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Dissemination of plants and technology for rural development in Bangladesh

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Abstract: Firstly, the authors are introducing such a case that a local farmer utilizes plants as environment friendly technology to protect the riverside. They suggest the researchers should make efforts to find such a local technology more intentionally to utilize in the field of rural development. Secondly, they are making report on another plant utilizing technology. In this case, the reason why newly introduced plant, or African *doncha*, which was used to prevent the water hyacinth invasion into the rice fields, could not be fixed in the village is analyzed. The result indicates the farmers select their choice in accordance with several environment conditions, namely natural, economical and timely. Thirdly, the authors describe the present situation of one of other new technologies, hand-weeder, which has disappeared once but reappeared later and is fixed in the village today. The reason why hand-weeder has appeared again is also discussed. The fact also suggests that the new technology can be acceptable for farmers when some condition would be set in right way like the case of African *doncha*. On the background of these discussions, at last, it is concluded that whether new technology can be accepted by the villagers or not is depending on the existence of moderate advanced farmers' group called *deka-deki* in the village.
Key words: Plant utilization, riverside erosion, local existing technology.

Introduction

People are actively utilizing many kinds of plant in the rural area of Bangladesh. The people of our target village (Fig.1) are also planting so many kinds of vegetation in their homesteads and all parts of those are used as food, fuel, medicine, timber and other utilities. We can understand easily the villagers are eagerly working on the introduction of useful plants to the village by seeing with homestead, including homestead garden, abounding in plants. Comparing farmland with homestead, only a few kinds of main crops are cultivated in the farmland but, in the homestead, more than 150 kinds of plant including 25 kinds of fruits and 33 kinds of vegetables are growing in the village (Yoshino, 1995). Not only males but also females are engaged in growing works in the homestead garden. The villagers might have fostered their feel familiar to plants through the experience of such plant utilization in the homestead rather than agriculture in cultivated land.

According to the villagers, the seeds of plants growing in homesteads are tend to have been provided by the neighbors and the relatives both in and outside the village, or sometimes seeds are gathered by the villagers themselves from the plants. On the other hand, plants growing on the roadside, the border of cultivated land and other open space, most of which are not edible for men, are tend to have been introduced by the villagers who found them outside of the village. Villagers might have brought the plants freely to the village as it looks to grow naturally on the roadside and other open space. It can be said that gathering the useful plants from the wild nature and/or other villages is the wisdom for their lives.

For example, *kaisha* (wild sugarcane: *Saccharum spontaneum L.*) was introduced to the village 10 years ago after the construction of embankment near the village (Photograph 1). One farmer who saw that *kaisha* was planted on the embankment in the neighboring village, he brought it to his village and it can be seen everywhere in the village nowadays. It is planted on the embankment, roadside, around the pond etc. to prevent the erosion and riverside to accumulate soil deposition. Moreover, it is also planted as the border and fence of farmland and used as roof material. Woody plant *dol-kolmi* (bush morning glory: *Ipomea crassicaulis*), which was introduced to the village 8 years ago and utilized in the same way of *kaisha*, especially for prevention of erosion and accumulation of soil deposition in the riverside, is also to be seen in the village everywhere at present (Photograph 2) (Uchida and Ando, 1998a).

Although it is only 8 to 10 years ago that *kaisha* and *dol-kolmi* were introduced to the village, both of the plants fit in with the landscape of the village at present as if they were indigenous plants from old days. High fixing ability of plants and villagers' eagerness for introducing new useful plants indicate that the plants can be accepted by the villagers easily and spontaneously if they can fulfill villagers' requirements. From this fact, we can think that the plants are possible to become one of valuable tools for rural development.

Materials and Methods

The study site Dakshin Chamuria village (hereinafter D village) is located on a small floodplain of the Lowhajon river, a tributery of the Jamuna river, about 9 km north-east of Tangail town (Fig. 1).

The Lowhajon river and rainfall bring rapid inundation to the village in July. The highest water level is 1 to 3 m in the flooded field during August and September, while homestead is not inundated. The flooded water quickly recedes into the Lowhajon river from late October. Most amount of annual 1,750 mm precipitation concentrates in the rainy season from June to October. The soils which are classified as Silmandi series are mainly silty loam and silty clay loam, with some scattered plots with sandy materials. Generally, topography of this area is flat and soil is sandy. The village has the total area of 184 ha with a population of 2,198 making 386 households, more than half of them are engaged in agriculture.

The field survey was done mainly under Joint Study on Rural Development Experiment (JSRDE) during 1992 to 1995 sponsored by the Japan International Cooperation Agency. In the survey field observations and interviews with farmers were conducted by the authors.

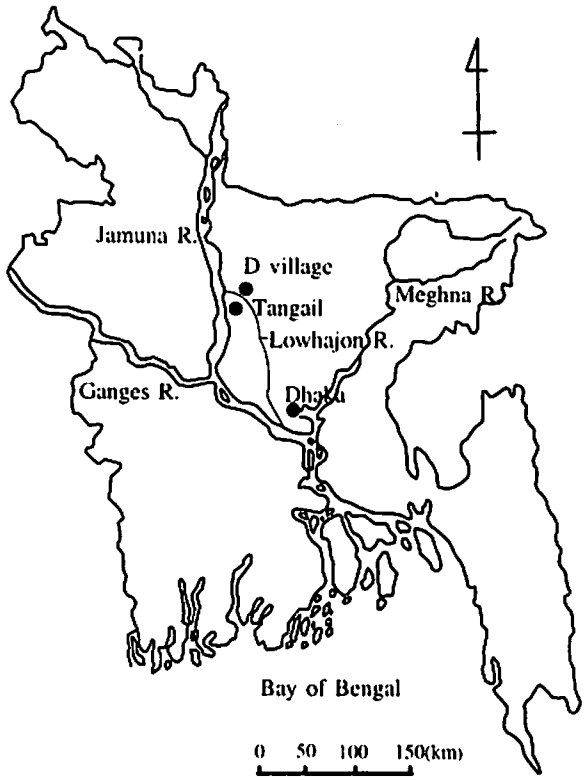


Fig.1. Location of Dakshin Chamuria (D) village

Results

Local Plant Utilizing the Technology to Protect Riverside: One farmer who lives on the riverside of upper Rowhajon river in Tangail district planted three kinds of vegetation on the ridge of riverbed. His purpose is protecting the riverside on which his homestead situated from water flow. He planted *dol-kolmi* on the lowest part of the riverside, *kaisha* on the medium elevating part and banana trees on the highest part of the ridge as shown in Fig.2 schematically (Uchida and Ando, 1996) (Photographs 3 and 4). He planted the vegetation in the dry season of 1994 in the aftermath of continuous two years' erosion by floods in the rainy seasons. The farmer who planted vegetation stated as follows:

"*Dol-kolmi* which has drifted ashore at the big flood of 1988 took root on char, or sand bar. I brought the cutting to plant near my house. As I have seen the cutting to root on the riverside on my way to the bazaar I planted the cutting of 45 cm on the riverside too. I am growing seedlings from the cutting in my homestead at present. *Dol-kolmi* can reduce velocity of water flow and also control waves. Sand and earth should deposit 90 cm thick annually if it would be planted in dense and the plant can stand even in deep water. I planted the cutting of *dol-kolmi* on riverside in 1989 at first and it grows thick over there with 3 m height at present. This plantation of *dol-kolmi* is protecting my homestead from the river erosion.

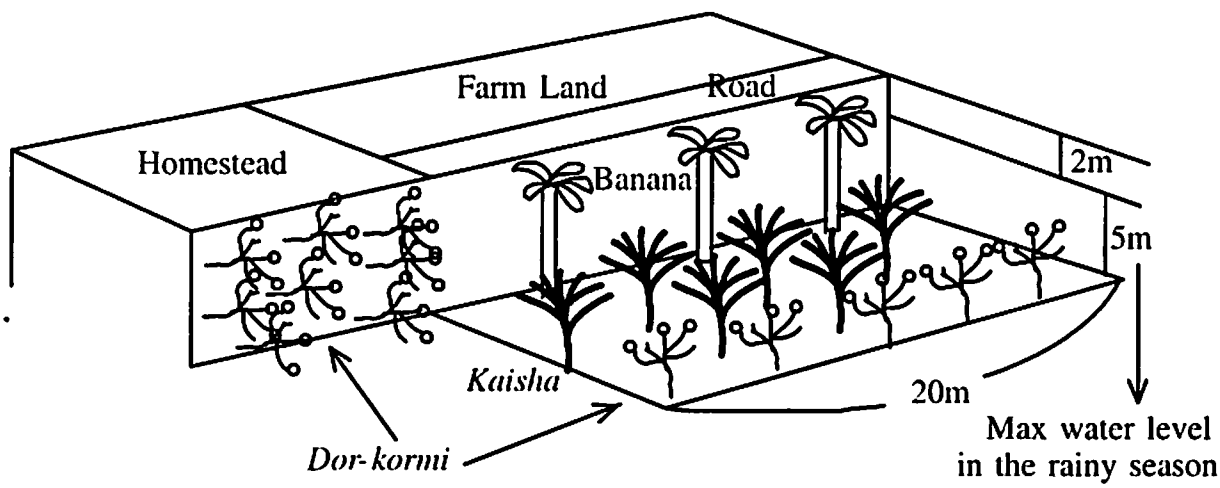
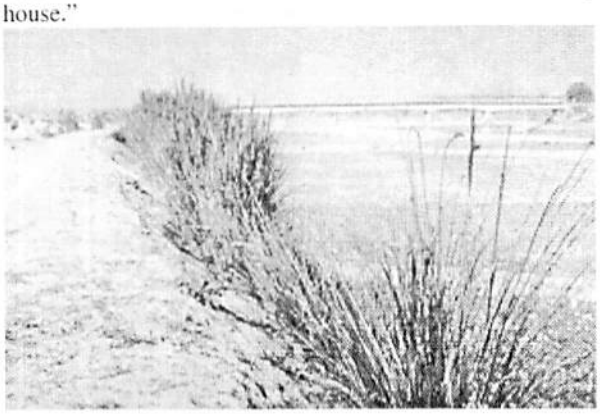


Fig.2. Planting against river erosion

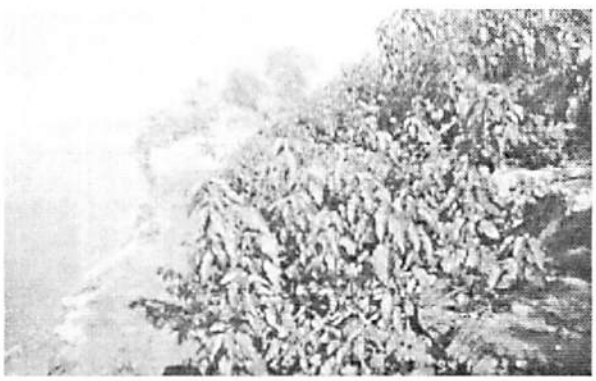
Planting *kaisha* on the riverside accelerates the deposition of sand and earth. Waves erode riverside when the engine boat passes by and continuous waves sometimes pull out *kaisha* from the ground. I planted *kaisha* around my house bringing from the *char* at first and I transplanted them to the riverside in November. A dozen stalks come from a root and it takes 10 to 15 days to root if there is enough rain and it takes one month in absence of rain. This weed grows about 2 m in a year. It can deposit 90 cm sediment if it could stay in water though the weed is pulled up sometimes by fast water flow. New stalks would come from the root in the following year after cutting old stalks at the point of 40 cm above the root if the root had not been buried in whole by sediment. It is only necessary to plant the root every four years if old stalks would be cut annually.

Banana trees are planted on the riverside to protect steep cliff and roadside from erosion and to promote sedimentation. The hard roots of about 3 m long stretch in all direction under the ground of 10 cm. The root is hardly

pulled out if once it rooted in the ground by waves and the tree can deposit sand 80 cm thick in a year. The local *bichikola* banana (similar to *Musa paradisiaca*) with hard stalks is usually planted on the riverside but I planted here other kinds of bananas too which have been around my house."



Photograph 1. Kaisha on the embankment



Photograph 2. Dol-kolmi on the riverside

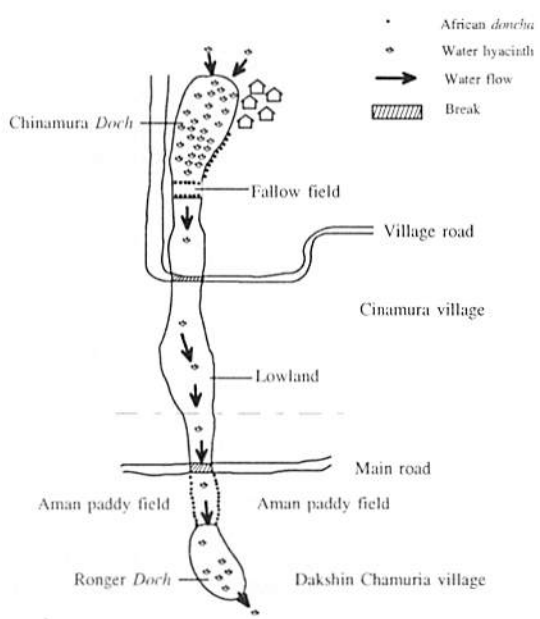
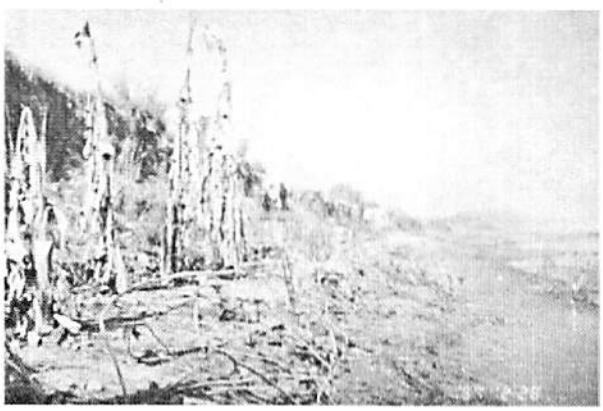


Fig.3. Water hyacinth control program

Photograph 3. Dol-kolmi & kaisha



Photograph 4. Dol-kolmi , kaisha & banana

It is clear that the efficiency of this kind of simple and small scale technology is less than so-called modern technology. But, at least, it is sure such kind of technology is suitable for a farmer who is not rich because of its inexpensiveness and sustainability. Moreover, this kind of technology can be said environment friendly technology, which can be substantiated individually. It is to be desired that the researchers are finding and collecting such local and/or indigenous technology more intentionally to utilize in the field of rural development. Such technology that is familiar to villagers can be

accepted easily by themselves and become an effective tool for rural development.

Water Hyacinth Control Program Using African *Doncha*: In Dakshin Chamura village, a lot of water hyacinth was flowing down from the upper Chinamura village and damaged deep water *aman* rice fields in the rainy season during the JSRDE acting period in the village. JSRDE decided to control those troublesome water hyacinth using newly introduced plant of African *doncha* (Photograph 5). African *doncha* (*sesbania rostrata*), an annual legume which grows up to a few meters, had been introduced to Bangladesh in 1986 by the professor of BAU (Bangladesh Agricultural University) from IRRI (International Rice Research Institute). The main difference from *deshi doncha* (*sesbania aculeata*), a local variety of *doncha* (*sesbania* spp.), is that the new kind of plant can be cultivated using seedlings (young plants and stem cuttings) under waterlogged conditions. Therefore, it can be cultivated at any time even during the rainy season if the seedlings are available. Rooting of African *doncha* occurs 2-3 days and leafing 5-6 days after planting of a stem cutting 50 cm high for normal cultivation and 1 m for deep waterlogged conditions, respectively.

Photograph 5. African Doncha

As shown in Fig.3, JSRDE implemented the program as follows (Uchida and Ando, 1998b). Firstly, at the beginning of the rainy season, the stem cuttings of African *doncha* were planted in the fallow field which was located just in front of water depression, or Chinamura *Doch* in the neighboring village from which water hyacinth flowed out. Secondly, the stem cuttings were also planted in the deep water rice growing area in two lines to guide water hyacinth into the other depression, or Ronger *Doch*, directly. Thirdly, at the same time, African *doncha* was also cultivated on the levees to prevent the invasion of water hyacinth to the deep water rice growing fields.

Photograph 6. Hand-weeder

This program was implemented in 1994 and 1995. But the efficiency of this program could not be substantiated. In the first year, the water hyacinth did not overflow from the upper depression, Chinamura *Doch*, because of unusual less flood and, on the contrary, in the second year, the large flood washed away the planted stem cuttings of African *doncha*. Nevertheless, at that time, we were sure the program is successful from the view point of introduction of a new plant. It was planted in the fields of 64 farmers and 80 farmers could not get the cutting in spite of their desire in 1994 and JSRDE could observe the villagers planted African *doncha* spontaneously not only in the second year but also in 1997.

But only five years later, nobody could see the African *doncha* in the village and in stead of it there were many *deshi doncha* in the same village. According to the villagers, *deshi doncha* was cultivated only in one plot in 1998 and 1999, and cultivated in 10 plots in the village in the year of 2000. On the contrary, Jute cultivation has decreased in the village. *Deshi doncha* is mainly used for fuel, *masa* (supporting terrace) for vegetable cultivation and Jute can be used only for starting the fire. Moreover, the price of *doncha* is higher than that of Jute. This can be thought as the reasons why *doncha* cultivation has increased and Jute cultivation has decreased.

According to the villagers, the reasons why African *doncha* was not acceptable for them are as follows. African *doncha* is unstable on the field and tend to fall down on the water, and its light weight and root spreading are also disadvantage in comparison to *deshi doncha*. Moreover, the hydrological condition surrounding the village has changed and water depth in the rainy season has decreased. So that, water hyacinth does not flow down from upper area any longer and usefulness of African

doncha has decreased for the villagers. This fact suggests that farmers select their choice in accordance with several environment conditions, namely natural, economical and timely.

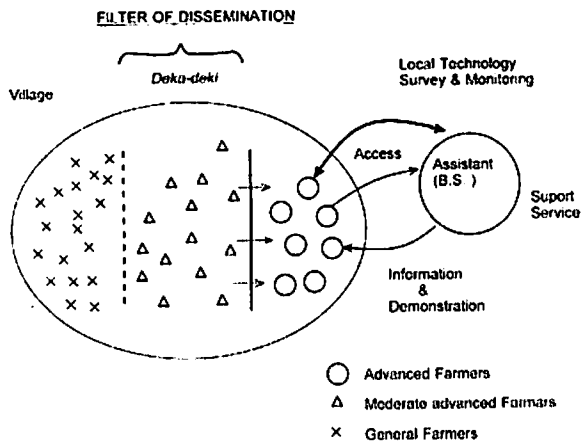


Fig.4. Dissemination of technology in the village

Re-Introduction of Hand-weeder: JSRDE also introduced the hand-weeder renting system with line transplanting method for *boro* rice of the dry season in the village (Photograph 6). During the program period there was only one hand-weeder of JSRDE's itself and no farmer had it. Moreover, very few farmers rent the weeder from JSRDE. Hand-weeder could not get popularity at that time. But six years later, number of hand-weeder owner has increased up to 9 and 69 farmers are renting the hand-weeder for their weeding work.

The reasons of this status quo, according to the farmers, are as follows. Firstly, the hand-weeder is available at the near bazaar at present but it was only available in Tangail city, center of the district (Fig.1), during the project period. Secondly, the price of the weeder is 150 Tk. now but it was 300 Tk. before (1 dollar was about 60 Tk. in 1995). Thirdly, the rental fee is cheaper at present. At last, most important reason should be that the *guti shar* (ball shaped fertilizer for paddy) was introduced after JSRDE gone by the block supervisor (BS) who engages in administrative service delivery for agricultural extension program.

In 1999, 75% of hand-weeder user is taking use of *guti shar* and only less than 50% of non-user is taking use of it as shown in Table 1. This figure indicates the relationship between the hand-weeder and *guti shar* in the dry season rice or *boro* rice fields of line transplanting. This fact also suggests that the new technology can be acceptable for farmers when some condition would be set in right way like the case of *doncha*.

Table 1. Relationship between hand-weeder and guti shar (in plots)

		guti shar	non-*guti shar*	Total
Weeder	own	13	6	19
	rent	25	7	32
sub total		38 (75%)	13 (25%)	51 (100%)
non-weeder		41 (47%)	46 (53%)	87 (100%)
Total		79	59	139

Only for line transplanting plots in 1999.

Discussion

In the case of the hand-weeder, new technology was not fixed at initial stage but about five years later fixed in the village. On the contrary, another new technology, African *doncha*, was not fixed although it looked to be accepted at initial stage, and consequently, the villagers chose old technology, *deshi doncha*. What is the reason of this queer phenomenon? When a new agricultural technology is introduced to the village by a field assistant, for example Block Superviser (BS), advanced farmers are willing to get it at first as shown in Fig. 4. In this stage, the technology is not fixed yet. In order to be fixed, the technology must pass through a kind of filter, namely, moderate advanced farmers at next stage. They don't jump to the new technology directly, sometimes even they pretend indifferent, but they are watching and hearing carefully advanced farmers and their plots to make sure whether the technology is useful for them or not. If they accepted the technology, it could be distributed even to the general villagers. Therefore, it is important their existence for dissemination system of agricultural new technology. They are conservative in a sense and called *deka-deki* (persons who are waiting and seeing how things go). It is *deka-deki* that both fixed hand-weeder and not fixed African *doncha* in the village. It can be said that *deka-deki* is playing key role in the dissemination of technology in the village. Consequently, it is needed that a sort of system to focus on them, consult with them and/or monitor their thoughts should be established for the dissemination of the new technology in rural development program.

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