

Chapter 5

Adapting to Floods: Technical Strategies

According to Sunita Pandit (Piparyia VDC, Sarlahi District) – and this is also valid for most households, “accommodation, houses falling down, cooking food, and health problems, including toilets, are the biggest issues women face during floods.” In order to cope with these issues, people have developed various structural and other technical strategies over the years. The strategies include both short-term and long-term strategies related to house construction and protection measures for walls, elevated stores, drinking water and transportation, and measures taken to divert streams.

Houses

Combining materials for house construction

“Before the 1993 flood, houses were made out of mud and bamboo but now more houses are made of brick. [...] Even people with two-storey houses leave their homes during the rainy season.” (Sunita Pandit, Piparyia VDC, Sarlahi District)

“Since the major 2003 flood more houses have their bases made out of bricks and the rest of the house is still made out of mud.” (Ram Ekbal Yadav, Jhauwa Tole, Bhaisarawa VDC, Makanpur District)



Figure 6: Walls of a local house made out of dried pulse plants, Kaitarait VDC, Dhunusha District

“Why invest in our houses? They will be washed away anyway. We don’t do anything in particular to our houses before the rainy season. Before the 2003 flood we started building brick houses but now we have stopped. We are waiting for the construction of an embankment before we invest in our houses again.” (Ram Kishan Giri, Sukchaina, Laxmipur VDC, Sarlahi District)

Locating houses in safe places

“When we bought this piece of land [where the house has been built] it was already like a pond without water. The land here was even at a lower level than the road. We knew that the place was vulnerable to floods but we already had a little bit of land here and the land was cheap too.” (Eklas Devi Yadav and Manaki Devi Yadav, Katarait VDC, Dhanusha District)

Raising the house plinths

“We don’t build houses on elevated wooden pillars because of the scarcity of land and because it requires a specific type of wood which is expensive. Most people elevate the foundations of their houses by building them on the top of one layer of mud. It is quite labour intensive because you have to transport lots of mud.” (Raj Jumar Yadav and Ram Ratan Yadav, Deuri VDC, Dhanusha District)

“We raised our house after the 2003 flood, the biggest flood in the last 10 years.” (Eklas Devi Yadav and Manaki Devi Yadav, Katarait VDC, Dhanusha District)



Figure 7: Old (left) and new elevated house (right) after the major 2003 flood, Katarait VDC, Dhanusha District

“Before the big flood in 2003, our house was at ground level. After that event, we raised the foundation of our house like this with two levels of mud. One of my sons, who works in Saudi Arabia, got the idea. He didn’t see this kind of house anywhere else but the flood is coming on and on in this village, so from our own experience we thought that building two layers would be best. There is only one house like this in the village. Many people would like to have the same type of house but they cannot afford it. This house is much more expensive than others because it requires a lot of labour. In total, it took two years and one month to build it, whereas a normal house



Figure 8: Mud house with two elevated mud plinths (see arrows), Katarait VDC, Dhanusha District

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takes about 15 days to one month of labour. The first step is to construct the first elevated layer or ground base. This ground base is made out of mud and the outside layer only is a mixture of mud and rice or wheat by-product. It is then left for one year so that it becomes compact and solid. Then the second elevated layer is built. After another year we finished the house in about one month. If you have your own wood, this type of house will cost about 60-70,000 NRs, if not, then it can cost around 100,000 NRs."* (Dakhani Devi Yadav, 70, Katarait VDC, Dhanusha District)

"We don't have enough money to raise our houses! If we had money we would try to make good homes, raised above ground level, and made out of bricks, and we would try to get involved in business." (Women group discussion, Bin community, Deuri, Dhanusha District)

"The plinths of our houses used to be raised on a mud platform, but you cannot notice it now because the flood has released some new sediment which covered our elevated plinths. The ground level is rising constantly because of the sediment deposited by the floods so that every year our houses will need to be raised according to the new level!" (Belhi village, Sarlahi District)

"We don't raise our houses because we feel safe now with the embankment." (Shreepur VDC, Sarlahi District)

* In 2006, US\$ 1 = 73.60 Nepali Rupees (NRs)

Comments on houses

Families adjust their houses to floods differently according to their perception of floods (e.g., the creation of an embankment may create a feeling of safety and therefore influence how people build their houses) and their socioeconomic status. Commonly, houses are made of mud and bamboo, and sometimes a combination of mud, bamboo and the stalks of a local pulse plant. Less often houses are made of mud, bamboo, and wood. Mud walls generally need to be replaced every year in flood-affected areas. Most of the roofs are made of straw or tiles. Some people strengthen and protect the wall foundations using mud or bamboo fences (which also protect against cattle), and many put wood, plants, straw, or mud in front of the house to prevent water seeping in. In some places people use beams to support walls in the rainy season.

Nowadays, wealthier households build brick houses, as they are considered safer than mud houses. Some with less money build the foundations with bricks and the rest out of mud. In many cases, people have realised that their homes are not in a safe place but they cannot afford to construct better homes and/or to buy land in a safer area. People understand that raising the level of their plinths can protect them from floods. However, even an apparently simple measure such as elevating the plinths is not affordable for every household.



Figure 9: Strengthening and protecting walls and wall foundations: a) foundations protected with piled up mud, Katarait VDC, Dhanusha District; b) foundations protected with a bamboo fence and mud, Katarait VDC, Dhanusha District; c) wall made of bamboo, mud, and dried pulse plants supported by a wooden beam, Seurai VDC, Dhanusha District



Figure 10: Mud house with brick plinths, Bhaisarawa VDC, Rautahat District



Figure 11: Elevated brick house, Katarait VDC, Dhanusha District

The Snake and the River Don't Run Straight

Storage

Three major types of local, indigenous structure are used to store food and keep other important belongings like land and citizenship documents, clothes, and gold in places elevated above the normal flood level. They are grain stores, locally called ‘kothali’ or ‘berhi’ in Maithali or ‘bhakari’ in Nepali; multipurpose platforms, locally called ‘machan’; and circular mud-made repositories, locally called ‘chakka’ (which means wheel or circular object in Maithali and Nepali). These structures can also be found in many non flood-prone villages, because they are traditional structures built for different protective reasons. Elevated grain stores, for example, are made not just for floods but for air circulation to prevent rot and to control insects and other vermin. In flood-prone areas, they contribute indirectly to flood preparedness. In some cases, villagers mentioned that slight modifications in design have been added with specific adaptations to the rise in water levels following the last exceptional flood event.

Grain store (‘kothali’)

Households can build various types of grain store depending upon their assets to ensure their food security on a yearly basis – including during difficult times such as the flood season. The number and size of grain stores indicate the wealth of the household and are examples of great economic disparity. A kothali is a store erected on posts with the main opening at the top and, in some cases, a smaller opening on the side.

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Figure 12: Elevated grain stores, Bhaisarawa VDC, Rautahat District

Different materials are used to build the store (bamboo, mud, or a mixture of bamboo and mud) and the posts (mud or wooden pillars, or more rarely a brick platform). The shape of the store can vary (round or rectangular), as well as its size and location (small ‘kothali’ are kept inside whereas large ‘kothali’ are built outside the house and have thatched roofs or, less commonly, a corrugated iron roof). In some cases, grain is also stored in a slightly elevated closed wooden room in the house itself.

“Our grain stores are traditional and have always been the same. They are always slightly elevated from the ground



Figure 13: Different types of grain store: a) Outside grain store with a brick base, Phoolparasi VDC, Sarlahi District; b) grain store made of bamboo inside a house, Singyahi VDC, Mohattari District; c) grain store made of mud and poles inside a house, Singyahi VDC, Mohattari District

against water or humidity and animals like mice and rats. After the major 2003 flood, people started to increase the elevation [of grain stores] a little bit more.” (Ram Erkal Yadav, Jhauwa Tole, Bhaisarawa VDC, Makwanpur District)

“The person who has land also has food stores!” (Pipariya VDC, Sarlahi District)

Multipurpose platform (machan)

‘Machan’, or platforms, are commonly used in the region. They vary in terms of the nature and quality of materials used (e.g., different types of bamboo or wood), the size and elevation of the platform (it varies according to the purpose and the household income), its location (e.g., inside and/or outside the house, or inside the kitchen; and sometimes it can take up the entire house), its purpose (e.g., used as a watch tower to guard against wildlife in the fields, used to store straw for cattle and firewood, used to keep small cattle and other belongings safe, used as a place to sit above the water, used for cooking during floods), and its lifetime (some machan are only built temporarily before the rainy season, in other cases they are built permanently as part of the house, furniture, and set up). In some cases, beds are placed on top of one another to serve as a temporary machan. Generally, the heights of machan tell stories about the level of previous floods and as such indicate the perceived safe heights in different places.



Figure 14: Bamboo machans outside a house in Rautahat District (top) and inside a kitchen in Dhanusha District (bottom)



Figure 15: Big wooden machan inside a house, Phoolparasi VDC, Sarlahi District.

“We construct machan before the rainy season so that people can sit above the water. The maximum that people waited here on the machan was 10 hrs” [this place is a little more elevated than other places in the village – Author]. Piparyia VDC, Sarlahi District)

“During the flood, by covering the machan with mud, we can cook food there.” (Sushila Mahto, Shreepur VDC, Sarlahi District)

“During floods we stay in the machan, we don’t leave the house. A machan is expensive and people may have to borrow money to buy bamboo or wood. Everybody can build a machan. Specific skills are not required but good, strong machan like this one are built by carpenters from outside [the village] with strong wood.” (Ram Kishan Giri, Sukchaina, Laxmipur VDC, Sarlahi District)

“Machan are not always safe!” (Belhi village, Sarlahi District)

“Fifty-two years ago we had a flood that brought a hailstorm in May. It was not raining here, but it was raining in the mountains. People used to watch their crops day and night (taking turns) against wildlife from machan made out of bamboo (15-20 feet). Fifty-two years ago, my grandfather was at the top of the machan and the flood came with hail and sleet, so my father gave a signal. Three people climbed up the machan. The river at the time was 25-30 metres away from the machan.

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The flood came and broke down the machan and four or five people were washed away. Only one person survived because someone pulled down a bamboo to save him. Everybody in the village knows this story.” (Ram Ekbal, 52, Dalit, Pipariya VDC, Sarlahi District

“I had a machan (a large one in the house) but it has been washed away so now I think that it is not the proper way. Plus I have other alternatives; I go to the school. I don’t want to take risks. However, before the rainy season starts I build a machan in case a flood comes suddenly. I also build machan in safe places like at the school or at the VDC office, to store feed



Figures 16: Decorated walls of a house in Mohattari District

for my cattle.” (Ram Chandra Sah, landowner and politician, Laxmipur VDC, Sukchaina, Sarlahi District)

“Machan are safe during normal floods.” (Women’s group discussion, Bin community, Laxmipur, Sukchaina)

Circular mud repository (chakka)

Chakka are circular mud repositories built around the main wooden pillar(s) of a house at around one and a half metres above ground level. In most cases, the repository forms a circular plate-like object. Small items can be kept there safe from children’s hands and away from water. These mud-made



Figure 17: Small ‘chakka’ outside a house in Katarait VDC



Figure 18: 'Chakka' with an unusual 'pigeon hole' design, Katarait VDC, Dhanusha District.

repositories also provide alternative storage in areas where there is not enough wood available to build a machan or other storage unit. Chakka also serve as decoration (most houses in Maithali villages are decorated with drawings and paintings and relief). In some households, small chakka are also made around small wooden pillars outside and these also give additional storage space for general use and during floods in particular. Hanging baskets kept outside can also be used to store food and small belongings safely.

"This is a traditional Maithali structure and is not found in every house. Only old women know how to make it. A chakka takes 15 days to make. First, the woman has to collect mud and mix it with water and rice husks and straw. If mud is not available close to the house, the men help her collect it. [In the Maithali culture, women mainly stay at home and are responsible for all indoor activities – Author] The mixture is then applied to a main wooden pillar inside the house. On the first day, the base of the repository is built on the wooden pillar and is then left to dry for one day. During the following days, additional layers are added one after another as each layer dries." (Eklas Devi Yadav and Manaki Devi Yadav, Katarait VDC, Dhanusha District)

"Nowadays, people prefer to use cement rather than wooden pillars because it is stronger and easier to build. [...] It is not possible to make chakka in houses with cement pillars." (Dakhani Devi Yadav, Katarait VDC, Dhanusha District)

Stream control, drinking water, and transportation

“Four months ago we built another stream channel with a tractor to limit bank erosion and protect our fields, but it did not work out, it did not divert the water.” (Jivachha Yadav and Pupalal Yadav, Singyahi VDC, Mahottari District)

“A few years ago, we used to make embankments using plastic sand bags. Now PRERANA [a local NGO] in consultation with the elders of the villages came up with the idea of making embankments using local materials. Vertical bamboo is planted into the river [which is] filled up with sand. At the top of the embankment, grass is planted to consolidate it.” (Ram Prasad, VDC President, Phoolparasi, Sarlahi district, Action Aid)



Figure 19: Embankment made out of bamboo constructed by a local NGO using local knowledge and local material. Phoolparasi VDC, Sarlahi District

“Since people on the other side of the river built an embankment, the stream has shifted from their place to ours!” (Shreepur VDC, Sarlahi District)

Stream control and diversion are limited at the local level. Local embankments and other attempts to change the course of the river may simply displace the problem to another area. Local embankments are also limited because of the lack of male labour and poor availability of bamboo.

Access to drinking water is another key issue. All the villages have manual water pumps, most built with government funds and others by NGOs or on a private basis. Access to and benefit from the water pumps varies within the village from household



Figure 20: Water pump raised on a mud and brick platform, Katarait VDC, Dhanusha District

to household. In some cases, the water pumps are built higher up from the surrounding area in safe places. In other cases, the water pump is flooded for a few days. Sometimes, the villagers raise the water pumps with mud or with bricks after a major flood event. Some water pumps that used to be raised cannot be used anymore during floods because the sediments brought by floods regularly raise the ground level.

Transportation of goods and movement, in general, are major issues during floods, hampering access to food and health facilities among other things. Some villages can stay completely isolated for a few days or weeks; at times villages are surrounded by streams.



Figure 21: Boat built with local materials (wood, bamboo, and metal containers) to cross the Jamuni River during the flood period. Note a shrine (temple) in the background. (Deuri VDC, Dhanusha District)

Box 4: Did you ask? Technical adjustment strategies

House construction and location – Why do people build their houses in vulnerable places? Is it because of lack of knowledge or lack of options? What are the main obstacles people face in building their houses in safe places?

Food storage – How do people store food, especially for the rainy season? When do they start storing food? Where? What kind of food? For how many days or months can they rely on the food stores?

Multipurpose platforms – What do people use to keep themselves and their small livestock above the water and to store important belongings during floods? Who knows how to build these platforms? What materials are required and how much do they cost?

Stream control, drinking water and transportation – What are people doing at the community level to control the stream? Are they building embankments as a community? How do people get drinking water during floods? What are they doing in advance to secure access to drinking water? How did people manage to move outside the village during previous floods?