VETIVER AND NATURAL DISASTERS: PREVENTION AND REHABILITATION

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Abstract

A disaster can be defined as any unforeseen or sudden situation that the affected community is unable to cope with or an event when natural hazards interact with existing conditions so that they disrupt the ability of a community to feed and care for their families. The natural hazards become disasters when the disruptions exceed the adjustment capacity of the community. We continually modify our living environment and thus increase the chances of disasters occurring.

Papua New Guinea, with areas of steep land, high rainfall, large rural populations and limited government capacity to monitor and deal with natural hazards, is very vulnerable to disastrous events which put the population and infrastructure at risk. This is particularly so for areas in the PNG highlands, such as Simbu province, where population and land pressure make it difficult for rural subsistence farmers to maintain sustainable farming practices. They have a very limited capacity to generate income to purchase inputs that could be used to maintain the productivity of their land and thus any additional difficulty can have a disastrous effect on their ability to cope. The government has a very limited capacity to provide them with relief of any kind.

Throughout the world, developers and governments are learning that local people must be allowed to formulate solutions to their problems themselves, rather than having solutions imposed on them.

Vetiver grass technology (VGT), because it is low cost, provides a partial long-term solution to soil degradation, fits in with traditional technologies farmers are familiar with, can be controlled and managed by farmers and is proven to work under such conditions, fits in well with attempts to make life easier and more sustainable for the at-risk rural population in disaster-prone areas.

Introduction

The topic of this panel is the role of vetiver grass in the prevention of natural disasters and rehabilitation of areas affected by them. Before we can address the problems of prevention or rehabilitation we have to know what we mean by natural disasters. In research in preparation for this paper, I came across a couple of definitions of natural disasters that I think are appropriate.

The first one said, “A disaster is any unforeseen or sudden situation that the affected community is unable to cope with”.

The second one takes a slightly different tack but says much the same. “Rural communities, particularly in developing countries, are sometimes faced with natural hazards which interact with existing conditions and develop into events which cause disruption to their lives and their ability to feed and care for their families. Natural hazards become disasters when the disruptions exceed the adjustment capacity of a community.” (Lechat 1976)

These definitions suggest that natural disasters happen when a combination of conditions occur which trigger an event that adversely affects people.

In recent years the view that disasters are entirely caused by natural events has largely been discarded. It is now recognized that, though many hazards are natural, disasters, in general, are not (Anon. 1995). We continually modify our living environment to suit our needs. These modifications can affect the frequency and severity of the effects of natural events that may later turn into disasters. I want to discuss some of these modifications and how we can reduce the likelihood that they will trigger disaster events.

The PNG Situation

The part of Papua New Guinea where I have done most of my work on vetiver grass is characterised by high population density, high rainfall, high altitude, very steep slopes and high likelihood of soil movements, both large and small. In short, all the necessary ingredients for a disastrous event to occur are present. I will describe two events that actually happened. Many more have occurred, fortunately very seldom with loss of life. Damage to property or infrastructure is often considerable.

During the first few weeks of December 1999, there was a period of heavy sustained rainfall, which resulted in many landslips that destroyed areas of forest and village gardens, blocked roads and damaged houses. The only road linking two thirds of the approximately two million people of the PNG highlands with the rest of the country and the seaports was cut and no essential supplies were able to get through until the road was cleared after about a week. Not a serious disaster, but certainly one that caused hardship to many people.

The second event occurred in Simbu province in PNG in 1970. Twelve people were killed in the village affected by a torrent of water, rocks and debris which inundated them. The only warning they had, and that was not much more than a minute, was the roar caused by the wall of water, estimated to be 10 m high, bearing down on them. From the investigation carried out following the disaster, it is presumed that the events leading up to the deaths were as follows.

During a period of sustained torrential rain, rock and mudslides occurred in areas of virgin bush in the mountains above the village but remote from any other settlements. No one was aware that they had occurred. The landslides could not be considered disasters, only potential hazards. However, some of these landslides blocked the river, formed an unstable dam and water was backed up behind it. At this stage it became an impending disaster which could only have been mitigated if a warning to evacuate the downstream village had been given. The only indications that could have alerted the villagers of the danger would have been a reduction in river flow at a time when river levels would normally have been expected to rise and the water may have become very dirty (which is not such an unusual occurrence anyway). These signs were not noticed and a disaster resulted.

Dealing With the Problem

What can be done about such events? The obvious response when one of these events occurs is to get your priorities right and run like hell if you happen to be in the way, if you have time.

Prevention is a different matter. If one can understand as many of the factors as possible that can trigger the events, one is half way to solving the problem, if it is solvable. The solution may simply be to relocate an at-risk population or village to safer ground nearby or some similar action.

It is not humanly possible to prevent all landslides during heavy sustained rain on steep slopes, forested or not, particularly if the profile is already saturated and if it overlays rock or some other sort of impervious layer.

Even if there are ways of predicting or preventing such events, it is beyond the capacity of many countries like PNG to finance the establishment or cover the ongoing maintenance costs of the necessary sophisticated warning system infrastructure or engineering works required to provide adequate warning of impending disasters.

It is when man intervenes in the environment and clears the forest for a garden, builds a road, opens a mine or extracts timber from vulnerable areas that the frequency and severity of landslides and their effect on the population becomes a problem. This is the area where we must concentrate our efforts to prevent or minimize the effects of our intervention on the environment.

I want to discuss the effects of traditional subsistence agriculture, as it is practiced in PNG, on the seriousness and frequency of disasters in the Simbu province in the highlands. There are many similar areas in other highlands provinces of the country, and no doubt also in mountainous areas of other countries in the region.

Forty-seven percent of the total land area in Simbu province is used for shifting agriculture. This land has gradients in the range of 10 to 27º (18-51% slope) (Humphreys 1984). The rest of the land is too steep or too remote. There are two extreme scenarios that occur in different parts of the province with a whole range of scenarios in between. The common factor in all of them is the steepness of the land.

1. The first scenario is where the population density is low, with plenty of land available for gardens. Each villager has a number of small gardens that are used to satisfy his food needs. The gardens are located in different parts of the land available to the farmer, sometimes quite far apart. The gardens have the following characteristics:

a) Land is only partially cleared of forest and tree trunks and other barriers often remain throughout the area.
b) The high soil organic matter content, which has built up during the fallow period, makes the soil less susceptible to raindrop impact damage.
c) Slope lengths are seldom over 10 m. The short slope lengths ensure that little soil is lost to erosion and what is moved is often held at the lower part of the garden by the vegetation growing there.
d) The cultivated areas are usually surrounded by largely undisturbed forest, which means that there are seldom any landslides because of the presence of mature trees.
e) The gardens are seldom cultivated for more than one cropping cycle and are then allowed to revert to forest again. They remain in fallow for up to 20 years before they are cleared again. Very little soil or fertility loss occurs in such gardens and landslips are very infrequent. The system is sustainable in the long term and because of the short-term nature of the gardens there is little point in instituting any measures to control erosion or landslips. The low level of income to the farmer is not a problem at the moment.

2. The other extreme is found in areas where the population pressure is high and suitable gardening land is limited. Gardens in such areas have the following characteristics:

a) Cultivated areas tend to be large, as the farmer has to use all the land that is available to him to satisfy his food needs.
b) Slope lengths can be 50 m or more, which makes the gardens vulnerable to scouring by running water.
c) The gardens are used over many cropping cycles before fallowing. Fallows tend to be short, one to two years at the most; some gardens are cultivated continuously.
d) The areas are usually cleared of all vegetation initially.
e) Intensive tilling in preparation for planting is carried out and drains and other structures, e.g. barriers to try to control erosion, are constructed.
f) Soils tend to be shallow because of continuous soil loss and their organic matter content is low, making them vulnerable to raindrop impact damage. Therefore, soil loss, particularly of the fertile topsoil, is accelerated.
g) There is a trend to fertility decline because of erosion, the depletion of organic matter and continuous cropping. It is difficult for the farmer to produce surplus crops to generate cash to purchase fertilizers to compensate for fertility loss and thus production continues to decline.
h) There are few trees anywhere on the slope that can help to stabilize it.

Under these circumstances a vicious cycle develops that can lead to events that have devastating effects on the land and the population. The farmer needs to produce enough to feed his family, but because his access to new land is limited, there is no new land he can clear where the fertility is higher and thus he has to continue using his existing gardens, even though the land is already exhausted. Such gardens are vulnerable to landslides and the farmer needs access to some intervention strategy that will enable him to get out of the downward spiral. The limited ability of the farmer to generate cash income makes it difficult for him to break the cycle. The system is not sustainable over the long term.

Practices in between these two extreme scenarios require more or less intervention depending on their place on the continuum. Likewise the effects disasters will have on the farmer will be determined by his position on this continuum.

The government of PNG, along with governments in many developing countries, does not have the capacity to make these farming systems sustainable by applying major interventions to address these

problems. The political and social ramifications of relocating large numbers of people from their ancestral homes to better and safer regions, which are usually at a distance, are too serious for such a solution to be contemplated.

Throughout the world, developers are learning that effective and sustainable solutions to the problems that local people face are the ones that the local people formulate for themselves after they are helped to get an understanding of the problem, are shown where they can get information about possible solutions to it, and are allowed to choose the technology they think will solve it best. They will choose and use solutions that are within their capacity to implement. They may have some initial failures, but will be empowered to try an alternative using lessons learned from their initial failure. The choices must be theirs; they know their situation and capacity better than anyone from outside. Outsiders can only give them as many alternatives as possible to choose from and should not try to impose solutions.

The Place of Vetiver Grass Technology

Vetiver grass technology is one of the tools that can provide a partial solution in the situations I have detailed.

I found, in working with farmers in many different villages in PNG, that when we talked to them about vetiver grass technology they took the ideas we suggested and chose a combination of the ones they thought would work and tried them. The proof of their grasp of the concepts we told them about was what happened after we left.

All we gave them was ten slips of vetiver grass each and some ideas and a demonstration of how to use and care for the grass. The reasons it has worked and is working are:

1. It was compatible with and improved on practices they already used to control erosion in their gardens.
2. It could be implemented at almost no cost and maintained with less work than was required to repair or replace the traditional erosion control technologies.
3. Given time the farmer can control supplies of the planting material himself.
4. It provides a long-term solution in that it helps to tackle the loss of topsoil and therefore the soil fertility problem, so that it makes the farming system more sustainable.
5. The grass has additional uses such as providing a source of thatch for houses and the roots can provide some measure of insect control in houses.
6. It does not pose a weed problem, which is a big factor, given the experiences PNG farmers have had with introduced species of supposedly beneficial plants that have become noxious weeds.
7. There are people in the region who have tried the technology and it has worked for them.

I have been back to many of those villages over the past few years and have been gratified by the numbers of farmers who have multiplied the original slips of grass we gave them in their own nursery, planted them in their food gardens and then managed the hedges in their own way. The majority remain enthusiastic about what they perceive to be the improvements in productivity of their gardens from using the vetiver grass technology.

They see it as a way to help them cope with the hazards they are faced with and help to mitigate the hazards so that they do not become disasters.

Dealing with landslides

Once landslides have occurred, the land that has moved and accumulates at the base of the slope is very prone to moving again. However, many farmers like to plant gardens in this soil, as it is much deeper than normal, is easily dug, is not as steep at the original and is usually reasonably well drained. Many farmers will plant trees into this loose material in an attempt to stabilize it. Vetiver grass hedges planted on the contour can go part way to achieving the same purpose.

The area where the landslip originated usually has very little soil left, is steeper than previously and is unproductive to garden. Planting contour vetiver grass hedges can lead to its rehabilitation over many years as the hedges may prevent the loss of any more soil, allow the accumulation of organic matter and encourage the establishment of trees, which will eventually stabilize it.

Conclusions

Local people are the ones affected by disasters and they must be involved in all aspects of disaster mitigation before their occurrence and if they occur, in the rehabilitation that follows. They must be given as much information as possible about the dangers they are exposed to and then allowed to choose the best solution, for their circumstances, from a range of possible solutions.

Introducing vetiver grass technology to rural communities is a proven way of helping to protect them from the disasters that so often strike and will make life safer and easier for them by making their system of farming more environmentally and financially sustainable.

References

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