From Concept to Impact:
Developing and Communicating Multipurpose Seed Drying Tables in Bangladesh

Bangladesh has recently become self-sufficient in rice, with a production of 39 million tons in 2001, an increase of about 40% over the past ten years (FAO, 2002). This has mainly been the result of the introduction of a new, irrigated cropping cycle during the dry season, and improvement of the existing rainfed one. The intensified cropping cycle has created a particular new problem: ***'how to properly dry seed during the rainy season?'***.

In Bangladesh, agriculture has been mechanized to some extent over the past years, however, engineers have paid little or no attention to issues like seed drying and storing. This is surprising because 95% of the rice seed is currently farmer-saved, hence, improved post-harvest technologies could directly benefit both household and national economies.

However, resource-poor farmers in developing countries are often bypassed in the technology generation process. This may, in part, be because an organized group which may communicate their needs to technology designers is lacking. It may also be that researches are not open-minded and willing enough to accommodate their suggestions. This is particularly problematic for the poorest people and when there exists no functioning platform for governmental institutes to regularly interact with non-government organizations (NGOs), communities or their institutions (Ashby, 1990).

This paper describes the experiences of the Seed Health Improvement Sub-Project (SHIP) in working with the Rural Development Academy (RDA) in Maria village, Bogra, Bangladesh. We discuss how learning-based approaches can improve the development and dissemination process of mechanical technologies, and ensure full ownership by its end-users. In this case, we illustrate the importance of building on local knowledge, experiences and experimentation, and the role of outsiders in facilitating the innovation adoption and adaptation process.

SHIP was initiated in 1999, under the Poverty Elimination Through Rice Research Assistance (PETRRA) project in Bangladesh. It is a collaborative effort between the Bangladesh Rice Research Institute (BRRI), the International Rice Research Institute (IRRI), CABI Bioscience (UK Center) and several government and non-government institutions. Since 2001, CABI Bioscience has provided training in participatory research and innovative extension methods.

Qualitative information on the technology (e.g., the origin of local innovative ideas, its use-flexibility, impact and expected durability) and quantitative measurements (e.g., size and cost of the drying tables) was obtained through informal household interviews and participatory community meetings.

Developing the Participatory Process

Participatory methods ought to be used in a creative and flexible way, and, if needed, in combination with other approaches, depending on the local circumstances. Otherwise, these methods risk of becoming yet another imposed, top-down approach to fulfil and satisfy one's agenda. Rather than giving a blueprint of how to develop a mechanical technology in a participatory way, we will pinpoint a few issues that need to be given due consideration.

An overview of the different steps involved in the development and dissemination of the technology is given in Table 1.

Table 1. The Seed Drying Technology Development and Dissemination Process

	Steps in the Process	Objectives
Diagnosis and Planning	Background information evaluation	Review existing information related to seed health. Define key sites for project intervention based on agro-ecological and/or socio-economic characteristics.
	Community meeting and mobilization	Introduce project staff, present project objectives and build rapport with target communities.
	Community information gathering	Assess farmers' knowledge, attitudes and practices in rice seed management.
	Participatory needs assessment	Assess needs and constraints of community with regard to improving seed health in function of social groups. Assess training needs of project staff with regard to facilitation and participatory methodologies. Plan staff training and community interventions.

Table 1. The Seed Drying Technology Development and Dissemination Process...
continued

	Steps in the Process	Objectives
Implementation	Participatory technology development workshop	Train project staff in facilitation and participatory technology development approaches.
	Meeting of village women	Introduce the concepts of ventilation and evaporation. Stimulate creative thinking in solving problems. Enhance project responsibility and ownership by women.
	Village households meeting	Develop criteria for good multipurpose drying tables. Stimulate discussion within and between households.
	Developing drying tables	Develop tables based on general criteria developed by the community and responding to specific household needs and limitations.
Feedback and Scaling-Up	Village picture exhibition	Create awareness among non-project staff. Get community feedback on strengths and weaknesses of tables. Develop pride and ownership among participants.
	Uptake pathways workshop	Evaluate performance of project staff and members. Expose and train project staff in developing innovative dissemination strategies. Develop scaling-up strategy for the technology.
	Going public	Expose innovator farmers to a new platform for marketing their skills. Get feedback from people from outside the village. Enthuse local officials to support farmer-to-farmer extension.
Scaling-Up	Video production	Assess most relevant knowledge gaps and adoption barriers. Understand key motivational factors of early adopters. Involve trained women in script research and video development.
	Communication fair	Distribute videos to a wide range of organizations. Enthuse government officials and national TV stations.
	Village video sessions	Reach a large number of resource-poor women.

Preparing the Ground

Before entering a community, a good understanding of the key issues and key players involved in seed health was required. The SHIP project has achieved this through a combination of activities such as literature review, expert interviews and multi-stakeholder workshops. Although RDA had hardly any contact with Maria village before the onset of the project, their close proximity has probably made both parties aware of the potential for future collaboration on other topics related to rural development. It has also helped create a relationship of mutual respect and understanding. Anticipated mutual benefits are one of the driving forces of the participatory process.

Research Relevance and Community Enthusiasm

A needs assessment through village group meetings and farmer workshops resulted in recommendations for participatory training, on-farm research, and participatory technology development. Seed drying in the rainy season was perceived as a major problem in all sites as drying has been traditionally done on the earthen floor, bamboo mats (*chatai*), dried cow dung or jute bags. The functional solution to this problem is the demand for improved seed drying. How to respond to this demand and to what extent men and women farmers are involved is both technology- and location-specific, but will by and large determine the adoption level of the technology.

Learning from past experiences, the project staff decided to focus activities on those topics identified by the communities as most relevant and for which a high potential for success and enthusiasm could be anticipated. Technologies should be accessible to resource-poor farmers, environment-friendly and gender-sensitive. The development of seed drying tables was obviously one of the options that could be explored, although at this stage the project was a bit reluctant to go in with a pre-designed model. It was decided to introduce the concept of drying through a learner-centred approach rather than a technology.

Back&Forth is a method developed in Bolivia in the 1990s through which mechanical tools are developed and redesigned in the laboratory and on-station after several Back and Forth visits to the community for comments (Bentley & Baker, 2002). Although intended to build on feedback from farmer communities, mechanical engineers working in the SHIP project developed a combustion dryer on-station, which uses rice bran as fuel and electricity to power the fan. Upon a first demonstration on-farm, farmers considered it too expensive and too difficult to keep track of the right temperature, and rejected this innovation. As many villages in Bangladesh do not have electricity yet, the project decided to introduce a different approach.

Designing, Developing and Validating the Technology

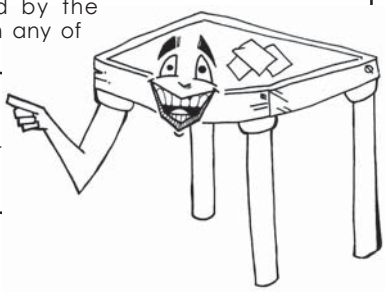
Because women in Bangladesh have the main responsibility for seed drying, a two-hour session with 30 women of Maria village was organized immediately after the needs assessment. The meeting was facilitated in the local language Bengali. A limited number of questions, embedded in real-world situations, were developed to stimulate the creative thinking process related to evaporation and ventilation. By the end of the session, women raised the idea themselves to develop drying tables. Both staff from RDA and the participating women felt empowered by this approach.

In the next session, both the women and their husbands were involved to stimulate household interaction. A matrix was established consisting of the major criteria for a good drying table (Table 2). This matrix with drawings made by the women, was transferred to an A4-sheet, photocopied and delivered to the households. It served as a guiding sheet for the design of drying tables, as such bringing back at the household level, the criteria developed and filtered by the community.

No incentives were offered in terms of materials or financial contributions. Each household was left free to decide whether the technology would be useful for them or not, and hence whether to make a table or not. In the next village meeting, nearly all 30 households had made a table of some sort, with some people already having some experience about the performance of their own design.

Table 2. Criteria for Drying Tables Developed by Maria Community Members

Criteria	Description
Seed drying	Drying should be possible in any season.
Portability	The table should be easy to move so that the women can always move the table to a place in their home yard where there is no shade.
Cost	The overall production cost should be kept to a minimum.
Material	Materials used should be locally available.
Height	The table should be high enough so that the seed is protected from chickens, toddlers and playing children, who often mix seed from different varieties. Proper height should also relieve (or prevent) back pain.
Size	It should be small enough to be moved easily by one or two people. The width is important; tables should be easily taken through the door of the house to be used for indoor purposes.
Strength	Opinions were divided for this criterion. Some people wanted strong and enduring tables, while others said that if it broke down after a year, that would be no problem, because they can always make a new and better one as long as it is cheap.
Multipurpose use	People also came up with clearly different ideas about what other functions the table should accommodate. Manual seed cleaning, threshing (which in Bogra has so far been done by beating the panicles on the earthen floor), drying other materials, household purposes, dining table and baby cot were all possibilities mentioned at this stage.
Slanting	This idea was actually introduced by the project staff, but was not retained in any of the designs.
Folding type	One household had very limited space and suggested a foldable table, which they could put on their roof whenever not in use.



Innovative Feedback Loops

Going Public...

"Going Public" is a method by which a two-way information flow is generated at an arena where people gather naturally, such as bus stops, crossroads or markets. In Bangladesh, people often gather briefly at crossroads for an informal chat; this setting was used by the project to get some extra feedback from other people living in or near the project village.

The weekly market, on the other hand, created opportunities to discuss with people from a wide range of villages within the district. Farmers trained during the project discussed the importance of proper seed drying as one of the components to improve seed health.

To share experiences with other people in the community, and because of the difficulty of bringing all these designs in one place, a village picture exhibition was organized to further spread the idea and raise local awareness. All tables were photographed with their respective owners and pictures displayed in a public space with a few live models. In this evaluation session, Participatory Rural Appraisal (PRA) tools were used, including matrix ranking and gender analysis to evaluate the strengths and weaknesses of the different designs. The picture exhibition provided a forum for the people to take a closer look at their own innovations, get community feedback and increase their pride.

Following the picture exhibition, "Going Public" exhibitions with different models of community-made drying tables were held at an important crossroads between two villages, and at a weekly open-air market or *hat*.

Capacity Building: A Continuous Process

The project adopted a process- and results-oriented approach rather than a technology-oriented one, necessitating the organization of a workshop on farmer participatory methods. The global concepts and methods had to be understood first, before each team could act locally in their own site.

Emphasis of Participatory Approaches

- generation of technologies through participatory variety selection, participatory technology development, etc.
- generation of knowledge through discovery-based learning approaches
- validation of on-station developed technologies through adaptive research
- validation of traditional knowledge and technologies either on-farm or on-station

The communication and facilitation skills of scientists, engineers and extension people involved in the SHIP project have been continuously upgraded. Capacity building was achieved through an iterative process of: communicative learning through community group discussions and experience sharing workshops with other project teams; and individual learning through frequent household interactions and constructive self-evaluation sessions following community activities.

The role of the master trainer or facilitator was to develop a judicious learning environment, provide appropriate learning tools and empower the project team to trigger both communicative and individual learning at the community level. Besides learning and facilitation, the institutional setting plays an important role in triggering change. The fact that the institutional setting was supportive of a participatory approach in the SHIP project further contributed to its success. To achieve this, the national project coordinator and high ranking officials of the

different partner institutions were involved in activities as much as possible, and stimulated to interact with the rural households throughout the project.

Adopting and Adapting the Innovation

From Concept to Innovation

As the project did not introduce a technology, but the concepts of evaporation and ventilation, the idea behind the technological innovation first entered people's minds. Several households quickly put the ideas into practice, and these innovators served as examples for the rest of the community. Within about two months, 2/3 of the participants had adopted the innovation (Figure 1).

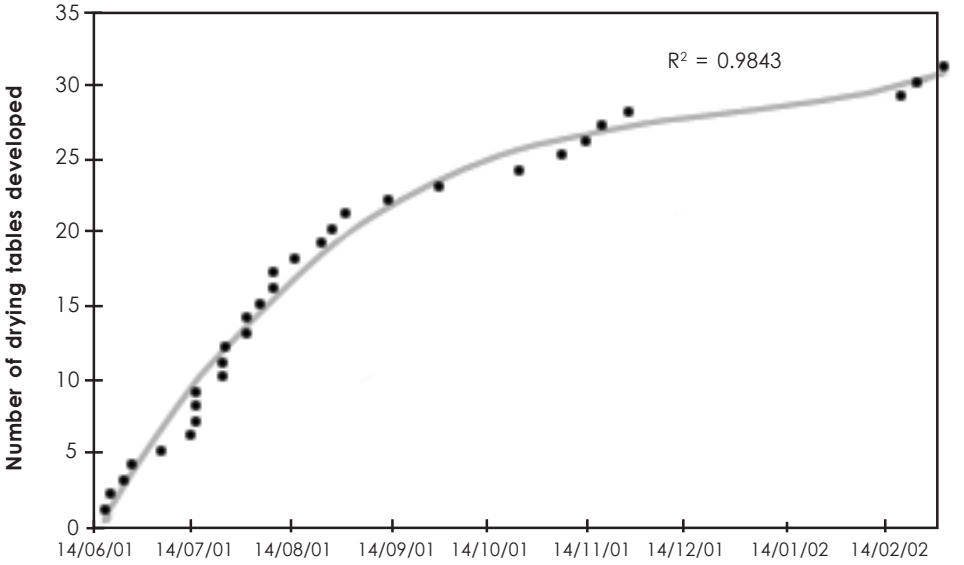


Figure 1. Trend Showing the Adoption Over Time of Multipurpose Drying Tables at Maria Village, Bangladesh (30 households)

The households adopted the idea first and only then did they apply a technology that fitted their financial limitations and personal household needs. Two clearly distinct ranges of designs evolved out of this process: light and heavy tables. The light tables can easily be used indoors and outdoors for keeping kitchen utensils and drying other food stuff such as rice flour, herbs and fish. On the other hand, the heavy tables are mainly used for drying and threshing the rice seed, and for relaxing on it. Due to the process-oriented approach, the project's initial focus on seed drying empowered households to tackle other constraints such as threshing. Creativity and necessity have turned these tables into multipurpose drying tables.

Gender Issues in the Design Process

Women, being generally smaller than men, raise the issue of gender compatibility in tool design (Jafry, 2001). In the SHIP project, even after we stressed the need for women involvement, still in 1/3 of the cases, they had not been involved in the designing process (Table 3).

Table 3. Contributors in Designing and Making Drying Tables, % of households (n=30)

	Designer			Maker		
	Farmer	Farmer + Wife	Farmer + Carpenter	Farmer	Farmer + Wife	Farmer + Carpenter
Heavy tables	35.7	64.3	-	-	42.9	57.1
Light tables	37.5	62.5	-	18.8	81.2	-
Total	36.6	63.4	-	10.0	63.3	26.7

Interestingly, most of those models were regarded by the women as either too high or too costly. Having discussed these issues during public meeting, men realized their mistake and contributed to better joint within-household decision-making about other issues from this moment onwards.

Farm Economics

For the development of the drying tables, every household calculated the total cost based on the actual cash costs such as materials bought or payment to carpenter, and an estimation of the costs of the materials they had at hand. When comparing the cost of the tables with other farm tools, the average price of a heavy table is about US$5, which is slightly higher than a knapsack sprayer or a plow, which not all farmers can afford to buy. The average cost for a light table, on the other hand, is only US$1, which equals the price of two to three jute bags, and is less expensive than a bucket, a water jar or a *motka* (clay pot), which most resource-poor farmers can afford.

Mothers and Fathers of Invention

If necessity is the mother of invention, its father is a new idea or a new piece of information (Bentley, 2000). Necessity was addressed from the early onset of the participatory technology development approach and partly contributed to the approach being taken up so smoothly and enthusiastically. It also explains how the introduction of a concept rather than a technology simultaneously triggered the community to address other constraints or necessities such as threshing.

This project also illustrates that Bentley's (2000) interesting idea can be expanded. Innovative ideas have been incorporated in the design of the drying tables, not only based on new information, but also on insights from previous exposures or experiences that suddenly became relevant in solving a problem (Table 4).

Table 4. Ingenious Ideas in Making Drying Tables Acquired Through Learning Activities

Innovation	Description
Binding structure	The way to bind different bamboo sticks together was borrowed from traditional roof binding technique.
Folding type	The household that made a folding table reported to have acquired this idea from a folding camp bed, which they had once seen being used by a 'rich man'.
Polythene socks	Table legs were given polythene socks to prevent the wood from rotting. This idea developed after associating table legs with human legs.
Food safety box cum table	One household integrated the innovation of a drying table with the existing idea of a box to keep food out of reach of animals such as rats.
Carum board	Carum is a traditional game played by two people who are standing around a square table. A separate surface can easily be placed on top of this game and as such be used to dry seed.
Polythene surface	A fertilizer bag is cut open and used as surface as this is easy to handle. When it suddenly starts raining, the polythene sheet can be easily taken inside.
Jute cloth surface	The project learning session on ventilation triggered the idea that if the wind could reach the seed at both sides, drying would be faster. A woman mentioned that a window screen would give good aeration, but as it was quite expensive, she used a jute cloth instead. To facilitate handling, she knitted two handles to the cloth.
Jute cloth on corrugated sheet	People know that roof tops made from corrugated steel become very hot. This triggered the idea that by using an old piece of corrugated sheet covered by a jute cloth, the seeds will dry faster, as the heat comes both from above and below.
Multi-layered drying surface	Triggered by the learning session and combined with the necessity due to a lack of sufficient drying space in their home yard, this farmer used multiple layers of drying sheets at intervals of about 0.2 m.
Clay pillars	People in Barisal use clay pillars to support a parboiling container, during which process the clay is baked. As bamboo is hardly available in this part of the country, people developed the idea to use these columns as support for a drying surface.

Measuring Impact

Although this paper mainly describes activities undertaken in Bogra, the project approach has resulted in more than 50 designs, all suited to local conditions.

- About 80% of women participants find it easier to manually clean their seed on the table, and all have fewer backaches. However, many found it straining for their eyes and back, as it was done on the floor. Ergonomic considerations should not only be limited to the technologies developed, but also to the project training activities undertaken.

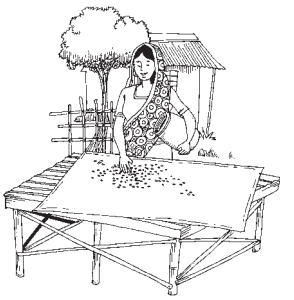
- Participating male farmers have increasingly appreciated the family approach. Rather than inhibiting women from participating, they now encourage their wives and daughters to attend project activities. Women also reported having gained more access to the household decision-making.

- All participants reported a significant improvement in seed purity as it is no longer mixed with inert material, or varieties. Many mentioned that seed actually dries faster on the table and agreed that their seed is more healthy, looks brighter and that seedlings are more vigorous.

- Drying seed on a table allows women to quickly bring their seed in the house when it suddenly starts to rain. People also feel they can now dry seed even if the floor is wet and there is no direct sunlight.

- Some farmers complained that the seed drying capacity of the light tables was limited to 10-20 kg, about the amount resource-poor farmers keep for storage. Some households who first made a light table have started to make heavy tables, whereas some who started off with heavy tables have seen the complementary benefits of the light table and now have both.

- All participants who had made a heavy table said it reduced labor requirements for threshing.



Scaling-Up Potential

One of the challenges of any participatory method lies in reaching a large number of people with the same quality approach. Feder *et al.* (1999) described scaling-up as one of the generic problems in extension which can be partly overcome through mobilizing other players in the extension process, empowering farmers and farmer organizations, decentralization and use of appropriate media.

Allen *et al.* (2001) stated that the use of linear approaches to extension are especially suitable for innovations developed primarily to increase productivity and/or reduce costs. Whereas a more collaborative approach between scientists, extension and end-user is needed if we wish to change people's behavior. To improve their thinking and decision-making skills in a dynamic environment, the learning has to be embedded in real-world situations.

Following this line of thinking, it should not pose any problems to promote multipurpose seed drying tables fairly easy and straightforward through linear extension. However, in the case of participatory technology development, with a strong focus on farmer empowerment and a decentralized approach, we believed that a hybrid between the linear transfer of technology and the learning tools and messages that triggered the innovation process would improve uptake.

Participatory principles were further incorporated in the scaling-up process. A new small-scale and low-budget project was developed to produce training videos with women from Maria village. Early results of our research indicate that learner-centered videos that incorporate specific elements of the participatory innovation development process trigger behavioral changes more cost-effectively than farmer-to-farmer extension.

So far, more than 700 copies of videos have been requested by and distributed to NGOs for use within their projects. The communication fair organized by

PETRRA in September 2003 was indispensable in bringing the video programs to the attention of extension service providers. In March 2004, the video team received an award for effective communication from the prestigious International Visual Communication Association in London (Van Mele *et al.,* 2005).

Conclusions

To improve rural people's problem-solving and decision-making skills in a dynamic environment, learning approaches have to be embedded in real-world situations. Our approach has merged participatory, learner-centered approaches with communication media to speed up the scaling-up process. Initial results look very promising. Especially for technologies that are not too knowledge-intensive, such as seed drying and storage, innovations can be disseminated in a cost-effective way when gender-sensitive, participatory approaches are used in both the production and dissemination process.

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