The Impact of Extreme Flooding of the Okavango River on the Livelihood of the *molapo* Farming Community of Tubu village, Ngamiland Sub-district, Botswana

By Lapologang Magole[1] and Kebonyemodisa Thapelo[2]

Abstract

This paper presents the results of a study carried out on the impact of the recent (2004) severe flooding of the Okavango River on the livelihood of the *molapo* (flood recession) farming community of Tubu village in Ngamiland sub-district. Government and NGO disaster relief organisations responded to the floods in panic and desperation while affected communities appeared calm and laid-back. To the extent that they (communities) refused to evacuate flood plains and island settlements to make way for the considerably high and potentially dangerous flood of 2004; the communities' reaction was surprising as the floods were so severe upstream, that they caused damage to property, threatened lives and reduced yields significantly. However, studying the farming community of Tubu revealed that community members have other considerations which make them perceive the inherent risk differently from outsiders.

Communities view flooding (whether severe or normal) more as part of the biodiversity production system and a source of livelihood than a destructive force. It was found regarding *molapo* farming that, first, even under hazardous flooding conditions crop yields are still better compared to those under alternative dryland farming. Secondly, destructive floods occur at 10- to 20-year intervals, making the gamble worthwhile because over time the flood-related benefits outweigh the risks. Thirdly, because the *molapo* farming communities are poor, other sources of livelihood are not adequately developed to take over from *molapo* farming. Fourth, the system has evolved into an old tradition which the farmers are not willing to part with. Hence the farmers are adamant that abandoning the production system is not, as yet, an option for them.

Introduction

Botswana's environmental challenges of poor soil fertility, low levels of rainfall and recurring droughts create risky farming conditions for arable farmers. Most ploughing seasons end in failed crops or very low yields. However, farmers in Ngamiland sub-district have an alternative system of arable production which appears to deal with these constraints - *molapo* (flood recession) farming. The yearly flood of the Okavango River brings with it nutrient-rich soil and some form of natural irrigation. Despite this advantaged position, the farmers are faced with challenges from inconsistent floods (too severe or too small, too late or too early); crop damage from pests, livestock and wild animals; and institutional issues pertaining to land management. Of these, flood issues are the most important for the community of Tubu and other *molapo* farmers in the sub-district. In particular extreme flooding, which is the main focus of this paper, often poses a problem for the farmers.

The Okavango River originates from the Angolan highlands and enters Botswana in the northwest, at Mohembo village. The annual flood of the Okavango River and Delta (see Figure

1. Research Fellow, University of Botswana, Harry Openhiemer Okavango Research Center, magolel@mopipi.ub.bw
2. Year 4 Sociology Student, University of Botswana.

1 below) is the background for the distinction between dryland fields and *molapo* fields in Ngamiland (ADN Technical Report No. 1 1981). It is important to note from Figure 1 that since the early 1970s the volume of flood appears to be on the decline. Severe floods (as indicated by the peak values) also appear to occur less frequently than they used to. This has a bearing on comparative flood-related benefits and risks.

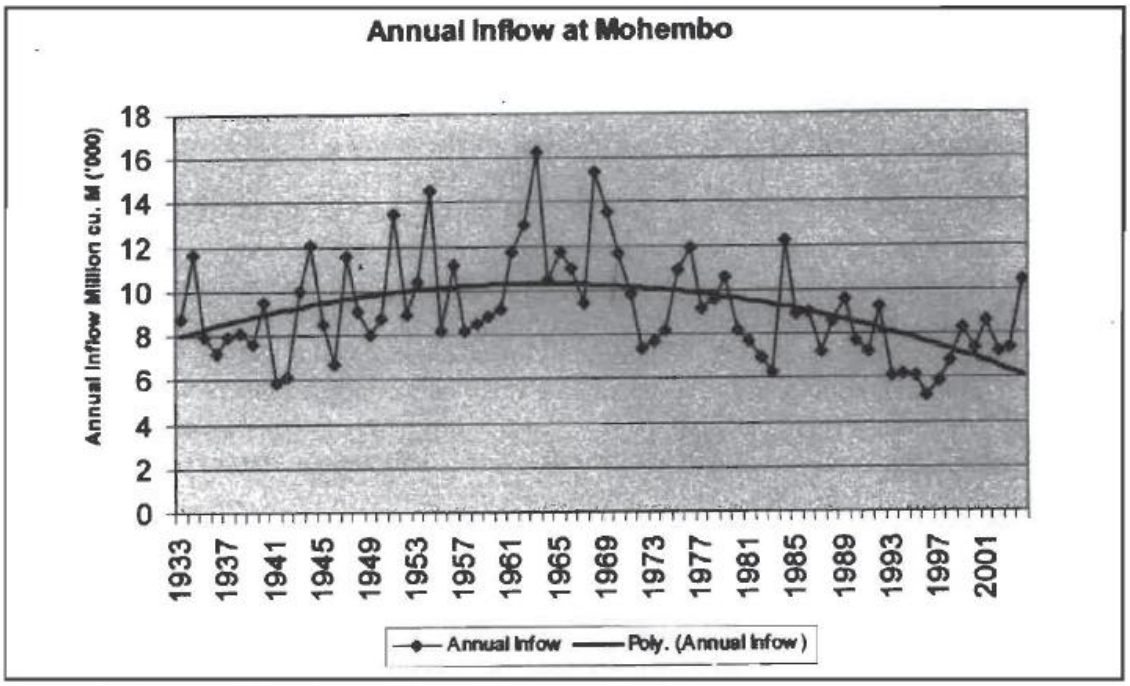

Figure 1: Okavango River Annual Water Inflow at Mohembo.

This paper presents and discusses the results of a study which investigated the extent to which extreme flooding of channels of the Okavango River poses a livelihood 'risk' for *molapo* farming communities of Ngamiland sub-district. Using the recent events of the 2004 flood-plain ploughing season, which was characterised by earlier and heavier than expected flooding, the article will assess the loss suffered by the farmers and find out whether there are any alternative livelihood sources which present an effective coping strategy for the affected communities.

Primary data for the study was collected using a questionnaire of closed and open-ended questions. The research tool was used to conduct structured and semi-structured interviews with respondents. Initially, semi-structured interviews were held with key informants. These included the *Kgosi* (Chief) of Tubu village, Village Development Committee (VDC) Chairperson, Chairperson of the Farmers' Committee, village elders, and the Agricultural Demonstrator (AD) and other extension workers in the village. These individuals provided insights into *molapo* farming and other sources of livelihood in the village. They also facilitated access to *molapo* farming households by making introductions where possible. At household level the head of the household or their representative was interviewed.

Altogether 50 households were studied, representing about 33% of the total 154 households as enumerated in the 2001 National Census. The first household was chosen randomly, while the subsequent ones were chosen in a systematic manner where every third household was studied. The systematic sampling method was seen to be relevant as, according to infor-

mation from the AD, all households in Tubu practice *molapo* farming. The sampling aim was to attain full geographical coverage of the area and interview people from across the whole socio-economic spectrum. Secondary data was obtained through a review of government publications and reports, other studies and newspapers.

The Concept of 'Flood'

Often when flowing water is termed 'flood', danger or disaster is implied. Indeed floods have been associated with huge economic loses, disruption and loss of people's lives (see Wisner *et al*, 2004; Tobin and Montz, 1997; and Smith, 1991). Wisner *et al* (2004:202) submit that floods accounted for the largest share of economic loses and fatalities from all natural hazards experienced in the late 1980s and throughout the 1990s. Smith (1991:259) wrote that floods are 'the most common of all environmental hazards.' Furthermore, it would appear that destructive floods have become increasingly frequent and serious, with severe flooding reported every year in parts of Asia and Africa. It is in this context that the 'fear' of floods is justified. However, in other areas, especially in wetland areas such as deltas which do not depend on local precipitation, but get flooded by waters rolling down from headstreams in other areas, floods are a 'normal and an essential component of agricultural and ecological systems' (Wisner *et al*, 2004:202). According to Smith (1991:260), 'more than any other environmental hazard, floods bring befits as well as loses'. Kundzewicz *et al* (2002:264) argues that they 'are a natural phenomena that have always existed, and people have tried to use them to advantage to the extent possible.'

Along the flooding river and downstream delta wetlands, such as those created by the Nile, Niger and Okavango Rivers, floods are critical for maintaining and restoring many of the important services provided to humans by wetland ecosystems. Flood-associated benefits, according to Wisner *et al* (2004:205), include the provision of critical habitat for fish, waterfowl and wildlife; maintenance of high levels of plant and animal diversity; replenishment of agricultural soil nutrients; and transporting sediments which maintain downstream deltas and coastal areas. These flooding areas have for a long time attracted farming, fishing and hunting communities; and of late tourism ventures. Agriculture benefits from the more fertile soils with improved moisture retention; fishing opportunities are enhanced by nutrient-rich waters brought to ponds, lakes, lagoons and river channels; while tourism is attracted by the scenic beauty of the unique water feature as well as the rich variety of the flora and fauna found in the area.

Unlike flash floods associated with tropical cyclones and storms, these floods are usually expected at a certain time. As argued by Wisner *et al* (2004:205), these types of floods amount to 'known risk', implying that a certain level of preparedness is possible. However, experience shows that floods have a wide range of frequency, intensity and duration, characteristics which complicate prediction and preparedness. Thus, even those floods which are beneficial under normal circumstances are potentially dangerous. This ambiguous character means that there is always the risk of disruption of people's lives, loss of livelihood, damage to property, general human suffering and even death.

This paper concentrates on the risk of loss of livelihood through extreme flooding. As noted in the introduction, arable agriculture is a very risky sector, mainly because of the unreliable hydrological systems on which it depends. The problem is exacerbated by the fact that this production sector and source of livelihood is very popular with communities across Botswana, which are often prepared to take the risk of investing their limited resources in it.

Understanding the Risks of Arable Production in Botswana

Against all odds, most communities in rural Botswana have stuck to agricultural production as their main source of livelihood, employment and income. Due to an extremely variable hydrological system, agricultural production, especially arable production, is viewed as a high risk sector. However, even in the desert area of Kgalagadi North sub-district, where only a maximum of 300mm of rain is received per year, farmers in Tshane village ranked arable agriculture as their number one source of livelihood, followed by livestock production (Magole, 1998). They stated that while only a few households own livestock (especially cattle), most own fields and do plough when it rains. In nearby Lehututu village, agriculture also ranked high, with livestock production taking the number one spot followed by arable production (Magole, 1997). This seemingly risk-taking behaviour may appear irrational. Kostov and Lingard (2003:464), however, argue that '...in the face of sheer uncertainty rational human action, and particularly economic action, is not possible'. They further argue that risk is a consequence of control - it is related to our desire to control the natural environment. Thus, what is perceived as risk depends upon the values held by individuals or groups. The institutionalised notion of risk, or whatever is perceived as risk by formal institutions, is related to the provision of security. According to Kostov and Lingard (2003: 465), security is 'a way of avoiding some risks and accepting others in order to achieve desirable outcomes'. This definition of security may be split between formal institutions and rural communities' views of risk. While institutions may stress the idea of avoiding risk, communities may prefer to accept some risk in order to achieve desirable outcomes. The two approaches were demonstrated in Ngamiland sub-district during the 2004 floods of the Okavango River. As stated earlier, government officials pleaded with communities to move from potentially dangerous areas ahead of the flood which had already devastated up-stream communities. Communities refused to move, preferring instead to 'wait and see'.

Nowhere in Botswana has agricultural production proven to be as risky as it is in Ngamiland. Risks range from livestock diseases, predation, floods, drought and destruction of crops by wild and domestic animals. However, before the outbreak of the cattle lung disease in Ngamiland sub-district and the consequent cattle cull, communities ranked livestock production as their number one source of livelihood, followed by arable agriculture (Fidzani *et al*, 1999). The surprise here was that government assistance did not make the list of the ten most important sources of livelihoods. However, the ranking changed dramatically a year after the cull (1997): arable agriculture maintained the top spot (Bendsen, 2002; Fidzani *et al*, 1999), but was this time followed by wages and government assistance (Fidzani *et al*, 1999). It appears, however, that by the year 2000 livestock rearing had made a comeback and formed, together with arable agriculture, the two most important sources of livelihood in the sub-district (Scott Wilson, 2000, Vol. 6). According to Mbaiwa and Rantsudu (2003), even *Basarwa* communities of Gudigwa, who are traditionally hunter-gatherers, are increasingly taking up arable and livestock production. It may be assumed, therefore, that agricultural production, especially arable agriculture, is - at least at the moment - a popular source of livelihood in Ngamiland.

Livelihood Dynamics in Ngamiland

In the past, most communities of Ngamiland were almost completely dependent on subsistence agriculture (Ngamiland District CSDA; 1993). Today people have to some extent been successful in reducing their dependence on this sector by commercialising some non-agricultural activities. As a result, the majority of people in Ngamiland maintain a diversified income

generation system as a means of reducing risks in a variable hydrological environment. The main economic activities in the sub-district are rainfed and flood recession cultivation (*molapo* farming), livestock rearing, fishing, hunting, gathering of veld products, small scale commercial enterprises like the production and sale of crafts, sales of natural resources (firewood, thatching grass, reeds, building poles), local food and beverages, wage labour in the tourism industry, and formal employment in the government and the private sector (Bensen, 2002).

It is clear that even today natural resources, which in this area (Ngamiland) depend on the Okavango River flood regime, are still the most important sources of livelihood. Any problems therefore with the flooding system will present a major upset to the livelihood strategy of the people.

Arable Farming in Ngamiland: Dry Land Farming vs. *molapo* Farming

As shown in the preceding section, arable agriculture became one of the major alternative sources of livelihood for the majority of people of Ngamiland after the 1996 cattle cull. Thus, despite the limited potential for crop production and the high risks, the majority of households in Ngamiland are involved in crop production. About 66% of the agricultural holdings in the district plant crops (Agricultural Statistics Unit 1968-2002). The people of Ngamiland practice two types of arable farming - dryland and *molapo* farming.

Dryland farming is the predominant farming system which is independent of the floods. It is practiced only during the rainy seasons (rainfed), mainly by the Hambukushu and Batawana farmers. The fields are normally cultivated in summer (December-February) and harvested in autumn (March-May). According to a land use assessment carried out by the Harry Openheimer Okavango Research Centre (HOORC) in cooperation with the University of Sachsen Anhalt, using the most recent remote sensing material, the total area cleared for cultivation in Ngamiland amounts to 48,900 ha. Out of this, 75% are dryland fields and 25% of the lands are *molapo* fields.

Molapo cultivation is a traditional farming system which is mostly practiced by farmers living along the fringes of the Okavango Delta. The cultivation takes place in the seasonally-inundated areas of the Okavango Delta (ADN Technical Report No. 2; 1982/84:35). *Molapo* is a local term coined to refer to the seasonally flooded plains. When there are no floods, the *molapo* fields rely on rainwater for cultivation, switching despite their location to dryland farming. Floods reach the Delta late autumn (about April) and recede just before the start of the rainfall season (about August). Planting on the *molapo* is done early following the receding flood waters. *Molapo* cropping is less risky as the residual flood water in the soil acts as a supply of moisture against seasons of either low or poorly distributed rainfall. There is also no need for destumping. The floods retreat before the beginning of the rains, allowing for early planting of crops with high yield potential like maize.

Soils in the *molapo* are favoured over dryland soils because of their higher inherent fertility and their larger capacity for soil moisture storage (Stockhardt, 1978). Sediment deposits are largely responsible for the high nutrient content of the floodplains, which means the crops do well and high yields can be obtained. According to Bendsen (2002:8), 'yields in the fertile *molapo* areas are generally higher than in the dry land'. She submits that under rain-fed conditions, 500kg/ha sorghum could be obtained, while under optimal flooding conditions 1800kg/ha-2900kg/ha sorghum have been recorded.

A variety of crops are cultivated in the floodplains. According to ADN Report No. 5 (1988), the most favoured crop is maize which is planted in about 80-90% of the fields. Other

crops are sorghum, groundnuts, beans, melons, pumpkins and sweet reed. The crops are mostly grown in a system of 'mixed cropping', where seeds of different kinds are sown in a mixture on untilled soil and then ploughed under with a mouldboard plough (ADN Technical Report No. 1, 1981).

Farmers in Ngamiland often choose one or the other of the two arable farming systems, rarely do they choose to combine them. However, the choice of one or the other, or a combination of the two, depends on the predominant farming system in a given area (see Table 1 below, showing the distribution of fields among the farming systems in the four land areas of Matsaudi, Makakung, Danega and Xaoga). A small proportion (10%) of farmers consulted at Tubu indicated that although they cultivated in the *molapo*, they maintained dryland fields. These fields are not cultivated every year due to problems of unreliable or scarce rainfall, but are kept because of the security of the title.

Table 1. The distribution of fields among the farming systems in four lands areas of Matsaudi Makakung, Danega and Xaoga.

Village	Dryland Field Only	Molapo FieldOnly	Dryland and Molapo
Matsaudi	15	14	8
Makakung	33	5	1
Danega	0	39	0
Xaoga	40	0	0

Source: Adapted from ADN Tech Report No.1; 1982/84.

According to the ADN Technical Report No. 2 (1982/84), *molapo* farms can be divided into two categories, namely wet and dry *molapo*. Wet *molapo* receives moisture either from the rising ground water table or from flooding, and can be cultivated independently of rainfall. Dry *molapo* on the other hand is on areas no longer receiving water from the flood, and are similar to the dry land areas in that they are dependent on rainfall.

The Case of *Molapo* Farming in Tubu

A study was carried out in June 2004 in the Tubu area in order to find out the impacts of heavy and early flooding on *molapo* farming and on the livelihood of *molapo* farmers. The Tubu area (Figure 2) is one of the places on the fringes of the Okavango Delta where flood plain cultivation is very popular, hence it was one of the areas adversely affected by the recent floods (February 2004). According to the Disaster Report of 20 March 2004, fields in Tubu were either partially or completely submerged under water. Standing crop was spoilt, negatively affecting yields.

According to the 2001 Population and Housing Census report, the population of Tubu village stands at 754 people residing in 154 households. According to the Agricultural Demonstrator (AD) responsible for the Tubu farming extension area, all the households in Tubu area practice *molapo* farming. Therefore a random sample of 50 households, representing 33% of the households, was chosen to be interviewed and studied.

The main sources of livelihood in Tubu are *molapo* farming, livestock rearing, the collection and sale of thatching grass and reeds, beer brewing, the production and sale of crafts,

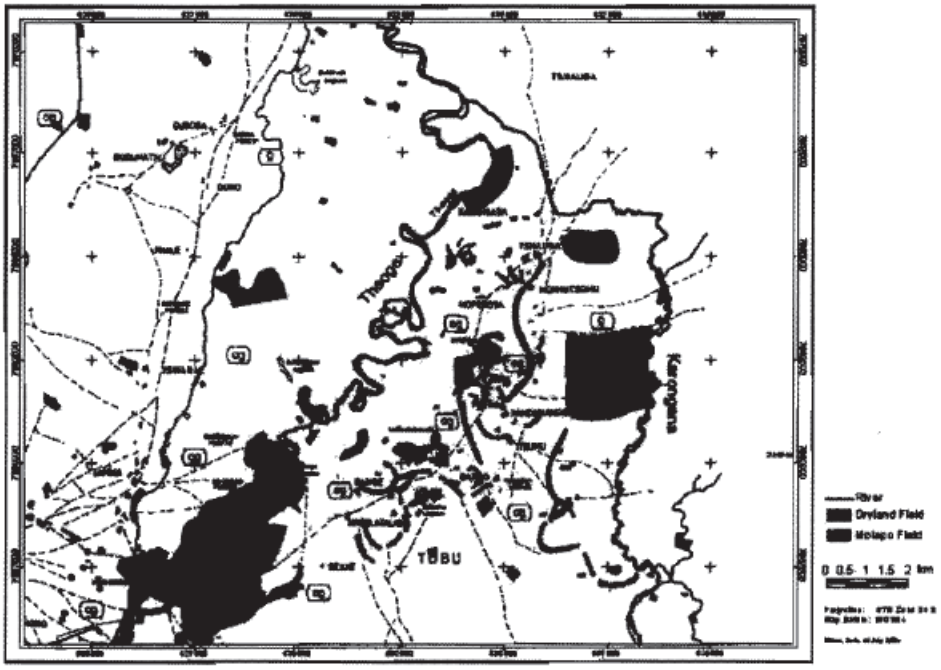

Figure 2: Molapo fields in the Tubu area.

and fishing. Of these economic activities, *molapo* farming, livestock rearing and disaster relief were the most popular livelihood sources at the time of the study (Figure 3). Disaster relief, which by nature is a temporary measure probably made the list because severe floods had just struck the area.

From interviews with the farming households it is clear that *molapo* farming is a long standing traditional activity of the Bayei ethnic group. A majority (98%) of the respondents indicated that their families have practiced the farming system for many generations. As a result most of the fields (94%) are inherited, while a few were recently self-allocated. It may be assumed from this that not much more land is put under this arable production system over time. According to Kgathi *et al* (2004), recent surveys for 1997 and 1998 have shown that the propor-

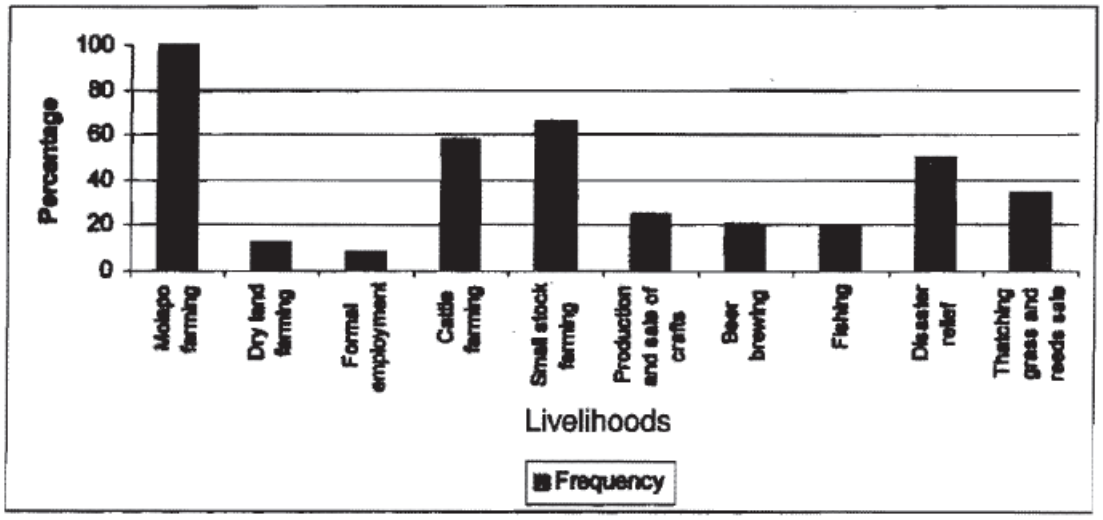

Figure 3: Sources of livelihood in Tubu, June 2004.

tion of farmers who practiced *molapo* farming in Ngamiland were 27% and 16% respectively. This appears to indicate a decline of the farming system in the sub-district at large. There could be several reasons for that. First of all this could be a sign of the district-wide or even the country-wide decline in arable production due to availability of other livelihood options, especially drought relief and other wage employment. Secondly, Land Boards do not allocate *molapo* fields, but simply respect traditional rights to the extent that they even tolerate self allocations. However, the fact that the *molapo* farmers do not hold formal title to the land may act as a disincentive for this farming system.

Furthermore, the required inputs may act as an impediment for poor and female-headed households. Draught power, labour, farm implements such as ploughs and hoes are among the inputs required. According to the farmers, flood-plain soils are heavier than those in dryland areas, hence draught power requirements are high (about 8-10 donkeys are required to pull a plough). Those who do not have draught power (mostly the female-headed households) have to hire draught power from neighbours. Usually these households have limited cash as well and end up cultivating fewer hectares of land and harvesting less than their male counterparts.

As shown in Figure 4, the vast majority of the farmers who were interviewed (86%) indicated that soil fertility and favourable moisture considerations in the flood plains were the main motivations to take up this farming system. These results correspond to those of Stockhardt (1978) and Bendsen (2002). According to these authors, higher yields are realised under *molapo* than under dryland production. Furthermore, ploughing and harvesting are done early. Some farmers claim that by January they are already harvesting crops like maize and melons. *Molapo* farmers may therefore take advantage of the still 'quiet' market and sell their produce at higher prices.

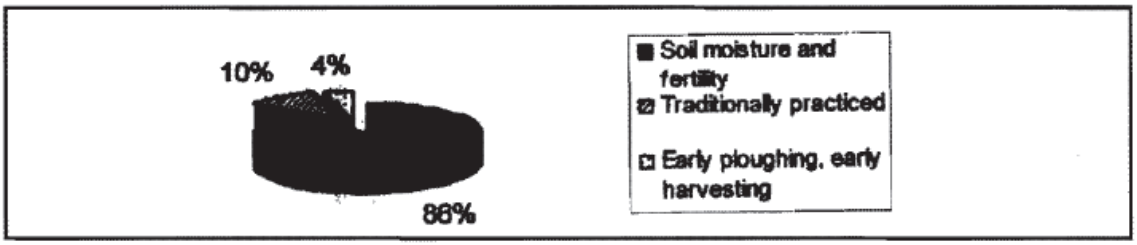

Figure 4. Reasons for *molapo* cultivation.

The Impact of Extreme Flooding on *molapo* Farming in the Tubu Area

Under 'normal' circumstances the flood from the Angolan highlands arrives in Tubu in the autumn or early winter (April-May), and recedes in spring (August-September). Farmers start to cultivate their fields as soon as the flood recedes. Cultivation starts at the edges of the flood-plain and moves towards the centre of the channel following the flood as it recedes. Flooding is therefore valuable to *molapo* farmers as it brings the moisture necessary for cultivation.

However, unusually early and heavy floods pose a problem to *molapo* farmers. In the past 20 years two such floods were experienced, in 1984 and in the recent flood season of 2004. In both cases *molapo* fields were flooded just before harvest time, causing grave damage to standing crops and adversely affecting yields. Sometimes there is a second flood, caused by excessive local rainfall during the summer season (November-January) resulting in higher surface water levels. Such rains find crops at different stages of growth depending on the ploughing time and may spoil some, further reducing harvests.

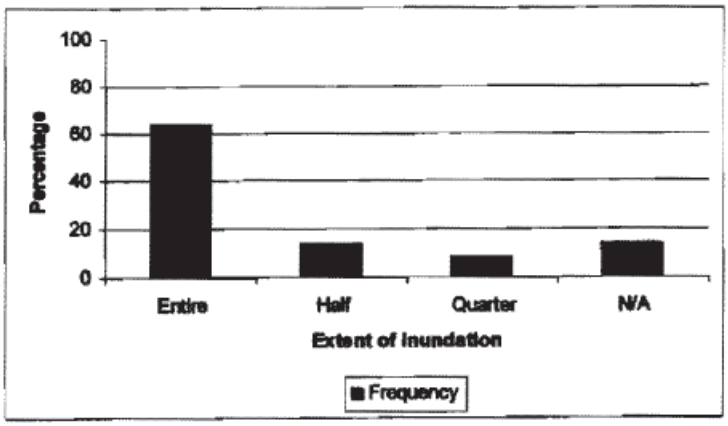

Figure 5. The impact of the 2004 flood on *molapo* fields in Tubu.

As implied earlier, the 2004 floods arrived earlier than usual, reaching the Tubu area in February while the previous season's crop was still in the fields. About 64% of the households reported that they lost their entire crop as a result of the early flooding.

Figure 5 shows the extent of crop damage from the flood, with most (64%) fields submerged entirely. According to the farmers, when a field is completely submerged there is no hope for any harvest. Altogether 86% of the fields studied were affected, only 10% of the farmers reported moderate yield (ranging from 630-700kg/ha) while 90% registered low yield (ranging from 70-560kg/ha). Farmers lamented that standing crops before the flood promised higher yields. It was clear judging by the magnitude and timing of the flood that some crop damage was unavoidable. However, lack of resources and flood defence mechanisms in general augmented the problem. According to the farmers, they need *mekoro* (dugout canoes) to save ripe crop when floods set in early. Those who do not own or have access to *mekoro* will normally have to watch their crop go to waste. Therefore, in the event of flooding, like in other natural disasters, some groups of people are more vulnerable than others. In their effort to unpack vulnerability, Wisner *et al* (2004:5) bring 'the natural and the social' together, arguing that people who are vulnerable 'are those who are at the "worse" end of the spectrum'. In this case the poor and/or female-headed households suffer more from the effects of extreme flooding as they do not have access to the resources they need for their livelihood before, during and after the flood.

According to the farmers, crops (especially maize) harvested within two days of flooding will normally escape damage. Farmers also reported that they are now banned by the Department of Water Affairs from building the traditional earth and grass bunds (*ndoba*) that they used to build to divert water away from their fields. The Department claims that the practice disturbs the natural course of the flood. It is however not clear whether the diversion from these bunds is really significant, given that the river channels in the Delta are always shifting due to sand sediment deposits and blockages caused by floating and dead reed, or if its just a case of paranoia and/or control. Whatever the case, the situation is unfortunate as it undermines the community and takes away its ability to self-protect. To enforce its power and control, the government offered social protection in the form of disaster relief items such as tents, and advised some communities to vacate. People in Tubu claim that promised relief was never delivered, while those in island settlements such as Jao Flats rejected calls to vacate the settlement as they saw this as a form of control by government. Wisner *et al* (2004:92) argue that natural hazards cannot be separated from social systems, which they argue 'create the

conditions in which hazards have a differential impact on various societies and different groups within society'. This refers to patterns of wealth and power which appear to have been at play during the 2004 floods.

Besides the problems of flooding, farmers in Tubu also encounter crop damage from pests, livestock and wildlife. Because flood plains are generally fertile areas with a larger capacity of soil moisture, they maintain richer vegetation than dryland areas. The rich vegetation plus water attract livestock and wildlife (reedbuck, lechwe, baboons, monkeys, porcupine, elephants, etc.) that move in to graze and drink, and end up breaking into fields and destroying crops. Of the households studied 86% said that they lose some of their crops to wildlife and cattle annually. Sometimes those whose fields are not fenced lose the entire crop to the grazers. This again is the plight of the poorer households (mostly female-headed) as they cannot afford either the materials or the labour required to put up effective fences. Pests such as stalk borer, locust and birds are also a problem in *molapo* farming.

Coping with Extreme Flooding: Alternative Livelihood Sources in Tubu Village

Households in Tubu insist that *molapo* farming is their main source of livelihood. However, households maintain other sources of livelihood which complement the main source, and also help them cope with crop failure. As shown in Figure 6, livestock production is the most popular alternative, followed by veld products and drought relief. This shows that natural resources in the form of good soils and water for growing crops, grasses for grazing and veld products for domestic consumption and sale, are important to the people of Tubu and possibly the whole of Ngamiland. This has implication for natural resources management, which should promote wise use rather than preservation of environmental assets.

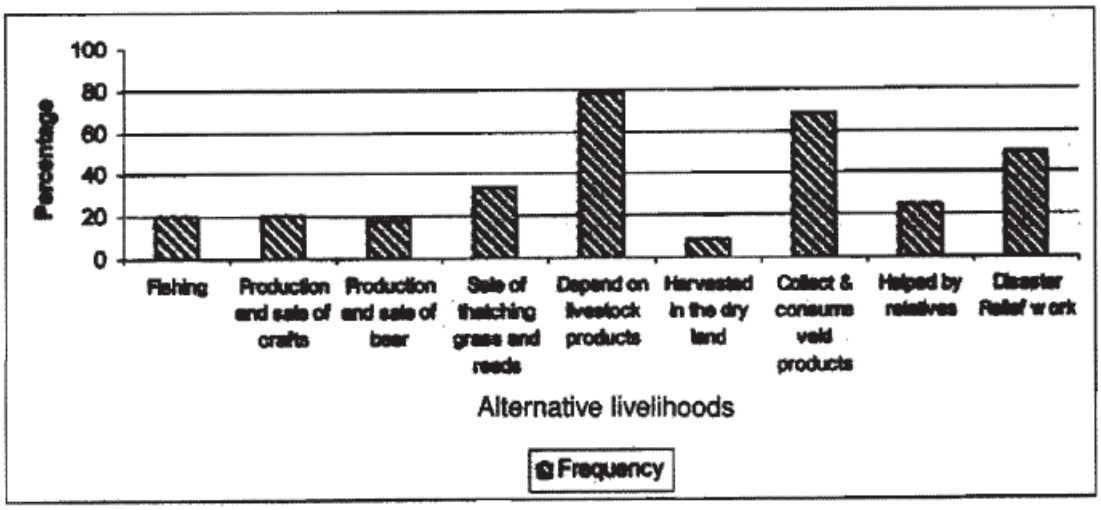

Figure 6. Popularity of other alternative sources of livelihood.

Government through the North West District Disaster Relief Committee also intervened to offer some relief. Throughout the sub-district, tents were given out to those whose homes were destroyed. This was not applicable to Tubu as homes in this area were not affected. Instead Tubu residents were involved in disaster relief work as shown in Figure 6. However, residents complained that although it is hard work, relief work pays too little to be considered as an alternative

source of livelihood. They further complained that the work was not much relief either. According to the farmers many people who had experienced crop failure could not be employed. The procedure for this type of work is that only ten people may be employed at any one time. At the time of the study people were still waiting for food rations which were promised by the government as part of the relief. There appear to be efficiency and resource allocation problems in government relief programmes. According to Wisner *et al* (2004), access to relief is one of the measures of vulnerability. Societies that for one reason or another are not afforded adequate and swift relief may not be able to cope with the disaster and its long-term impacts, and hence may be termed vulnerable.

It was not clear at the time of the survey whether people would be compensated for crop damage. While people expected some compensation, government could not make a decision because of the status of the fields (self-allocated). Government also appeared to be careful not to set a precedence, maintaining that farmers should farm these areas at their own risk. Here again the complicated interaction between environmental disasters and socio-political systems comes into play. The position of the *molapo* farming communities in the social spectrum is such that they may not be compensated for lost crops. Because these communities are poor, their crop is not insured and hence there is no compensation for damaged crops. Furthermore, the government has decided not to legitimise their rights to farm flood plains by refusing to allocate the land under common law. Consequently, farmers do not have the formal land rights which may release public funds for their compensation. There seems to be an element of control here. It appears the government does not favour this production system and is now taking advantage of the impact of the flood to 'encourage' people to move out to dryland areas, where they may be allocated fields and be compensated for crop damage. According to Wisner *et al*'s (2004) analysis of risk and natural hazards, it is more these political decisions than the disaster itself that take the people a few steps up the vulnerability ladder.

Conclusion

Despite the losses they encountered, especially in yields, farmers made it clear that abandoning their *molapo* fields and moving to dryland areas was not an option. They insisted that they are 'river people' meant to live near the water and use water-related natural resources. This strong cultural connection to flood plain cultivation and other considerations seem to encourage a view of risk by the *molapo* farming communities which is characterised by a lack of desire to control the natural environment and hence accepting the inherent risk (Kostov and Lingard, 2003).

First of all, destructive floods appear to occur less frequently than they used to. The two most-recent floods occurred 20 years apart (1984 and 2004). Furthermore, from the records of inflows at Mohembo (Figure 1), recent severe floods are smaller in volume than the previous ones, presenting a possibility that the damage they caused may not be as severe as that caused by earlier ones. Second, the alternative (dryland farming) is not so attractive. Even under severe flooding what is salvaged from *molapo* fields is better than yields realised under dryland farming. Third, the availability of other sources of livelihood, especially livestock rearing, appear to be effective as coping strategies in the event of severe floods like that of 2004.

It would appear therefore that it remains up to the land resources management authorities to recognise the benefits of *molapo*, and the commitment of the farmers to the farming system, and offer institutional incentives for farmers to continue practicing it. More studies would need to be carried out, however, to find out if more or less people are practising *molapo* farming and whether younger generations are inheriting the tradition from their parents. This would give an

indication of the demand for flood plain land and help build a strategy of institutionalisation. The fact is, the authorities cannot simply continue avoiding involvement with a system that has potential to feed families.

References

Bendsen, H., and Meyer, T. (2002) *The Dynamics of the Land Use Systems in Ngamiland; Changing Livelihood Options and Strategies*. Maun: Harry Oppenheimer Research Centre.

Bendsen, H. and Gelmroth, H. (1983) *Land Use Planning Ngamiland Communal First Development Area*. Maun: Ministry of Local Government and Lands.

Central Statistics Office (CSO) (1991) *Guide to the Villages of Botswana*, Gaborone: Government Printer.

Central Statistics Office (CSO) (1991) *Summary Statistics on Small Areas (For Settlements of 500 or More People)*. Gaborone: Government Printer.

Central Statistics Office (CSO) (2001) *Population of Towns, Villages and Associated Localities*; Gaborone: Government Printer.

Fidzani, B. *et al* (1999) *Socio-economic effects of CBPP in Ngamiland*. Division of Agricultural Planning and Statistics, Ministry of Agriculture, Gaborone.

Kgathi, D.L., Mmopelwa, G. and Mosepele, K. (2004) *Natural resource assessment in the Okavango Delta, Botswana: Case studies of some key resources*. Natural Resourses Forum, NRF29 (in press).

Kostov, P. and Lingard, J. (2003) Risk management: a general framework for rural development, *Jounal of Rural Studies* 19 (463-476).

Kundzewicz, Z.W. *et al* (2002) Coping with variability and change: Floods and droughts. *Natural Resources Forum* 26 (263-274).

Magole, L. (1998) *Report of the Participatory Rural Appraisal of Tshane and Ngwatle Communities*. Unpublished report.

Magole, L. (1997) *Report of the Participatory Rural Appraisal of Lehututu community*. Gaborone: Forestry Association of Botswana.

Mbaiwa, J.E. and Rantsudu, M. (2003) *Socio-economic baseline survey of the Bukakhwe cultural conservation trust of Gudigwa, Botswana*. Maun: Conservation International.

Meyer, T. (2002) *Land Use Map Ngamiland*. Maun: HOORC and University of Sachsen Anhalt.

Ministry of Agriculture (1984) *Agricultural Development, Ngamiland*, Technical Report No.2 (1982/84) Gaborone.

Ministry of Agriculture (1981) *Agricultural Development, Ngamiland*, Technical Report No.1. Gaborone.

Mokgethi, M. (2004) *Disaster Report on Floods*. Maun: North West District Council.

Petermann, T. (1989) *Molapo Development Project: Report on Hydrological Conditions in Boro-Shorobe Flood Plains*. Maun: Agricultural Research, Ministry of Agriculture.

Scott Wilson (2000) *Environmental assessment of veterinary fences in Ngamiland (vol, 6): Consultation and methodology plan*. Gaborone: Government of Botswana.

Smith, K. (1991) *Environmental hazards: Assessing risk and reducing disaster*. London: Routledge.

Stockhardt, B.J. (1978) *Swamp and Dry Land Soils of the Okavango Project: Data Recorded in the Seasonally Flooded Area in the Okavango Delta*. Field Doc. No.1. Unpublished.

The Ngami Times (2004) Vol. 6 No. 23 (Jan 30-Feb 6). Maun.

Tobin, G.A. & Montz, B.E. (1997) *Natural Hazards: Explanation and Integration*. New York: Guilford.

Van Hoof, P.J.M. (Ed.) (1993) *Ngamiland District CSDA Eastern Part; Socio-Economic Baseline Survey and Land Suitability Analysis*. Maun: North West District Council.

Wisner, B. *et al* (2004) *At Risk: Natural Hazards, people's vulnerability and disasters*. London: Routledge.