

## **PARTICIPATORY ACTION RESEARCH (PAR) ON BUILDING-FOR-SAFETY OPTIONS FOR LOW-INCOME HOUSING IN FLOOD-PRONE RURAL AREAS OF BANGLADESH**

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### **Introduction**

This paper discusses current research projects supported by the Grameen Trust and the Housing & Hazards (H&H) HEL (Higher Educational Link) between BUET and the University of Exeter, UK in which Participatory Action Research (PAR) methods are followed for developing building-for-safety construction options for low-income rural housing in flood-prone areas of Bangladesh. The research follows from previous studies which show that policy decisions regarding low-income rural housing projects in Bangladesh are usually taken at the organisational level; there is hardly any consultation with target low-income end-users, resulting in a variety of mismatches between organisational objectives and rural community/household needs (Ahmed 1999). PAR is an alternative approach to working with communities, involving the community in a participatory process of synthesis of academic/professional and local/indigenous knowledge in generating context-specific, locally appropriate ideas and solutions to problems that the community faces (see for example, Rahman 1993).

The researcher is leading two PAR projects in different rural areas of Bangladesh to understand the potential and relevance of community participation in a specific arena: developing building options for strengthening houses in flood-prone rural areas of Bangladesh. Previous studies indicated natural building resource scarcity affecting the ability of poor households to cope with the demands of building and repairing houses (Ahmed 1998), augmenting their vulnerability to hazards such as floods – a naturally occurring event worsened by top-down development policies (Hughes *et al* 1994). Rural communities and households, especially those with low-income, now need institutional support that reduces instead of increasing their vulnerability. Because floods represent a major hazard in Bangladesh, it has been chosen to locate research in flood-prone villages to develop building-for-safety construction options for rural houses to better resist floods. Perhaps there might be a possibility of developing vulnerability reduction options based on local knowledge supplemented by insights from the outside that are sensitive to local concerns. Such local knowledge systems are increasingly being recognised as invaluable (Sillitoe

2000), particularly because of their potential for contributing towards development options for local communities that reflect their needs and can be sustained by them. Therefore it would be justifiable to investigate their value in a field, low-income rural housing, in which there are very few examples in Bangladesh that respect and build upon local knowledge systems. Based on appraisal of local conditions, the basic method involves participatory workshops with villagers to arrive at consensus on building-for-safety construction techniques, which are tested and evaluated in demonstration projects with local participation with a view to replicate and disseminate.

This paper mainly presents the methodology and actions carried out in the Grameen Trust supported PAR project because it is at a more advanced stage. The H&H link project is at an early stage and thus discussed briefly. The two projects are similar in methodology and objectives, but located in different areas for comparability. However, each project is expected to have its own specific and independent outcome, and carried out under different organisational arrangements. The project entitled "Participatory Action Research (PAR) on Building-for-Safety Options for Low-Income Rural Housing in Flood-Prone Areas" is supported by the Programme for Research on Poverty Alleviation (PRPA), Grameen Trust. It began in May 2000 and is expected to be completed by October 2001, hence preliminary results of the research can only be presented here.

### Research Background

The research follows from the researcher's extended involvement and interest in low-income rural housing (see for example, Ahmed 1994; Ahmed and Ahmed 1993), and his PhD thesis (Ahmed 1999) - a detailed study (using participatory research methods for data-collection) on the house-building process involving different stakeholders in various rural areas of Bangladesh. This has been accompanied by the development of various concepts regarding improvement of low-income rural housing, specifically in the hazard-prone context of Bangladesh. Because of this specialised interest, the researcher has been involved in the Housing & Hazards (H&H) link since its inception in 1996. As part of the activities under the link, extensive literature on the subject has been collected (for example, IT Publications 1994) and published, and a number of technical and community-based studies on rural housing have been undertaken. In general, there are very few studies on low-income rural housing specifically in the hazard-prone Bangladeshi context, and hardly any on micro-level, in-depth, context-specific 'building-for-safety' or hazard-resistant construction methods relevant to the circumstances of low-income villagers. Some of the studies carried out under the link addressed this, resulting in a number of ideas offering possibility of practical application (Ahmed *et al* 1998;

Carter 1997; Magne 1999; Hodgson *et al* 1999; Hodgson *et al* 2000; Hodgson and Seraj 2000a; Hodgson and Seraj 2000b). These research projects thus originate from three main sources:

1. The researcher's independent studies
2. Results of the H&H studies
3. Studies on 'low-cost', 'appropriate' and 'hazard-resistant' construction techniques and building materials, which are ample but often general in nature or appertaining to contexts other than Bangladesh. There is, however, perhaps scope for adapting in the Bangladeshi rural context some relevant ideas from this body of literature.

### Research Concept and Aims

In Bangladesh floods represent the principal hazard, particularly to low-income communities that are more vulnerable due to poverty. The majority of rural areas in Bangladesh are flood-prone and in periods of excessive flooding, such as in 1998, more than 60% of Bangladesh was affected (Hannan 1998; Seraj 1998). With potential to contribute to other institutional efforts for augmenting flood-preparedness, there is a need to seek ways of improving the performance of rural housing in floods. There are few studies on the subject, and hardly any based on participatory dialogue with rural communities; even in a comprehensive compilation as the Grameen Trust's Website on Flood 1998 (Grameen Trust 1998), most references to housing show quantitative data for house damage/loss, and other similar observations, but there is hardly any mention of building for safety in flood-prone areas, based particularly on community participation. To respond to this need, on the basis of the above experiences, these PAR projects purport to develop building-for-safety options for flood-prone areas that might contribute towards improving the performance of low-income rural housing. The research is being conducted in flood-prone villages in Manikganj districts where the researcher had existing links from previous work and Gopalganj.

The research concept is to develop useful building-for-safety options for flood-prone areas based on a synthesis of professional/academic and local/indigenous knowledge through participatory consultation. A building option is expected to be adopted by individual households according to their specific circumstances: all options might not be applicable for all households or households might prefer to adopt options incrementally and according to affordability. The researcher and his team, through research and professional experience, have some concepts of improved rural house construction. On the other hand, villagers, especially builders/craftspersons, have context-specific

knowledge and needs-assessment methods that can inform professional/academic efforts. Thus a dialogue between villagers and the research team provides opportunity to both groups for benefiting from each other's knowledge and participating in developing safer house construction options for flood-prone areas. This experience would indicate directions for replication, assessment of local adoption, appropriateness and dissemination methods. Thus the research aims can be summarised as below:

- To engage in participatory consultation with local communities on developing building-for-safety options in flood-prone villages
- To arrive at consensus between various individuals/groups on possible building-for-safety options
- To apply in practice some of the options gained from participatory consultation
- To assess the results of the practical project after one monsoons season

### Summary of Actions

The Grameen Trust Project Because this research project is action based, it develops primarily according to the sequence of field visits (each with a specific objective) and a series of consequent actions and decisions taken during the visits. The research structure is sequential and work progresses according to field visits: visits to flood-prone areas to understand their characteristics and identifying communities to work with, then visits for holding workshops to develop building-for-safety options, then further visits to observe and participate in demonstration house construction using concepts developed in the workshops, to be followed by periodic monitoring and evaluation visits.

Firstly, reconnaissance visits to two flood-prone areas in Manikganj district, Jhitka and Shibaloy, was undertaken to plan ensuing activities and to study local building methods and other contextual aspects. Separate workshops were held subsequently in each location for staff members of local community development organisations (BRAC, CCDB, Grameen Bank and Proshika), village women and men, and housing maps and building materials inventories were prepared together with villagers. The village workshops discussed the main parts of buildings (base, walls and roof) in the form of focus group discussions; community meetings and slide shows supplemented the workshops. This allowed building rapport with a community in Bhawalkandi village, Shibaloy, known to the researcher from before.

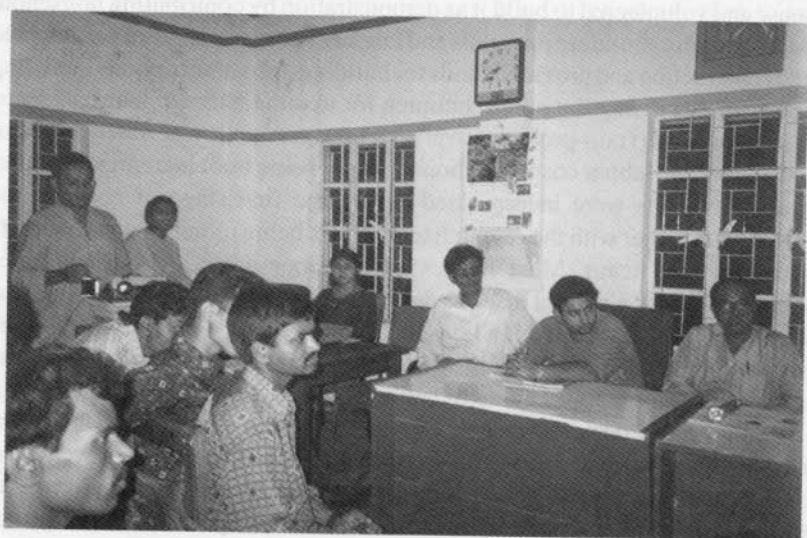
A peer-group-nominated household, that of Mokshed's (studied longitudinally in intervals over the last four years and a case study in the researcher's PhD thesis), volunteered implementing building-for-safety options discussed during the workshops. Mokshed's household was planning to build

a house and volunteered to build it as demonstration by contributing household resources such as building materials and labour. The research team participated in the construction and provided funds for building-for-safety options including cement for stabilising the plinth, bitumen for treating bases of bamboo posts, CI sheet for *bhelki* (rain-protector over door) and *gorani* (lower water-protector panel) and some labour costs. The house is now being built incrementally after some innovations were incorporated during the first stage of construction carried out together with the research team and is being monitored periodically by the research team. Most houses of the poor are built and improved incrementally, but a natural disaster can undo this progress. It is expected that such regress can be arrested if a household implements some hazard-resistant construction items that would allow adding to them and improving the house gradually without fear of having to begin all over again after a disaster.

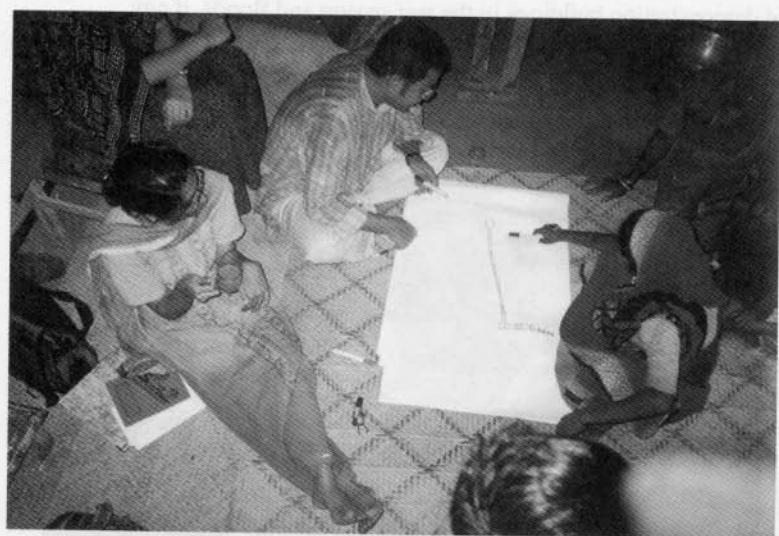
Some more demonstration houses are expected to be built during the forthcoming building season in winter. Research investigators who have gained experience in this project would manage construction of individual projects, resulting in devolution of power from a team structure led by the researcher to more autonomy of investigators, consequently building their capacity. There would be ongoing visits and monitoring and the project would be evaluated together with local residents next year (2001) after the monsoons to understand the performance of the demonstration buildings in the wet season and floods, if any.



**Fig. 1 : Women's workshop: Bhawalkandi village, Shibaloy**



**Fig. 2 : NGO workers' workshop: BRAC office, Jhitka**



**Fig. 3 : Preparing a Housing Map with villagers**



## Demonstration House Construction

There are three main parts of this research project: reconnaissance, workshops and demonstration housing. Construction of the demonstration house proved vital in developing rapport with the community and provided opportunity for participation of both the research team and the community. It has therefore been chosen to discuss the demonstration house construction here. For details of the reconnaissance findings and proceedings of the workshops, please refer to reports submitted to the PRPA, Grameen Trust.

The demonstration house consisted of participating and assisting in construction of a new house for Mokshed's growing children. A raised plinth of 62 cms was built using cement additive to stabilise the earth to better withstand the effects of floods. Results of soil stabilisation and other tests are available from the H&H studies and were followed here (for example, see Carter 1997; Seraj *et al* 2000; West and Harding 2000). Seraj *et al* (2000,) have conducted laboratory tests specifically on stabilisation of mud plinths and this research attempts to extend to the field results of these tests. Separate tests on local soil samples were also carried out independently in Dhaka by the research team.

Including stabilisation of plinth, there were other building-for-safety options selected for application in this house: treatment of lower ends of bamboo posts with bitumen and CI sheet rain-protector over door (*bhelki*) and lower wall panels for water protection (*gorani*). These are local techniques but not used in all houses; the aim is to promote their use more widely by using them in this demonstration house. These improvements and some labour costs were sponsored through the research funds and Mokshed's household and neighbours provided labour and building materials such as earth, bamboo posts, CI roofing sheets and *gorani* framing. It is expected that the household would incrementally complete and improve its house and the research team's input can be viewed as an effort to reduce vulnerability of the house to floods, thereby supporting the incremental improvement process.

Cement was purchased from a local shop and arrangements for construction were made such as borrowing a scales and manual compactor from neighbours. The site had to be cleared and field tests on soil were done. Earth and cement were then weighed and mixed in the proportion of 1 part cement to 19 parts of earth (5% by weight). An outer perimeter was built with the mixture and then filled in with three successive layers of mixture of gradually increasing cement proportions, i.e. first 3%, then 4% and the top layer 5% merging with the perimeter; this was done to reduce amount of cement and hence cost. The finished plinth was then cured for a week by pouring water on it twice daily. The bitumen-treated posts were embedded into the plinth during construction and

kerosene was injected inside posts to get rid of poisonous ants (*myjali*). These improvements are expected to increase the water-resistance of the plinth and posts. CI sheet was provided for *gorani* and *bhelki* added later and the household is expected to fund other construction and complete the house at its own pace, using some already saved materials such as CI roofing sheets and by purchasing other materials when household funds permit.

Construction spanned over three continuous days and the research team lived nearby and participated fully, including doing construction work and menial tasks as well as learning from locals and providing guidance, suggestions and decisions on technical and other matters. Many neighbours visited and commented on the work and neighbourhood children joined in the construction work. Further improvement of the building-for-safety options being built were suggested by some villagers and costing exercises were done in group meetings. An evening entertainment session with a meal and singing was held to build further rapport and celebrate the team spirit that developed over the previous days. Rapport building continued with swimming sessions in the river with villagers. A complete housing map of Bhawalkandi village was also prepared by research team members.

### Post-Construction Visits

Several visits were made, particularly during floods, to examine the condition of the demonstration house and to observe progress. It was found that the plinth has hardened significantly, but was wet due to seasonal rise of water level and rain. According to the technical expert, Prof Salek Seraj, to achieve the best result a stabilised mud plinth requires a period of drying after curing to gain complete strength; after drying, shrinkage cracks can be repaired and the plinth can be given a smooth finish. In this case because construction was carried out in the wet season, the plinth might not achieve its full strength because of sustained wetness. However, judging from the strength gained by the plinth, it can be expected that it would still resist water much better than a regular mud plinth. The household and neighbours were convinced by the plinth's durability over the short-term. There were floods at that time and some Mokshed/Asiah's homestead was flooded. A month after construction there were floods and after the water had receded, on comparison it was evident that the mud-plinth of the existing house and kitchen were eroded at the sides, while the cement-stabilised plinth of the demonstration house was not affected. However, it had not hardened fully everywhere, and possible reasons for that such as inadequate mixing and timing of construction need investigation. Nevertheless, the plinth had performed sufficiently well, pointing to the need





**Fig. 4 : Building the demonstration house**



**Fig. 5 : The demonstration house after completing the stabilised plinth  
(on the left: new kitchen being built , later roofed with recycled cement bags**

to further explore its potential as a building-for-safety option.

The household has completed roofing a small kitchen in front of the demonstration house, using inexpensive materials such as polythene and thin bamboo members; polythene cement bags from the demonstration house construction were recycled and used in the kitchen roof. Steps were also added later to the demonstration house using leftover cement. Gradually, a mono-pitch (*chapra*) roof was added using previously saved CI sheet, and the *gorani* and *bhelki* were added with CI sheet provided through research funds. The household paid for labour and bamboo framing costs. At later stages bamboo and rushes walls were added, building each wall over intervals. This indicates that the research has encouraged the household's self-initiative for gradually improving its living conditions within a relatively short time. Household members, especially the children, expressed a strong interest in completing the house and have begun living in it. The household saved some money and built parts of the house during the slack employment season following the rice harvest. The typically incremental mode of house building in the rural Bangladeshi context is clearly evident from this house. Studies since 1997 show an incremental improvement of housing conditions of the household (see Ahmed 1999). This research is expected to complement this long-term process and perhaps allow reducing hazard vulnerability by shortening the process.

The project has generated local interest and many people expressed interest in building some of the options, particularly stabilised mud plinths, in their houses. Ideas for improvement of the options were also suggested, based on this project's experience. Community meetings were held during the later visits to discuss possible future activities. Villagers suggested that it would be best to carry out construction work during the main building season in winter. Additionally, experience gained from the construction of this demonstration house suggests that it would be best to build a cement-stabilised plinth during the dry season so that it can better withstand effects of subsequent wet seasons.

### **H&H Project in Gopalganj**

This project has begun recently and at the time of writing this paper, reconnaissance and the first workshops have been completed and a housing map and building materials inventories have begun to be prepared. The main aspect in which this project differs from the other is that the primary field facilitator is a villager from Dinajpur district, who has experience from the H&H project there (Carter 1997). This is expected to allow investigation into the potential of a participatory 'training-of-trainers' type approach in generating momentum in disseminating research findings within rural communities without



**Figs. 6, 7 : Stages of incrementally building the demonstration house**

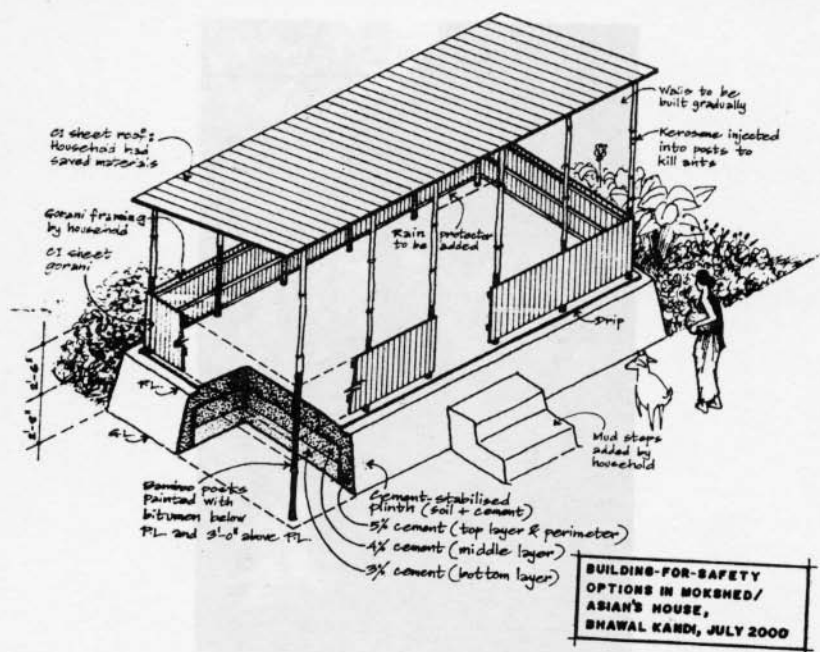


Figure 8 : Sketch showing construction details of the demonstration house



Figure 9 : The H&H project location in Gopalganj: isolated settlement on a raised mound

outside input. It should also allow local capacity-building. This project is primarily concerned with a Hindu community living in a somewhat isolated location on a raised mound surrounded by fields and water-bodies. The mound becomes an island during the wet season. This research project is expected to result in context-specific findings that might find applications in similar contexts elsewhere, as well as benefiting the community involved in the research.

### **Conclusions and Justification of Outcome**

In the ongoing PAR project supported by the Grameen Trust, it has been found possible to find a suitable location and conduct the research in a participatory mode by active participation of both team members and villagers. Local NGO workers are also very helpful. Gaining rapport with the community is given high importance and is being found worthwhile. The workshops proved valuable for generating discussion and developing ideas for building-for-safety options. The options developed are modest, but have potential for minimising vulnerability of the house to floods. However, there is scope for improving the options implemented in the demonstration house, as already suggested in local consultations. During the next stage of the research it is expected that a few more demonstration houses would be built in the village with care to schedule construction in the regular building season. This would lend comprehensiveness to this research by allowing further tests to be made and lessons to be gained. At that stage it would be possible to initiate a small-scale programme for developing a model process for improving low-income rural housing in a flood-prone area with community participation. Because this project began earlier, it would be possible to use lessons learnt from it in the other PAR projects for H&H. These projects in different locations should allow comparability and an understanding of crucial issues involved in reducing vulnerability of housing to hazards over a wider geographical area.

The outcome of this research might have relevance in several spheres:

- On the broader level, it might inform institutional policy and practice for improvement of flood-preparedness measures from the perspective of low-income rural communities
- On the micro-level, it would generate useful concepts that might have practical applications for better house construction in flood-prone areas
- These concepts would have potential for extension to other areas through participatory replication projects
- The projects would allow developing participatory action research methods specific to low-income rural housing



- The research methods used would be refined by experience and would prove useful for replication projects, as well as contributing to the body of knowledge in the field. Some organisations have expressed interest in carrying out similar projects, so there is scope for replication and use of lessons learnt from these projects

Synthesising local/indigenous and academic/professional knowledge to develop low-income housing could begin to address an important aspect of the serious problem of floods that affect a large proportion of Bangladesh's predominantly low-income rural dwellers. The results of this research could contribute insight to the larger goal of national poverty alleviation by seeking ways of reducing vulnerability of rural communities to floods by safeguarding a valuable commodity - housing.

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