

## Part II: BUILDING PRACTICE

### Villages, Paras & Homesteads

In rural areas almost all families own the land their homestead is built upon, even the functionally landless who have little or no agricultural land. The homestead land is typically raised up artificially from the surrounding paddy fields with mud dug from a nearby pond. In northern Bangladesh a group of up to 25 or so homesteads are usually grouped together to form a hamlet called a para. The para sometimes, but not always, contains members of the extended family. Fig. 2 shows a map of Hari para in Sundarban village. Hari para is largely made up of two family groups, one of basket weavers and one of rickshaw van peddlers.

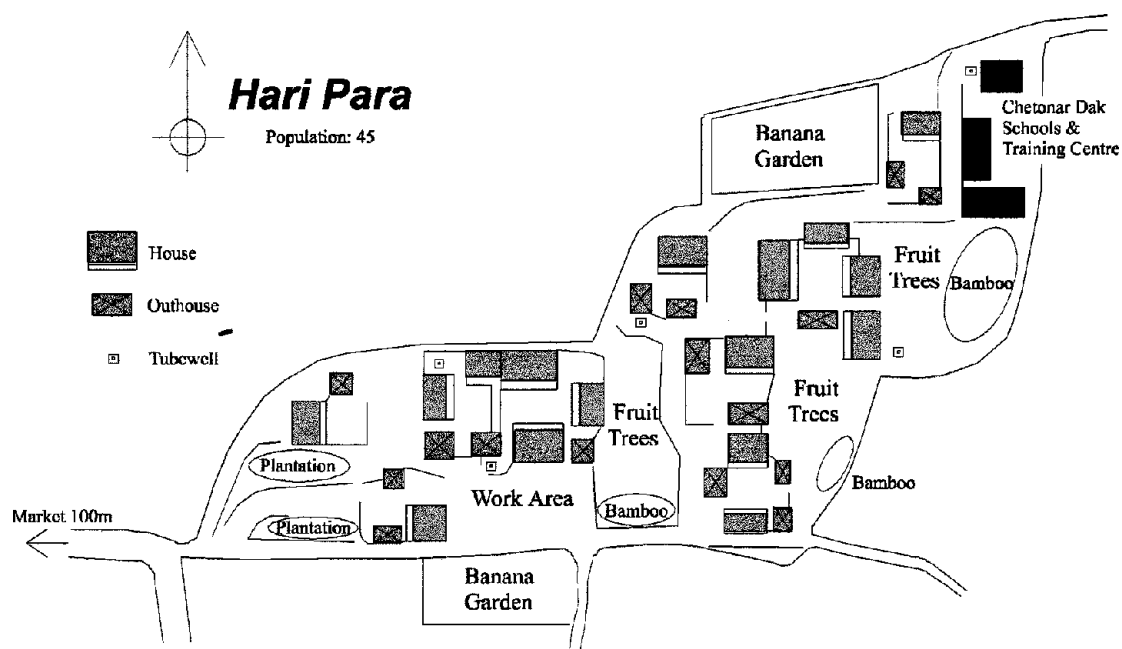


Fig. 2: A typical para in Sundarban village

Each homestead is arranged around a courtyard. The main house is usually a single room about 4m long and 2.5m wide and often south facing (see Appendix A). The homestead will also have a small separate kitchen house and sometimes a cow house or other buildings associated with farming. The courtyard gives the family an area to carry out their day to day activities in private such as husking of cereals and drying of clothes (Sultana 1993). The inside of houses is usually too dark and poorly ventilated for such activities and is reserved more for sleeping and shelter than as a place of work.

A village such as Sundarban is often a fairly artificial administrative unit. Sundarban contains over 100 paras distributed evenly throughout the village. There is no clustering around a central point which is the feature of most European villages. The village blends directly into neighbouring villages as the spread of paras, raised above the low lying agricultural ground, continues in all directions.

### Basic Form of Bengali Housing

The form of Bengali housing has developed over a long period of time as a combination of cultural and climactic response. It is not the purpose of this report to go into this development in detail. Hasan (1985) and Ahmed (1994) chart this development and should be referred to for more than the basic facts outlined below. The Bengali house is an elongated single room raised on a plinth. The plinth raises the house above minor flooding and protects the mud floor of the house from damp. Many plinths have a sand core which helps prevent damp rising. Ahmed suggest that the plinth, which is universal throughout Bangladesh, is not only functional but also represents a "stylistic adaptation to cultural precedence". The elongated form of the house is a response to climactic factors, minimising the absorption of solar radiation. Householders have a preference for hipped rooves (chochala) which have a higher status than gable end rooves (dochala), the latter being usually reserved for outhouses. Many NGOs promote gable end corrugated iron (CI) sheet roofing because it is slightly cheaper than a hipped roof of the same type. This is very prone to the CI sheet being ripped off in cyclones and turned into the infamous "flying saws" for which the roofing material is condemned. Ironically most householders who can afford a CI sheet roof themselves spend slightly more to have the higher status (and safer) hipped roof. Photograph 1 (Appendix B) shows a typical thatched house.

### Building Materials

The vernacular building practice in Bangladesh is not one of time tested methods with well known natural materials. Scarcity of natural materials and the availability of modern materials has forced great change, like many areas of the world "incompatibility between traditional methods and modern materials is the root of the problem" (Hall 1996) of vulnerable housing.

Wall Material	Roof Material
<b>Bamboo frame, with</b>	
* Bamboo mat walls	* Thatched
* mud plaster on bamboo trellis	* Clay tiles
* Layered mud wall	* CI Sheet
* Low grade brick with mud mortar	

The common building materials of domestic housing in Sundarban village are outlined above. Other materials are used in other circumstances. Some shops, for example, have plastic sheeting sandwiched in a bamboo frame as a roof material. This is considered ugly and whilst common in the slums of Dhaka it is not found on housing in the village. Less care is taken over the construction of outhouses and cheap materials such as jute stick may be used. Clay tiles were traditionally manufactured by a certain class of Hindu potters. After partition in 1947 when most of the Hindu population fled to India the craft largely died out. Clay tiles are no longer manufactured in the area but this was one of the last regions for the practice to die out in and their use as a roofing material is still significant. There are some prominent differences between the house building in the Dinajpur / Rangpur region compared to other areas of Bangladesh. One is that it is very rare to see CI sheet used as a walling material, probably due to the general poverty of the region even compared with the rest of Bangladesh. More details of particular building styles of the region are given in the following sections.

### **The Gola Ghor & Cross Bracing**

A fairly common house type in Sundarban village is the gola ghor or "grain house". This is a bamboo framed house which is raised above the ground. The house has a bamboo floor with a mud plaster finish to it and is supported by brick piers. Photograph 2 (Appendix B) shows a gola ghor in Sundarban village.

The gola ghor is designed to protect grain from rats, damp and flooding. It is also considered to offer more security against thieves who could tunnel under the wall of a regular bamboo house. Whilst landlords may have dedicated gola ghors, poorer householders use them both to sleep in and for grain storage. The space under the house is used for storing possessions and the house would also offer some protection against flooding.

Cross bracing has often been suggested as a suitable way of strengthening bamboo framed houses.<sup>3</sup> In practice, however, implementation is often limited as graphically illustrated in Aysan et al. (1995) describing the results of a building improvement programme in Andhra Pradesh, India.

*"While the innovation of cross bracing may well have caused many a jaw to drop, it was never incorporated into the local building pattern. Nine years after the cyclone, a visit to the homes that had been so carefully constructed as a training ground in wind-resistant construction for local builders revealed the sawn off bamboo stumps of the original cross bracing. One home owner confessed that he had no idea what the braces were for and had therefore used the wood years ago as firewood... "*

Throughout the Dinajpur region many gola ghors are cross braced like the one illustrated in Photograph 2. This practice has been widespread for at least 20 years, probably longer. In contrast to hundreds of buildings of this type the author did not see a single regular bamboo house with cross bracing. This illustrates that whilst householders appreciate the function of cross bracing they do not consider it to be necessary for a building where the bamboo posts have foundations.

It is possible that the bracing is only meant to hold the frame together during construction but this does not seem likely. Householders often said that the bracing protected the house from cyclones.

This understanding of cross bracing was used as an approach for teaching about it in a "Building with Bamboo" workshop (qv). The householders knew that if a bamboo framed house had no foundations then cross bracing helped it to survive storm winds. A regular bamboo house typically has its posts founded 1/2 in the ground but it is well known that the part of the post underground is quickly rotted away. Householders were taught that an old bamboo house also has no foundations just like the gola ghor and needs cross bracing for the same reasons.

<sup>3</sup> "Flipchart for strengthening Bengali bamboo housing" - Chisholm (1979) "Wind resistance of non-engineered housing" - Anwar (1996) "The cyclone prone coastal region of the state of Andhra Pradesh - A state government approach" - Shiri & Reddy in Aysan et al. (1995)

## **Thatched Rooves**

The traditional roofing solution of thatching is still prevalent throughout Bangladesh and the house survey presented in Appendix A showed that thatch is the dominant roof type in Sundarban village. Despite the association with poverty, Hall (1988) has pointed out the advantages of a thatched roof with good thermal properties using locally available skills and natural materials. It would be surprising if there was not a hidden complexity to thatching. In Sundarban and surrounding villages there is a variety of thatching materials and methods. In contrast there is only a single type of bamboo thatching frame which is universal throughout the area. Photograph 14 (Appendix B) shows a villager making this type of thatching frame for a verandah.

### **Thatching materials**

1. Rice straw    Lasts 1-2 years\*    Comparative cost 100%

This is the most common thatching material because it is so widely available. It has alternative uses as fodder and fuel. Rice straw is traded in markets whereas the other thatching materials are bought and sold in private deals.

2. Wheat straw    Lasts 2-3 years\*    Comparative cost 60%

Similar to rice straw but slightly better wearing wheat straw is cheaper because it cannot be used as a fodder.

3. Chon grass    Lasts 5-7 years\*    Comparative cost 75%

When available chon grass is a cheap and very long lasting thatching material however it is rarely available because it is a specialised thatching grass and has no food product associated with its growth. It is sometimes grown in riverside areas which are unsuitable for other crops.

4. Sugar cane cover Lasts 5-7 years\*    Comparative cost 150%

Sugar cane is a product grown particularly in the Dinajpur / Rangpur region. The use of sugar cane cover as a thatching material is a fairly recent innovation. It was found to be a durable material but its use took a while to catch on. Sugar cane cover is a broad leaf as opposed to the other materials which are stalks. Once local builders had learned to thatch with a broad leaf it became quite popular

This shows the approximate range of life that can be expected from the thatch. The quality of thatching, roof pitch and thickness of material used affects the life of the roof. The later the thatch is replaced then the greater likelihood that the bamboo thatching frame will need repairing.

The lifetimes and costs of thatching materials are based on interviews with villagers and direct observation. These thatching materials are available at different times of year which can also make a significant difference to the choice of material. It should be noted that IRRI rice straw is unsuitable as a thatching material because it is a short stalked hybrid.

The adoption of sugar cane cover as a common thatching material is an encouraging example of local innovation adapting vernacular techniques to take advantage of an improved building method.

### The Sapra CI Sheet Roof

Although using sugar cane cover is a cheap way of improving the life of a thatched roof there is no doubt that most families aspire to a CI sheet roof. Despite its poor thermal qualities CI sheet is seen as a symbol of affluence. A CI sheet roof is considered permanent, not requiring the constant maintenance of a thatched roof, and the CI sheet itself is also a resaleable commodity in times of hardship. A hipped CI sheet roof would be preferred however it is beyond the means of most of the villagers of Sundarban. An alternative is a sapra CI sheet roof. This is a roof type particular to the region which is a single pitched, almost flat, roof of CI sheeting sandwiched in a lashed bamboo framework (see Fig. 3). This has some of the advantages of a hipped CI sheet roof but is significantly cheaper as outlined below.

- Affluence and permanence associated with CI sheet
- Low maintenance cf. thatched roof (periodic replacement of bamboo frame)
- Uses less CI sheet than a hipped roof
- The bamboo frame is cheaper than the timber frame needed for a hipped roof
- CI sheet is left intact (no piercings for nails, screws etc.)

The last point is critical. Most villagers with a sapra CI sheet roof hope one day to be able to afford the additional CI sheet and timber required to convert it into a hipped roof. If the CI sheet were pierced then it would leak through the old holes when in the new position. For the same reasons the resale value is higher if unpierced, which is a significant factor for those who feel vulnerable and need the security of being able to resell the CI sheet if necessary.

The sapra CI sheet can then be seen as an affordable way to have a relatively low maintenance roof and also a stepping stone towards the "ideal" hipped CI sheet roof. It is however vulnerable to storm winds, particularly if the bamboo frame is old and rotten. Ways of making this roof type less vulnerable were explored by the villagers in a "Roof Construction Workshop" (qv).

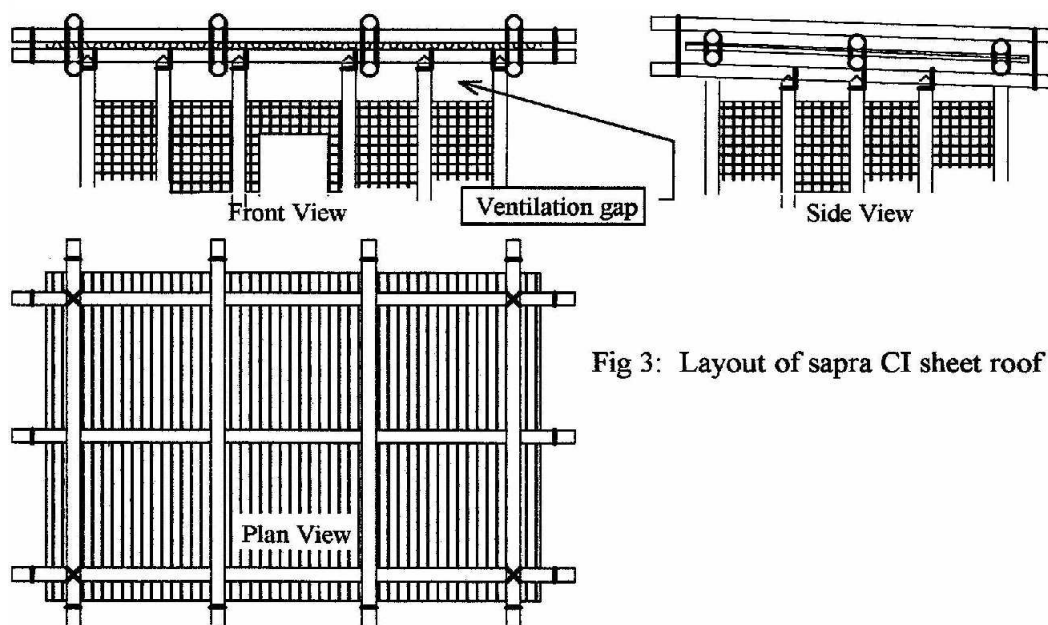
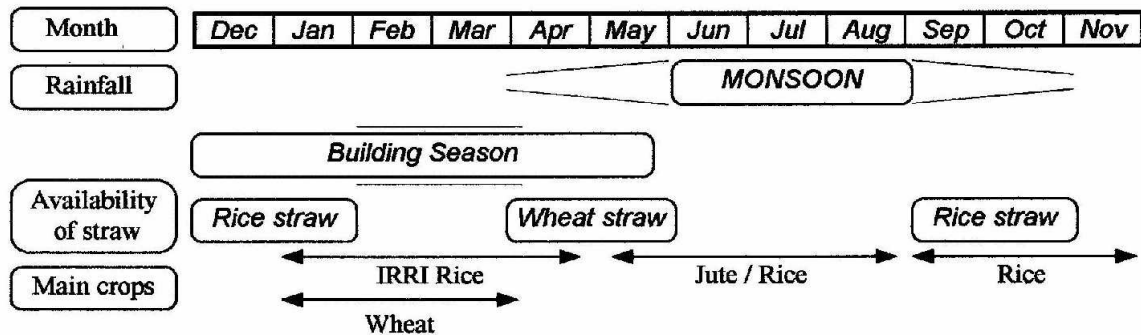


Fig 3: Layout of sapra CI sheet roof

**The Building Season**



**Fig. 4: The building season**

Fig. 4 shows the building season lasting from December to May with most activity going on in the months of February and March. The rains have passed away in September / October and then building activity starts after the harvest of the rice crop in early December. Layered mud walled houses can take over 3 months to build properly so construction must start relatively early if they are to be finished before the rains start to come back in April / May. In February and March there is little agricultural activity between the planting and harvesting of the wheat and IRRI rice so the majority of building of bamboo houses goes on at this time.

**The Role of the Local Builder**

Almost all villagers have some building skills. Building a layered mud wall house or a bamboo framed house is a fairly routine task however roof construction is considered a skilled job. Whilst some villagers build their own house, often hiring a roofing expert, many will hire a local builder. The local builder is a skilled labourer, the design of the house is specified in precise terms by the householder. This relationship is summarised in Flowchart 1. The importance of this relationship to innovation must be understood. It would be of no use to train local builders in a new technique without also communicating to householders the costs and benefits of this technique.

