

Strength of the Slash-and-Burn Planting System in the Manikin River Basin, West Timor, Indonesia

Max J. Kapa, Totok Gunawan, and Su Ritohardoyo

Abstract— Slash-and-burn farming systems actually have high complexity. Slash-and-burn cultivation requires knowledge of location suitability, burning time, fire control, the timing of planting, erosion control, the combination of plant arrangements, and so on. The purpose of this study was to identify various factors that become the strength of the slash-and-burn farming system in the Manikin watershed. The method used was the survey method. Data collection was done through in-depth interviews with key informants, and through field observations. There are four villages that were used as sample villages, namely Soba Village and Oben Village for upstream areas; while the North Baumata and East Baumata villages represented the central area of the Manikin Watershed. The results of the study show that the slash-and-burn farming system has several elements which are the strongest factors that can be used to develop a scenario for a sustainable farming system. These elements are (1) slash-and-burn farming system is very suitable to be applied on dry, even very dry land, (2) slash-and-burn farming system does not require tillage, so it can be applied to land with a thickness of less than 20 cm, (3) intercropping patterns are proven to provide sufficient results to meet food needs until the next planting season, (4) local maize, both large corn (yellow and white) and small corn (pen'ana) can grow with well. Small corn is harvested within 2 months so that it can be used when a famine occurs, (5) during fallow, the land is left to experience fertility recovery, and (6) culture and religious spirituality of traditional communities is an important part of their work system.

Index Terms— cropping pattern, dryland, maize, Manikin watershed, slash-and-burn agriculture, West Timor

1 INTRODUCTION

Slash-and-burn farming systems are a whole way of farming that involves cutting and burning activities, without distinguishing whether the system is done permanently or relocated. The term shifting cultivation is actually more appropriate to be translated into shifting cultivation or cultivation without moving. This system refers to the way of farming that is carried out temporarily for several years in one location and then, when the land in the location is considered infertile, the location is left to open land in a new location. [1] Introduced the term rotating shifting cultivation and arbitrary hedging. Farming is called rotating if after being fallowed for a certain period of time the farm location is re-opened for farming field. Farming is called moving irregularly if there is no fallow due to continuous movement to find new locations.

Shifting cultivation generally involves slash and burn activities, but slash and burn activities can also be carried out at sedentary farming sites. Various studies have shown that cultivation in West Timor always involves slashing and burning activities. The term used differs between the *Meto*-speaking regions in the West and in the *Tetun*-speaking region in the East which borders Timor Leste [4]. However, slash-and-burn cultivation in the two West Timor regions still uses the same steps that begin with slashing, burning, building fences, determining planting time, planting, weeding, harvesting and transporting yields [2, 5]. All of these steps are actually equally important, but slashing and burning are

prominent because they are the first step that is easily seen by outsiders [5]

The Manikin Watershed is a river basin between Kupang Regency and Kupang Municipality. Farming communities in this watershed are still using slash-and-burn farming systems. This system is often considered negative as an impact of the paradigm built on the philosophy of parts [generalization], and scientific certainty about the world can be achieved [6, 7]. This paradigm places traditional society in its judgment that is too subjective, and tends to be condescending. [8] emphasizes:

"Many farmers practicing slash-and-burn are migrants displaced from other parts of their country because of a series of socio-economic constraints. Others are indigenous peoples faced with increasing land pressures. Together they ... are among the poorest people in the rural tropics, and face formidable challenges. The problem, therefore, is not only one of environment but one of human equity as well".

Thus partisanship is not only focused on the physical and biological environment but also for slash and burn farmers as an integral part of efforts to overcome environmental problems. Slash-and-burn farmers are involved in this farming system not as an option, but rather because there are no other choices to meet their food needs. Intensive farming systems are not necessarily adapted to traditional farmers, only for productivity purposes. Fair treatment for slash and burn farmers must begin with understanding the context or scope.

In the context of watershed management, specifically the management of the Manikin watershed, although various attempts to transfer the variety of slash-and-burn cultivation systems continue to be carried out, in reality until now the practice of cultivation in this region has persisted. They realize that the slash-and-burn farming system applied to their land does not guarantee that it will always succeed and produce in large quantities [9]. To overcome this, they carried out intercropping cropping patterns, where local corn became the main seed planted together with other seeds. Local corn planted is

- Max J. Kapa is currently pursuing doctoral degree program in Environmental Science Postgraduate School in Gajah Mada University, Indonesia PH+6282147113820. E-mail: maxj.kapa@gmail.com
- Totok Gunawan is currently Professor at the Faculty of Geography, in Gajah Mada University, Indonesia.
- Su Ritohardoyo is currently Professor at the Faculty of Geography, in Gajah Mada University, Indonesia.

not only large corn, but also small corn or "*pen'ana*" which can be harvested in two months of planting. Intercropping patterns are carried out not for the purpose of efficiency of the production process but rather as an effort to distribute risk [10].

Efforts to diversify from shifting and slash-and-burn agriculture to settled agriculture continue to be introduced by the government as policy makers, through various means such as group formation and subsistence provision in superior fertilizers and seeds, but these efforts do not attract much farming farmers, because the system is not can be applied to dry land and shallow and rocky solum, short rainy season and erratic rainfall. Their only hope is a slash-and-burn farming system. If so, there should be a certain strength that this system has so that it can survive until now.

2 RESEARCH OBJECTIVE

This study aims to (1) knowing the reason for maintaining the slash-and-burn farming system, and (2) examine the strength of the slash-and-burn farming system practiced by farmers in the Manikin watershed area, West Timor.

3 RESEARCH METHOD

3.1. Research location

There are four villages that were used as sample villages, namely Soba Village and Oben Village for upstream areas; while the North Baumata and East Baumata villages represented the central region of Manikin River basin.

3.2. Data

The data for this research consisted of primary and secondary data. The primary data collection was done through in-depth interviews with 60 key informants of 4 villages, and through field observations. While the secondary data was collected from several government bodies such as Local Agricultural Department, Central Bureau of Statistics, as well as village profile data in the study area.

4 RESULTS AND DISCUSSIONS

Traditional people's understanding of slash-and-burn farming is still very strong, which is preserved from the traditions of previous generations. They still maintain slash-and-burn farming due to several factors, namely: trust in the superiority of local corn seeds, skills in the practice of slash-and-burn agriculture, knowledge of biodiversity, and the role of social institutions.

4.1. The Advantages of local seeds

A number of advantages of using local seed explained by the respondents (key informants) namely:

- a. No need to buy seeds, all respondents in the study area explained that they prefer to use local seeds to avoid cost to buy seed. Local seeds can be replanted in the next planting season. Seedling is normally fumigated to avoid insect attack
- b. No fertilization application and no tillage
Slash-burn systems are a method of obtaining weed-free land, and fertile soil for the corn seeds they plant. By do-

ing slash-burn, it is not necessary to tillage the field.

- c. Survive during famine period
Corn seeds can be planted together, in one hole, with pumpkin seeds and beans. There is also a type of local corn or short-lived corn called *pen'ana* that can be harvested at the age of two months after planting. This is done to anticipate the harvest failure.

4.2. Traditional community skills towards slash-and-burn farming systems.

4.2.1. Cultivations Process, there are several steps or activities to be done namely:

a. Pre-planting, this stage consists of:

- Field preparation (slashing and tripe activities)

Field preparation is distinguished between new fields and old fields. The new fields begin by clearing the forest from May to June. Trees are cut down, except useful trees (i.e teak, tamarind, and mahogany). Shrubs are cleaned. Stems and branches are taken to the house to become firewood. Branches and leaves, as well as cleared bushes (biomass) are left to dry to be burned in September-October.

Preparation of old fields (fields that have been used for 1-3 years) is only done by '*tofa*' (cleaning of bushes), pruning branches of teak, tamarind, and mahogany, and collecting biomass (September-October).

- Determine burning time of the fields (September-October), The important things to be considered in the burning process are to make fire taps (*tapsani*), pay attention to the wind direction, and be guarded/monitored until the fire no longer has the potential to burn useful trees (teak, tamarind, mahogany) or spread to other places. Field burning is usually done at night because the conditions are not too hot and the wind is not too strong The important things to consider in the burning process are to make fire taps (*tapsani*), pay attention to the wind direction, and be guarded / monitored until the fire no longer has the potential to burn useful trees (teak, tamarind, mahogany) or spread to other places. Field burning is usually done at night because the conditions are not too hot and the wind is not too strong. if there is still fire until dawn (3 AM), then the fire must be turned off by dousing it with water.

- Determine planting time (end of November or early December). This stage can be divided into three stages namely:

First stage: Plant preparation time is seen from several natural signs, namely: kosambi trees (*Schleichera oleosa*) start out new shoots, "nikis" trees (*Cassia fistula*) start flowering, and the emergence of rain birds ("*kol ulan*"). Before the sign appeared, they set up a hut on the edge of the field. Second stage: First day and second day it rains, seeds have not been planted. Rain on the first day is termed "*namas kuku or nail polish*" (rain flush ash) or "*haulo*" (rain to grow new shoots). On the third day, the depth of wet soil is examined. If the depth of the wet soil reaches ± 5 cm, the seeds are planted the next day (fourth day of rain).

b. Planting process

The planting process is carried out without tillage, so as not to damage the structure of the soil surface. Planting holes are made using wooden stick, and the seeds are placed directly on a hole that is held in a hole. Planting hole is done by men, while women put seeds. One planting hole is filled with 3-4 corn seeds, 1 pumpkin seed, 1 bean seed rice, 1 turis bean (*Cajanus cajan*) seed. The distance between holes is ± 23 cm x 23 cm. Weeding is done throughout the growing season.

c. Harvest

The time of harvesting corn is marked by the dryness of the cornhusk and the grain is broken. Generally, the plants are not cut (left upright) as a propagation of *nasi bean* (*Vigna umbellata*) plants.

- The first harvest is for *pen'ana* corn (small corn), pumpkin shoots, and young pumpkins, in January-February.

- The second harvest is for large corn and it is carried out in April-May. Beginning with harvesting 10-20 grains (1-2 bunches) of corn to be brought/offered to the church as *ta'tulu* (tithe). After doing *ta'tulu*, the whole harvest is done in mutual cooperation. Corn is tied into a bundle and each bundle consists of 10 corn grains and those will be kept temporarily in the garden hut until they fully dry.

- The third harvest is for pumpkin and nasi beans (*Vigna umbellata*) and it is done in April.

- The fourth harvest is *turis* beans (*Cajanus cajan*). The bean is harvested in June-July.

Such stages of harvest show that farmers have a competent strategy in maintaining food availability for a year. Thus their food security is guaranteed.

d. Post-harvest

After all the corn is collected, corn will be taken home and stored in halls (*bale-bale/dadegu*) made in the kitchen or more precisely on the furnace to be smoked. This fumigation method is a preservation method that has been carried out for generations. Some of the results are used for eating, and some are stored as seeds for the next planting season.

4.2.2. Land rotation

The new land used in the first planting season is the land that has been cleared of forest or land that has been given for three years. This new land is still fertile so the yield is higher than the land that was cultivated in the second and third planting seasons. After the land is processed in the third planting season, the land is allowed to fall in so that the land experiences fertility recovery.

4.2.3. Intercropping

Intercropping is not only beneficial for producing corn as the main food source, or for pumpkin and beans as a reserve, but it also produces waste that can be used as biomass. During the first planting season, biomass was obtained quite a lot from slash/forest tripe, in the form of leaves, tree twigs, and shrubs. Biomass in the second and third planting seasons is obtained

from waste corn, pumpkin and beans. If it is still lacking, biomass is collected from plants outside the field.

4.2.4. Pest Control

Pests that threaten the growth of plants are in the form of weeds, snails and livestock. Weeds are controlled by burning biomass, so the availability of biomass is very important. Burning biomass apparently cannot eradicate snails. To control snails, farmers use papaya leaves as bait. Snails will gather on papaya leaves which are spread on the land, and after that they hit the snail using a piece of wood. In addition, "bendar" or dividing fence between the cultivation area and grazing area is made by the community so that the livestock do not enter the field.

4.3. Knowledge of biodiversity

4.3.1. Knowledge of the types of local plants (landrace).

Some types of plants that are maintained by local people can be divided into two functions, namely: as food ingredients (corn, cassava, pumpkin, rice beans, and *Cajanus cajan*) and for sale such as banana, coconut, leucaena, teak, and mahogany. Corn, pumpkin, and beans are planted in intercropping, with a slash-burn farming system, Leucaena is planted as a hedgerow. Teak and mahogany trees are grown in the fields. Bananas and coconuts are grown in local agroforestry (*mamar*).

4.3.2. Views on local types of plants.

Corn owned by local communities is large corn (*pen'muti and pen'molo*) and small corn (*pen'ana*). *Pen'ana* is planted to overcome famine, because it can be harvested in January-February. Pumpkin and various beans are harvested after corn, both as food additives and as a variation. They keep the availability of food ingredients available for one growing season. Bananas and coconuts are used more for cash. Can be sold when young, or dried as copra. In a state of famine, both can be a backup food ingredient. Leucaena has three functions, namely: as hedgerows, as fodder, and Leucaena stems are sold as 'wood stick'. Teak and Mahogany will be harvested after being large enough for sale

4.4. Traditional social institutions that are still practiced

Customary institutions still play an important role in carrying out fines, even though the determination of fines is carried out in collaboration with the village government. Penalties were set up to overcome the problem regarding negligence in guarding the fire while burning fields (fire entering and destroying plants in other people's fields), and the problem of entering livestock into fields (damaging / eating plants). The role of the adat institution, prior to the influence of the presence of the church, also included conducting seed rituals, asking for rain rituals, and ritual fertility of the land.

Religious institutions (churches) take over customary traditions in terms of implementing several rituals, namely: worship for rain (in October), worship of blessing of seeds and agricultural equipment (early November). *Ta'tulu* or the first harvest must be brought to church as a form of gratitude to God. The attachment of the community to religious institutions is very strong, so they will not bring the crops to home before bringing *ta'tulu* to to the church.

4.5. Strength of the Slash-and-Burn Farming System

Farmers in the Manikin watershed understand the slash-and-burn farming system not only in terms of traditional agricultural technology, but also in terms of their socio-cultural attachments. Various rituals carried out on land, seeds, and equipment became part of indigenous traditions, which were later taken over by church institutions. The unity between work systems and religious spiritual attachments is unique, which has been built from generation to generation. Thus, some elements that show the strength of the slash-and-burn farming system, which causes traditional communities to maintain it are: (1) slash-and-burn farming systems are very suitable to be applied on dry, even very dry land, (2) slash-and-burn farming systems do not require tillage so that it can be applied to land where the thickness of the soil solum is less than 20 cm, (3) cropping patterns in term of inter cropping proven to provide sufficient results to meet food needs until the next planting season, (4) local corn, both large corn (yellow and white) and small corn (pen'ana) can grow well. The corn is small in size within 2 months, so it can be used when famine occurs, (5) during fallow, the land is left to experience fertility recovery, (6) culture and religious spirituality of traditional communities is an important part of their work system. These elements are an inseparable part of the effort to prepare a scenario for a sustainable farming system.

5. CONCLUSION

The strength of the slash-and-burn farming system in traditional communities in the Manikin watershed is not assessed from the aspect of productivity, because the aim of this system is to manage erratic rainfall so that production can meet their food needs. Negative assessments of slash-and-burn farming systems are not enough reason to refute the power of slash-and-burn farming systems, because such an assessment is carried out without regard to how farmers have the technology applied in slash-and-burn agriculture. The knowledge and skills of traditional farmers obtained from generation to generation cannot be ignored.

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