



Analysis of farmers' participatory research on mite management in coconut in Bangladesh

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Coconut farming is an important occupation in Bangladesh which provides income to the growers on regular basis. Coconut is mainly grown in homesteads, with small holders being the main growers. In recent years, coconut farmers in Bangladesh are facing problems like reduction in nut size and dropping of immature nuts. These problems are mainly due to tiny mites affecting the perianth near the stalk portion in coconut, which was first reported in the Jessore region in 2004. The mite sucks saps from tender portion of young nut which causes zigzag fissures on nut surface (Keifer, 1965; Griffith, 1984; Ramarethinam and Loganathan, 2000; Islam *et al.*, 2008). It spreads from plant to plant by wind, birds and insects and has the potential for rapid spread due to distribution of coconut palms in the vicinity. Hence, management of mite demands cooperation among the farmers. Community approach in an area of about 1000 ha can be considered for the management of mite for which farmers participatory rural appraisal (FPRA) was conducted at six villages of Bagharpara Upazila, Jessore, Bangladesh during May 2011.

A consultative participatory FPRA described by Eyzaguirre and Batugal (1999) was followed to elicit information from villagers. A multidisciplinary team comprising of horticulturists, entomologists,

plant pathologists, extension specialists and NGO workers facilitated the PRA exercise. Emphasis was given on varieties of coconut, problems in coconut, income from coconut, plant species and biodiversity in the homesteads during PRA. The documented information was discussed among the farming community on 21 June 2014 for reviewing by them after implementing mite management programme for three years.

Collected data were summarized and computed for interpretations and analysis. The number of plant species and their relative abundance in the homesteads were measured by Shannon-Weaver Diversity Index (H') where H' ranges from 0 to 1; one indicates the maximum diversity (Li *et al.*, 1996). Relative prevalence (PR) of species by using the formula, $PR = \text{population of the species} / \text{homesteads} \times \text{percentage of homesteads with the species containing a particular species}$ (Millat-e-Mustafa *et al.*, 1996).

Majority of the respondents were middle aged with a family size of more than six members. Most of them were literates and they possessed diversified occupation opportunities including farming and as daily farm labor. Majority of land holding size in the study area were small (65%) followed by medium (30%) and large (5%) holdings. Traditionally, women rarely go outside their

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residence for income generating activities. Women have opportunity of processing husk of coconut in to coir yarn. Demographic characters of the community revealed that there was an opportunity for production of more agricultural products by utilizing family labour. Islam *et al.* (2011) had reported such opportunities of generating income and employment by utilizing coconut for the women in Jessore district of Bangladesh. Persley (1992) also described coconut as a subsistence crop of small holders in rural communities where women could be employed. Household income derived from agriculture was found to decline from 30 to 25 per cent in twelve years from 2000. The share of income from non-crop agriculture (animal, forest, fishing and related activities) has been increasing which accounted for nearly 45 per cent from agriculture. Women took part in postharvest handling and storage of coconut. Men and children were mostly involved in marketing of coconut and other fruit crops. Islam *et al.* (2011) had reported male domination in household planning and farming activities in Bangladesh. However, women in small households actively participated in household income generating activities. The estimated diversity index of plant species in the household was 88 per cent. On the other hand, diversity index within the fruits was 81 although 50 per cent of the individuals belonging to one species. The most

prevalent fruits in the homesteads were mango, coconut, guava and date palm. At least 95 per cent of the households had coconut palms. Uddin *et al.* (2002) also reported highest abundance of coconut palms in the households of southern districts of Bangladesh. FPRA matrix also revealed that there was no exclusive coconut orchard in the community. Coconut is grown with other fruit trees in the homesteads. Income from coconut has declined over the years from 32 to 4 per cent from 2000. Mite infestation in coconut is one of the reasons which affected the productivity and income from coconut farming. The community preferred tall varieties with green color (Table 1). Yellow and red colored varieties were also found, albeit in a lesser area in the villages. Age of the palms was found to be in the range of 30 to 40 years. Farmers seldom use fertilizers and irrigation for their palms. Generally, farmers harvest both mature and tender nuts. Small households sell tender nut when in need of money. In big households, surplus nuts were sold in nearby community markets. Retailers sometimes buy coconut directly from farmers' house.

Mite infestation was the most serious problem among the nine problems identified by the villagers which made the farmers to shift the cultivation to other crops. The PRA matrix revealed that 90 per cent crop loss was due to mite infestation. The community also pointed out insufficient extension services, low income from coconut, high competition with other crops were the major threats of coconut cultivation (Table 2). From the FPRA matrix, it was also revealed that farmers had poor knowledge with respect to coconut varieties, agronomic practices, nutrient, pest and disease management practices for enhancing the productivity. The community was ignorant of mite infestation in coconut till 2004. FPRA matrix done by the community revealed that mite attack in coconut was first noticed in Jessore, a south-western district of Bangladesh, and in its adjacent areas in 2004 which spread throughout the country by 2010. Farmers' started adopting various management practices but the mite infestation and its spread could not be reduced. Hence, some farmers cut down their palms and shifted to other field crops/ fruit trees. Time line analysis from 1990-2010 revealed a downward trend of coconut production in the country (Table 3). Less priority for coconut

Table 1. Coconut variety and its characteristics

Sl. No.	Particulars	Description
1	Method of cultivation	Homestead
2	Variety preferred (%)	
	a) Green Tall	90
	b) Reddish Tall	5
	c) Yellow Tall	5
3	Age of palm (Years)	30-40
4	Nuts per palm	25
5	Starting age of flowering (Years)	5-7
6	Start of economic yield (Years)	12-16
7	Bunch per palm	6
8	Nuts per palm	80
9	Use of coconut (%)	
	a) Tender	47
	b) Mature	50
	c) Seed nut	3

Table 2. Farmers experience on chronology of mite attack in coconut

Year	Relating events	Farmers' reaction and social perspectives
2000-2004	• Splitting on pericarp of young nuts • Reduction in nut size and yield • High percentage undersized fruits noticed • Recommendation given to the farmers from research institutes and extension department were not targeting mite	• The incidence was neglected as to be mechanical damage • Seldom control measures taken
2005-2009	• Production of coconut reduced drastically • BAR Researcher claimed mite as causal organism of distortion of coconut • No new plantation of coconut	• Coconut was under threat of extinction
2010-2015	• Farmers replacing coconut by other fruits, field crops and timber species • Generation of mite control technology	• Farmers learnt that mite causing damage to coconut by sucking sap from the young nut at early stage

in national agricultural policy, old/senile coconut palms, community plantation program for planting timber species, adverse climatic conditions, pest and disease incidences might have reduced the coconut production in Bangladesh. Campaigning against coconut and coconut products, especially coconut oil by western countries reduced consumption of coconut which negatively influenced coconut production. Mite infestation, high cost of inputs and non availability of labour were identified as major constraints in coconut cultivation in Bangladesh.

To support and facilitate local initiatives on mite management in coconut, a three-year farmers' participatory research involving farmers was conducted from May 2011 to June 2014. Guided by the FPRA results, the program was designed to

ensure participation of farmers. Farmers' perceptions on mite infestation in coconut cultivation which were documented during October 2011 were returned to them during June 2014 and the change of attitude of the farmers to mite infestation was recorded. The community reacted in various ways in evaluating their own experience on mite attack in coconut. Acaricide, neem oil, neem cake, Tricho compost and Tricho leachates were used separately or as combinations for the management of mite infestation in coconut. After the intervention, the farmers were able to understand the actual damage symptom due to mite infestation.

Coconut was an important crop in the community which they have been cultivating since long time. Mite infestation created disinterest

Table 3. Time line of coconut farming

Year	Events related to coconut farming	Reasons/causes for events
1990	Reduction in area and production	• New plantation of coconut stopped • Old/Senile coconut palms • Planting of timber species
2000	Reduction in production	• Laborious methods of cultivation • Higher profit from field crops • Introduction of new crops and HYV of traditional field crops • Lack of awareness on use of fertilizers, HYV and pest management
2010	Replacement of coconut with fruit and timber species	• Mite infestation • Lack of awareness on mite as pest in coconut • Unfavorable climate • Less priority of coconut in national program

among the farmers towards cultivation of coconut. Extension approaches like farmers' participatory research is the need of the hour to strengthen technology utilization and technology integration at the grass root level for enhancing the productivity and profitability from coconut farming in Bangladesh.

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