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Community Initiative for Azolla Cultivation by Farm Women of Uttar Dinajpur District of West Bengal

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ABSTRACT

Azolla is a small fast-growing free-floating water fern and has been proved as sustainable source for the poor and disadvantaged women and men farmers in their hardships of finding viable feed for the farm animals and enriched bio-manure in rice farming. Keeping above points in view backyard azolla cultivation was introduced to 10 self help groups by KVK, Uttar Dinajpur in the year 2013 under frontline demonstration programme covering five villages. Through farmer-to-farmer knowledge sharing and proper training, now it had been reached to 55 SHGs covering more than 50 villages and 650 farm families in five blocks of the district. Azolla had been introduced in domestic animals and birds' feeds. As azolla produces abundant biomass, and has 5-7 per cent protein respiration abilities, offer cost-effective solutions for fodder security [more than 30-40 per cent cost saving] and significantly reduces costs towards chemical farming. It was revealed that there is significant change in knowledge, attitude and skill level of SHG women practicing azolla cultivation after getting training. Reasons for adoption and discontinuation were also assessed for the selected group.

Key Words: Azolla, bio-manure, biodiversity, livestock feed, livelihood security.

INTRODUCTION

Azolla is considered as the most economic and efficient feed substitute and a sustainable feed for livestock. It is a potential source of nitrogen and thereby a potential feed ingredient for livestock (Pannerker, 1988). For decades Azolla has been used as bio-fertilizer in many paddy growing countries including India, Vietnam and Philippines. It is a cost-effective technology to harness fully this dimension of Azolla which benefits mainly the marginal dairy farmers. Azolla is a water fern that can be grown both at farmstead and homestead by resource poor farmers for meeting organic cattle feed supplement in addition to use azolla as Dual Culture in rice farming and bio-manure for crops, vegetables and plants for environmental conservation and economic returns.

Azolla pinnata is a small aquatic floating fern that lives in symbiosis with the nitrogen fixing blue-green algae; it has a high nitrogen fixing ability (Ventura *et al,* 1992). It grows naturally in stagnant water of drains, canals, ponds, rivers, marshy lands (Becking, 1979). Azolla can be used in animal feed and is a potential feed ingredient for broilers; an income generating crop (INDG, 2006). Mathur *et al* (2013) reported that feeding of Azolla as livestock feed to milch animals resulted in increase in milk yield and fat content.

Azolla is easily propagated but requires abundant standing water, relative humidity of 85-90 per cent, pH of 4.5-6.5, salinity of between 90-150 mg/L and adequate phosphorus for its nutritional needs. Azolla doubles its weight in 3-5 d. From a start of 1t/ha, it can reach a fresh weight of 15-20 t/ha in about 20 d (Khan, 1983). Azolla is rich in protein (25 – 35%), 10 - 15 per cent minerals and 7 – 10 per cent of amino acids, bio-active substances and bio-polymers.

MATERIALS AND METHODS

Uttar Dinajpur Krishi Vigyan Kendra primarily promoted azolla cultivation among 10 selected Self

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Table 1. Categorisation of respondents based on adoption. **n=64**

Sr. No.	Category	Frequency	Percentage
1.	Adopters	50	78.12
2.	Non adopters	14	21.87
3.	Total	64	100.00
4.	Discontinued	3	6.00
5.	Continuous adopters	47	94.00

Help Groups spread in six villages of Uttar Dinajpur district in West Bengal by imparting training on azolla cultivation and also by providing azolla culture, Silpauline sheet (UV stabilized plastic sheet) for azolla tank and fertilizer for maintaining tank for at least six months. For purposes of this study, the necessary data were collected from a randomly selected sample of 64 farm women spread in six of these adopted villages. All these respondents underwent training on azolla cultivation given by the KVK. The investigator personally interviewed all of them individually with an interview schedule designed for this purpose. Interview schedules were prepared separately for adopters, non-adopters and those who continued azolla cultivation. Acceptability of various training programme was measured taking into account the various parameter viz. knowledge, attitude and skill in which pre and post exposure level was assessed and overall score was grouped in low medium and high categories. The data were tabulated and analysed for assessing the reasons for adoption and non-adoption in some cases of azolla cultivation.

Categories of respondents based on adoption

The decision to apply an innovation and to continue its use is called adoption (Van den Ban and Hawkins, 1996). The process of adoption depends upon a number of factors such as the technology itself, the farmer, the extension agency and the infrastructural facilities (Rogers and Shoemaker, 1971). This study focuses on adoption of azolla cultivation as an alternative source of cattle feed to reduce cost of milk production.

The respondents were categorised into adopters - those who were cultivating azolla and feeding to their cattle at the time of interview; Non-adopters - those who neither cultivated azolla nor fed to their cattle; and discontinued – those who cultivated azolla and fed to their cattle initially and later stopped cultivating as well as feeding azolla to their cattle. The reasons for differential adoption behaviour (Table 1) of the respondents.

RESULTS AND DISCUSSION

Profile of the respondents

Age and occupation

Majority of the respondents (about 65 %) were middle aged whereas 16 were in the age group of 16-30 yr and the rest were more than 40 yr old (Table 2). All the respondents owned cattle the primary criterion for including them as beneficiaries by the KVK. Agriculture was the main occupation of the majority of the respondents and dairy farming hence was either a secondary or tertiary occupation for them. About 35 per cent of the respondents depend on agricultural labour for their livelihood.

Family and Herd size

A majority of 46 respondents had a medium sized family of 4 to 5 members and only 14 respondents had a big family of more than 6 members. About 89 per cent of the respondents owned 1-3 cows and there were only four respondents who owned more than 4 cows. Majority of the respondents had experience in rearing cattle which range between 10 to 20 yr. There were as many as 16 respondents who had less than 10 yr of experience in cattle rearing.

Table 2. Profile of the respondents. n=64

Sr. No.	Socio personal Characteristic	Number	Percentage
1.	**Age**		
	Young (16-30 yrs)	16	25.00
	Middle aged (31-45 yr)	42	65.62
	Old aged (> 45 yr)	6	9.37
2.	**Occupation**		
	Agriculture	36	56.25
	Labour	22	34.37
	Cottage industry	0	0.00
	Any other (tea garden labour)	6	9.37
3.	**Family size**		
	Small (1 - 3)	4	6.25
	Medium (4 - 5)	46	71.87
	Large (> 6)	14	21.87
4.	**Herd size**		
	Nil	3	4.68
	Small (1 - 3)	52	81.25
	Medium (>4)	9	14.06
5.	**Experience in cattle rearing (in yrs)**		
	Low (<10)	16	25.00
	Medium (11 - 20)	36	56.25
	High (> 21)	12	18.75
6.	**Av. Milk Production per day (in litres)**		
	Nil	3	4.68
	Low (1- 4)	52	81.25
	Medium (4 - 7)	9	14.06
	High (> 7)	0	0.00
7.	**Dairy income (Rs. Per month)**		
	No income	42	65.62
	Low (> Rs.2000/-)	14	21.87
	Medium (Rs.2001 to 4000/-)	8	12.50
	High (> Rs. 4000/-)	0	0.00
8.	**Family income**		
	Low (<Rs.20000/-)	2	3.12
	Medium (Rs.20000-30000/-)	42	65.62
	High (> Rs. 30000/-)	20	31.25

Milk production

About 81per cent of the respondents had a daily household milk production ranged from 1-4 *l* and only 14 per cent possessed milk production more than 4 *l*. It is obvious that there were 3 respondents whose household milk production is zero as they do not possess any dairy cow at the time of interview.

Family income

A majority of 65 per cent had an income ranged from Rs. 20,000-30,000/ annum and only 2 farmers had an income of less than Rs. 20,000 / annum. Some of the respondents (22%) were getting income ranging from Rs. 1500-2000/- whereas majority of them use the milk for family consumption and most of the respondents possess no income at present.

Knowledge, attitude and skill change of the respondents

On the basis of average score obtained from pre and post exposures, gain in knowledge, attitudinal change and change in skill was worked out for the adopter group. It was evident (Table 3) that about 72 per cent respondents had medium acquisition of knowledge followed by 14 per cent low and only 14 per cent respondents had high acquisition of knowledge regarding different institutional trainings done under azolla cultivation. In case of attitudinal change near about same trend was followed. About 74 percent of respondents had medium level of attitude change followed by 14 percent respondents fall in high attitudinal change category.

The data (Table 4) revealed that 58 per cent respondents had medium skill change followed by high skill change (36.0%) and low skill change (6.0%). Kala *et al* (2004) reported that majority of the trained respondents (56.66%) got high quantum of work while in case of untrained respondents the quantum of work was low (40%) because of higher level of skill is acquired by the trained respondents. They faced fewer constraints and earned more than those untrained respondents. So, job satisfaction among the trained respondents was more as compared to the untrained respondents because skill and critical knowledge acquired by the trained respondents during training.

Reasons for adoption, discontinuance and non-adoption

Out of the total 64 respondents who attended the training on azolla cultivation, about 74 per cent of them only adopted azolla cultivation whereas the rest 26% did not adopt it at initial stages for various reasons. However, at the time of interviewing the

Table 3. Knowledge, attitude and skill change of the respondents regarding different institutional trainings. **n=50**

Sr. No.	Catagory	No. of Respondents	Percentage
1.	**Knowledge Score**		
a.	Low (up to 2)	7	14.00
b.	Medium (3-4)	36	72.00
c.	High (5-6)	7	14.00
2.	**Attitude score**		
a.	Low (12-14)	6	12.00
b.	Medium (15-17)	37	74.00
c.	High (18-20)	7	14.00
3.	**Skill score**		
a.	Low (up to 5)	3	6.00
b.	Medium (6-10)	29	58.00
c.	High (11-15)	18	36.00

Table 4. Reasons for adopting Azolla cultivation. **N= 50***

Sr. No.	Category	Frequency	Percentage
1.	KVK provided inputs and supplied azolla seeds free of cost	26	52.0
2.	KVK insisted to cultivate azolla	17	34.0
3.	Developed interest to cultivate azolla after attending the training	40	80.0
4.	To reduce the cost of feed	12	24.0

*Multiple responses

respondents it was observed that these 74 per cent of the adopters have continued the practice of cultivation of azolla. This means at present most of the respondent in these selected villages was cultivating azolla. Reasons for differential adoption behaviour of the respondents were also ascertained.

Reasons for adoption

Majority of the respondents (78%) adopted azolla cultivation mainly because they developed interest to cultivate azolla after attending the training (Table 4). Other reasons specified by the adopters were the KVK insisted on cultivating azolla and organised training programme for the beneficiaries. Once the programme was introduced through frontline demonstration programme backyard azolla cultivation was adopted by the most of the farm families. As programme was initiated through SHGs of adopted villages, so, sense of responsibility was there. Field days were also conducted in selected villages and Incidentally, there was diffusion affect in these adopted villages as well as farm women of other villages (other than beneficiaries of the programme) were also become interested and adopted this practice.

Reasons for discontinuing Azolla cultivation

Although the azolla cultivation was taken up by about 78 % respondents initially and adoption trend was upward with time passed but, in few cases, (6%) they discontinued it later for a variety of reasons. Most prominent among them where cows were disposed off and hence no need to cultivate azolla, rain water washed away the tank, very poor growth of azolla due to non-availability of proper place due to scarcity of land etc. Rogers (2003) argued that "Although incentives increase the quantity of adopters of an innovation, the quality of such adoption decisions may be relatively low, thus limiting the intended consequences of adoption". As a technology it has got few positive aspects like low initial cost, simple and compatible with the existing norms of the society so the discontinuing cultivation cases are very less.

Reasons for not adopting Azolla cultivation

There were 14 respondents who did not cultivate azolla even after participating in the training programme on azolla cultivation and classified as non-adopters of azolla (Table 5). Out of them 6 respondents did not adopt because they did not

Table 5 . Reasons for not adopting Azolla Cultivation. **N= 50**

Sr. No.	Category	Frequency	Percentage
1.	No cow	6	42.85
2.	Didn't get any input from KVK	0	0.00
3.	No one to maintain tank	1	7.14
4.	No place to grow azolla	5	35.71
6.	Not at all interested	2	14.28
7.	Afraid to feed azolla to cows	0	0.00

purchase cows although some of them had ducks initially which were sold out later on. Similarly, there were 5 respondents who did not cultivate azolla due to lack of place to construct the tank.

It was revealed from the survey of non adopter group that three women were not at all interested in cultivation of azolla. Technology adoption could be enhanced through proper matching of problems with possible technological solutions, which necessitates screening of technologies. Rao *et al* (1995).

CONCLUSION

Azolla can be used as a good substitute for the cattle feed. As a technology it has got few positive aspects like low initial cost, simple and compatible with the existing norms of the society so the discontinuing cultivation cases are very less. Azolla can be fed to the livestock either in fresh form or dried form and can be given directly or mixed with concentrates to cattle poultry, sheep, goat, pigs and rabbits. Unlike almost all other plants, *Azolla* is able to get its nitrogen fertilizer directly from the atmosphere. That means that it is able to produce bio-fertilizer, livestock feed, food and biofuel exactly where they are needed and, at the same time, draw down large amounts of CO_2 from the atmosphere, thus helping to reduce the threat of climate change. It is suggested that we must promote this multi-dimensional fern plant among farming community to draw its maximum profit towards society as well as our environment.

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