland farming. From each block, two villages having the highest area under paddy cultivation were purposively selected for the study. The adoption of 76 IWAPs common to the study area was tested through structured interview schedules administered to 30 farmers selected through random sampling technique from the study area. Forty IWAPs which were adopted by more than fifty percent of the respondents were taken up for studying the perceived effectiveness. Sundaramari (2001) [2] defined perceived effectiveness of an indigenous agricultural practice as the extent of ability of that practice, as perceived by the farmers, in solving various problems faced by them in farming. In the present study, perceived effectiveness of indigenous wetland agricultural practices was operationalized as the degree of positive outcomes obtainable, as perceived by the farmers, by applying the practice, in solving their problems faced in farming. The perceived effectiveness of IWAPs in rice was measured using the Perceived Effectiveness Index (PEI) methodology developed and used by Sundaramari (2001) [2] and used by Sakeerhusain (2010) [3] and Venkatesan (2012) [4]. This consisted of 12 traits related to indigenous agricultural practices which formed the basis for working out the Perceived Effectiveness Index (PEI). The list of 12 traits was administered individually to each of the respondents and they were asked to rate the effectiveness of each of the IWAPs, on a three-point continuum, the points being agree, undecided and disagree with scores of 3, 2 and 1 respectively. PEIs obtained from all the respondents for a particular IWAP were summed up and the mean was worked out. The mean PEI was taken as the MPEI for that IWAP. Those IWAPs, who's MPEIs were greater than 2 were considered as effective IWAPs as perceived by the farmers and all others as less effective IWAPs. The IWAPs which secured an MPEI of 2.5 and above were regarded as highly effective.

Table-1 *Mean Perceived Effectiveness Index of IWAPs*

SN	Mean Perceived Effectiveness Index range	Crop Production practices		Crop Protection practices	
		Number of practices	Percent	Number of practices	Percent
1	1.00 – 1.50	-	-	-	-
2	1.60 – 2.00	-	-	2	13.33
3	2.10 – 2.50	19	76.00	5	33.33
4	2.51 – 3.00	6	24.00	8	53.34
	Total	25	100.00	15	100.00

Findings and Discussion

Rice being the major wetland crop in the study area, 76 IWAPs were selected for the research. Thirty-two (42.11%) practices were crop production practices while the remaining 44 (57.89%) were crop protection practices. It could be seen that a greater number of practices were in crop protection aspects, as protection of the crop from pest and disease was a major factor for better yields and the farmers' experimentation in this category was presumed to be more. Different combinations of plant parts were used to control pest. This may be the reason for an increased number of practices in crop protection category. This gains support from the findings of Rhoades and Bebbington (1994) [5], who stated that farmers using IK system engage in systematic experimentation either for problems solving or out of curiosity create new technologies and test or adopt existing techniques and technologies. Out of these 76 IWAPs, forty practices were found adopted by more than fifty percent of the respondents and those were taken up for studying the effectiveness index.

Distribution of effective IWAPs as perceived by the rice farmers

Out of the forty IWAPS, 38 IWAPs were perceived as effective by the respondents. Similar findings were reported by Sakeerhusain and Sundaramari (2011) [6] and Meenakshi (2015) [7]. Two crop protection IWAPs were perceived as ineffective. It could be seen from table 1, that 14 IWAPs were perceived as most effective *i.e.*, with MPEI above 2.50. Six MPEIs related to crop production and eight IWAPs related to crop protection were perceived as most effective. Similar findings were reported by Venkatesan and Sundaramari (2014) [8].

Crop production practices

All the 25 crop production practices were perceived as effective by the rice farmers, as seen from [Table-1]. Three IWAPs that had cent percent adoption rates *viz*. "Paddy field is puddled well to destroy the weeds and to reduce the water loss by seepage and percolation", "Trimming the field bunds during field preparation to control weeds, pests and diseases and rats" and "Stopping the irrigation 15 days before harvest to enhance ripening of seeds" had MPEI scores of 2.26, 2.66 and 2.71 respectively. The above three practices are basically the inevitable practices in rice cultivation in wetlands. Wetland rice is cultivated in puddled conditions and the bunds are cleaned and trimmed before puddling operation. The trimming operation is done along with plastering of the field bunds to reduce the seepage of water. The third practice is followed by all wetland farmers because this helps in the ripening process as well as permits the usage of machinery, like harvesters and balers into the field, as mechanised farming is a common scenario in the rural landscape in the present days.

Adoption of traditional varieties were found to be high. "Arcot Kichadi Samba and "Seeragasamba," had 96.70 and 93.30 percent adoption rates respectively. These two varieties are quite popular varieties and a household name in the villages and both were perceived as effective (MPEI = 2.21 and 2.28) by the respondents. Most of the farmers had sown these varieties at least once as a passion or curiosity. Other traditional varieties like "Kouninel and Rasagadam" were also popular with less adoption rates (76.70% and 70.00 %) but with MPEI, 2.17 and 2.31 respectively.

Water management in the rice field is one of the methods of effective farming. Alternate wetting and drying in rice fields is a concept very recently advocated by the Department of Agriculture. Farmers have been practicing this from earlier days in nursery. Similarly weed growth in rice fields could be managed by constant submergence because most of the non-aquatic weeds get rotten due to constant submergence. IWAPs like, "Water is drained from the nursery in the morning of the succeeding day of sowing and kept dry for 24 hours and again irrigated on the third day for better rooting of seedlings" was adopted by 93.30 percent of the respondents while the practice "Weeds can be controlled by constant submergence of rice fields at certain stages" had 93.30 percent adoption. These practices were perceived as effective (MPEI = 2.22 and 2.21) by the farmers.

Storage of rice even for a short time needs to be done with much care as the moisture in the grains may lead to germination of the seeds or the seeds may get spoiled due to fungal infection. The IWAP "Paddy seeds (after harvest) are sun dried for two days and shade dried for one day before storing" was found to be adopted by 93.30 percent of the farmers. Sun drying the seeds will reduce the moisture but repeated sun drying may make the seeds nonviable. Hence, farmers go for shade drying after initially drying in the sun. This explains the reason for a large number of farmers having adopted this practice. This IWAP was perceived as effective (MPEI = 2.21) by the farmers. Sastikannan and Santhagovind (2005) [9] also reported similar findings.

The IWAP "While transplanting, the tips of the seedlings are clipped if they are more than half foot height to ensure correct spacing" is a very common practice followed by rice farmers (90.00% adoption). This practice was perceived as effective by the farmers with an MPEI score of 2.19. This may be due to the fact that before the advent of System of Rice Intensification (SRI) method, farmers usually transplanted 25 to 30 days' old seedlings, which are quite big. To prevent the lodging of these seedlings they were clipped before planting. Another advantage of this practice is that, the stem borer eggs present on the tip are also removed before planting.

Organic manure whether cattle manure or farm yard manure, both occupy a very important place in enriching the soil nutrients. IWAPs "Cattle manure will provide nutrients to the succeeding crop also" and "Application of abundant farm yard manure (FYM) in the nursery for better seedlings" were adopted by 83.30 percent respectively by the respondents. Since both these IWAPs were about usage of organic manure, the farmers also perceived them to be effective. This could be inferred from the high MPEI scores (2.34 and 2.61 respectively) for these practices. Findings supporting these findings were also reported by Dave and Mishra (2018) [10]. Similarly, the IWAP for better germination the gunny bags containing soaked paddy seeds are covered with wet straw and kept for a day" was adopted by 83.30 percent of the respondents and the MPEI as 2.29. The practice of soaking the paddy seeds before sowing helps in better germination rate. The seeds soaked in a gunny bag and covered by wet straw generate the required heat to dilate the seed coat and enhancing germination. This might be the reason for the practice perceived as effective with higher adoption.

Crop protection practices

Out of the 15 IWAPs under crop protection practices in rice, 13 were perceived as effective and two were perceived to be ineffective. The two practices which were perceived as ineffective were "Digging the field burrows manually to kill the rats" was perceived as ineffective. This might be due to the reason that digging all the burrows manually is quite laborious in the present context when the demand for labour is more. Similarly, the IWAP, "To control pests in paddy, farmers generally spray chilli (Capsicum annuum) and tobacco (Nicotiana tabacum) extracts" was perceived as ineffective possibly due to the reason that large quantities of the extract need to be prepared for spraying rice fields. This process is laborious, time consuming and expensive. Farmers would have tried with these practices and discontinued it later, which may possibly be the reason for perceiving them as ineffective. Some of the IWAPs had higher adoption rates. "Dusting fresh wood ash in the nursery to control or prevent the pest incidence" was adopted by 96.70 percent of the respondents and the MPEI was 2.53. Use of ash for pest protection is a common and age-old practice.

Table-2 Practice-wise Adoption and Perceived Effectiveness of Crop Production IWAPs

SN	IWAPs in rice	Adoption level Percent	MPEI
1	Cattle manure will provide nutrients to the succeeding crop also.	83.30	2.34E
2	Application of tank silt in the nursery area every year for good seedling growth.	73.30	2.65E
3	Application of abundant farm yard manure (FYM) in the nursery for better seedlings.	83.30	2.61E
4	Applying farm yard manure (FYM) and green leaf manure (GLM) to the nursery for healthy seedlings.	80.00	2.10E
5	Collection and burning of rice stubbles will help in increasing soil fertility.	60.00	2.24E
6	Sheep penning results in more crop yields.	73.30	2.16E
7	Dhaincha (*Sesbania aculeata*) seeds are sown on in the main fields when paddy nursery is raised and the grown up Dhaincha (*Sesbania aculeata*) is ploughed in-situ during field preparation to increase soil fertility.	76.70	2.59E
8	*Arcot Kichadi Samba* is a local variety with super fine and tastier grains, moderately resistant to pests and diseases and yielding 1500 kilograms /acre.	96.70	2.12E
9	*Kouni Nel* is a 150 days duration variety with dark brown coloured rice.	76.70	2.17E
10	*Rasagadam* is a 125 days variety with very small and round seeds.	70.00	2.31E
11	*Seeragasamba*, having 150 days duration and producing very fine grains is good for meals, particularly for biryani.	93.30	2.28E
12	When the germination percentage is good, regular seed rate is used, otherwise seed rate is increased.	80.00	2.26E
13	For better germination the gunny bags containing soaked paddy seeds are covered with wet straw and kept for a day.	83.30	2.29E
14	Water is drained from the nursery in the morning of the succeeding day of sowing and kept dry for 24 hours and again irrigated on the third day for better rooting of seedlings.	93.30	2.22E
15	While transplanting, the tips of the seedlings are clipped if they are more than half foot height to ensure correct spacing.	90.00	2.19E
16	Paddy field is puddled well to destroy the weeds and to reduce the water loss by seepage and percolation.	100	2.26E
17	Trimming the field bunds during field preparation to control weeds, pests and diseases and rats.	100	2.66E
18	Dense sowing controls weed growth in paddy nursery.	76.70	2.26E
19	Ploughing the field and maintaining 2 inches of water for 15 days followed by puddling to control Nut grass (*Cyperus rotundus*).	70.00	2.16E
20	Weeds can be controlled by constant submergence of rice fields at certain stages.	93.30	2.21E
21	During first weeding the soil around the root zone is disturbed which enhances tillering.	70.00	2.22E
22	Before flowering stage *Panchakavya* is sprayed @ 3 litres / acre for better seed set.	50.00	2.22E
23	Stopping the irrigation 15 days before harvest to enhance ripening of seeds.	100	2.71E
24	Separating and collecting best grains at the thrashing yard itself for seed purpose.	56.70	2.73E
25	Paddy seeds (after harvest) are sun dried for two days and shade dried for one day before storing.	93.30	2.21E

Table-3 *Practice-wise Adoption and Perceived effectiveness of crop protection IWAPs*

SN	IWAPs in rice	Adoption level Percent	MPEI
1	*Panchakavya* is sprayed 2 times (once in 30 days). This increases the vigour of the crop and prevents pest incidence.	50.00	2.21E
2	Providing irrigation whenever termite attack is observed.	76.70	2.75E
3	Digging the field burrows manually to kill the rats.	66.70	1.78IE
4	Waste polythene sheets or used fertiliser bags tied to poles and placed on the periphery of the fields reduce the menace of rats	93.30	2.54E
5	Fully cooked parboiled rice is mixed with furadon granules and spread in the bunds, near burrows and other rat infested places in the rice fields. Rats are attracted to the smell of parboiled rice and after consuming, the rats die within hours.	70.00	2.25E
6	Continuous rain during ear head emergence stage induces the incidence of BPH (Brown Plant Hopper) in rice.	56.70	2.68E
7	Allowing ducks inside the fields after harvest to reduce the pest incidence in the next crop.	73.30	2.27E
8	To control pests in paddy, farmers generally spray chilli (*Capsicum annuum*) and tobacco (*Nicotiana tabacum*) extracts.	56.70	1.87IE
9	Using rope to dislodge caseworms.	63.30	2.23E
10	Shaking of paddy seedlings to reduce the caseworm population.	36.70	2.64E
11	Clipping the tips of rice seedlings at the time of transplanting to eliminate stem borer eggs.	76.70	2.76E
12	Dusting fresh wood ash in the nursery to control or prevent the pest incidence.	96.70	2.53E
13	If Neem (*Azadiracta indica*) cakes are applied as basal fertilizer there will not be any incidence of diseases.	83.30	2.59E
14	Irrigating the paddy nursery so as to submerge the whole plant for some time and draining the water to wash away the thrips.	53.30	2.77E
15	Neem cake is applied as basal manure which helps to protect the rice from BPH (Brown Plant Hopper) at later stages.	70.00	2.16E

The effectiveness of this practice could be justified since it is widely used by the farmers and the adoption rate was also found to be high. Research findings supporting this has been reported by Venkatesan, *et al*., (2016) [11] and also cited by Tinashe (2017) [12]. Rat is a major menace in rice fields. So many practices have been devised by the farmers to ward off the rats from the fields. The IWAP, "Waste polythene sheets or used fertiliser bags tied to poles and placed on the periphery of the fields reduce the menace of rats" was adopted by 93.30 percent of the farmers with an MPEI of 2.54. The sound created by the polythene bags deters the rats from entering the fields. The easy availability of polythene papers / bags and cost-effective nature of this IWAP might be the reason for the higher adoption of this practice.

Trait wise analysis of the IWAPs

The perceived effectiveness of an IWAP has been studied considering the twelve traits shown in [Table-4]. In order to have a better understanding on the traits that influenced the perception of the farmers regarding the effectiveness of an IWAP, trait wise analysis was taken up. The IWAPs that received a score above the average possible score have been represented in [Table-4]. It could be inferred that the three traits *viz*., "lesser time for adoption, ability to be handled easily and used by the farmers and yielding earlier results" were found to have influenced large number of IWAPs to be effective. The other traits that influenced the effectiveness of the IWAPs were observable results, reduction in cost of cultivation, easy understandability and reducing the cost of external inputs. This implies that higher or sustainable yield alone was not the major criteria for the perceived effectiveness of an IWAP.

The farmers considered different dimensions while considering the effectiveness of an IWAP. Further analysis of the IWAPs, revealed that the following six IWAPs had perceived effectiveness scores above the average score in all the 12 traits.

1. Seeragasamba, having 150 days duration and producing very fine grains is good for meals, particularly for biryani. 2. Trimming the field bunds during field preparation to control weeds, pests and diseases and rats. 3. Waste polythene sheets or used fertiliser bags tied to poles and placed on the periphery of the fields reduce the menace of rats. 4. Dusting fresh wood ash in the nursery to control or prevent the pest incidence. 5. If Neem (*Azadiracta indica*) cakes are applied as basal fertilizer there will not be any incidence of diseases. 6. Stopping the irrigation 15 days before harvest to enhance ripening of seeds.

Table-4 *Trait wise analysis of IWAPs*

SN	Traits of IWAPs	Relevancy weights	Average score	Number of IWAPs above the average score	Percent
1	Yields effective results earlier than other IWAPs	0.83	1.66	17	44.74
2	Yields effective results sustainable over a long period	0.86	1.72	11	28.95
3	Satisfies the farmers needs	0.76	1.52	12	31.58
4	Available in required quantity	0.79	1.58	13	34.21
5	Yields easily observable results as compared to other IWAPs	0.8	1.6	15	39.47
6	Yields higher cost- benefit ratio	0.88	1.76	14	36.84
7	Acts as an effective alternative to the modern technology	0.84	1.68	12	31.58
8	Helps to reduce the cost of cultivation	0.85	1.7	15	39.47
9	Understandable easily to the farmers	0.81	1.62	15	39.47
10	It is easy to be handled and used by the farmers	0.78	1.56	18	47.37
11	Helps in reducing the external inputs / external solutions to a large extent	0.89	1.78	15	39.47
12	Requires less time for its adoption	0.72	1.44	21	55.26

The following two IWAPs had perception scores above the average score on 11 traits

1. Paddy field is puddled well to destroy the weeds and to reduce the water loss by seepage and percolation.
2. Providing irrigation whenever termite attack is observed.

It was found that the following three IWAPs had perceived effectiveness scores above the average score on 10 traits.

1. Application of abundant farm yard manure (FYM) in the nursery for better seedlings.
2. Arcot Kichadi Samba is a local variety with super fine and tastier grains, moderately resistant to pests and diseases and yielding 1500 kilograms /acre.
3. Clipping the tips of rice seedlings at the time of transplanting to eliminate stem borer eggs. The above practices are part and parcel of the wetland cultivation practices of rice. They have been adopted over years and very common knowledge among the rice farmers. Their adoption rates were also higher as seen in the earlier paragraphs. Earlier studies by Jayakumar and Sundaramari (2014) [13] also supports this finding. However, 19 IWAPs (47.50%) were found to have perceived effectiveness scores below the average score on all the 12 traits.

Conclusion

The study revealed that 38 out of 40 IWAPs were perceived as effective by the rice farmers. All the 25 crop production IWAPs were perceived as effective while 13 out of 15 crop protection IWAPs were perceived as effective. Fourteen IWAPs were perceived as most effective *i.e.*, with MPEI above 2.50. Six MPEIs related to crop production and eight IWAPs related to crop protection were perceived as most effective. Those practices that were very common and integral part of the cultivation practices in wetland rice cultivation were perceived as more effective and adopted by a greater number of farmers.

Trait wise analysis revealed that 11 IWAPs had effectiveness scores above the average possible scores in more than 10 traits. Traits like "like lesser time for adoption, ability to be handled easily and used by the farmers and yielding earlier results" were found to have influenced large number of IWAPs to be effective. Higher or sustainable yield alone was not the major criteria but the farmers considered different dimensions while considering the effectiveness of an IWAP.

Application of research: Standardisation and popularisation of eco-friendly and cost-effective Indigenous wetland agricultural practices

Research Category: Wetland Agriculture

Abbreviations: IWAP: Indigenous Wetland Agricultural Practices
PEI: Perceived Effectiveness Index, MPEI: Mean Perceived Effectiveness Index

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