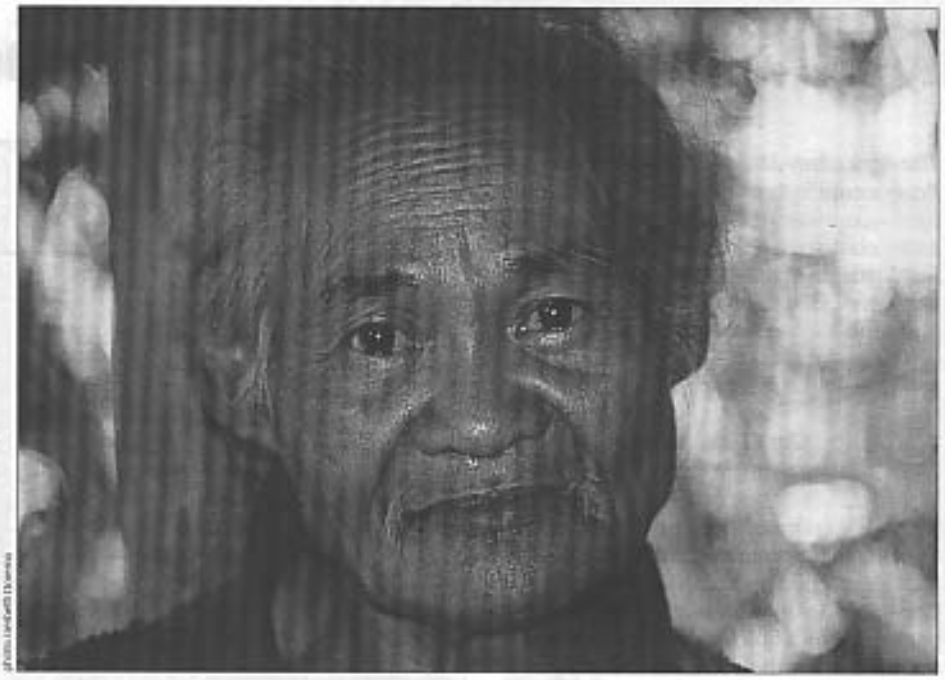

Swidden agriculture is often seen as unsustainable and not adapted to present day needs. Whilst it is true that traditional swidden systems are vulnerable to pressures from contemporary society, it is surprising how little effort has been made to improve these systems by building on indigenous insights and initiatives in order to increase the economic and ecological sustainability of swidden agriculture. This article describes the innovativeness of the Mangyan swidden farmers, the indigenous inhabitants of the island of Mindoro in the Philippines, and demonstrates their ability to adapt their farming to changing needs and conditions.

Indigenous intensification by Mangyan swiddeners

Klaas Nijhof

Mangyan swidden agriculture was one of the first swidden systems to be fully researched. Conklin (1957) classified it as an established integral system. In such a system few crops are raised outside the swiddens and farms are usually located in secondary forests, as the clearing of primary forest is avoided. A long fallow period during which the forest recovers, completes the swidden cycle. The fallow ensures the sustainability of swidden agriculture by regenerating soil fertility and preventing high levels of yield loss through weeds, pests and diseases. Such swidden farming systems allow an efficient and ecologically sound exploitation of the hilly, wet, tropical lowlands. The stability of swidden systems is partly due to the fact that crop production is in conformity with the natural regenerative processes that takes place on the cleared swidden. Crop choice, crop management and crop succession reflect the process of forest recovery. Competent swiddeners have a deep understanding of the dynamics of natural processes and use this knowledge to manage their swiddens. In this aspect swidden farming differs essentially from other agricultural systems where natural processes are usually controlled to allow crop growth.

No forests left

Since the late 1950s the population of Mindoro has increased sharply as thousands of immigrants settled on the island. Mangyan land was taken by the settlers and as a result the Mangyan had to retreat into the hills. More recently, commercial loggers devastated most of Mindoro's extensive forest reserves. After logging kogun grass (*Imperata cylindrica*) took over the land in many areas and hampered forest recovery. The Mangyan continued their swidden-based life style but the lack of forest land meant they had to adapt their traditional farming system.

SALT not a feasible alternative

Under such conditions swiddeners are often advised to abandon their swiddens and take up plough agriculture. But in tropical, hilly, lowland conditions ploughing exposes the soil to degradation and erosion. The recent development of Sloping Agricultural Land Technology (SALT) in the Philippines is an attempt to overcome the disadvantages of plough agriculture. An upland agroforestry technology, SALT aims to prevent soil degradation and erosion by planting hedgerows of leguminous shrubs or trees along contour lines (IIRR/DENR/ FF, 1991).

The merits of SALT farming are taken for granted here. In the Mangyan region, however, SALT - including the use of the plough - has been rigidly promoted as an alternative to swidden farming. Moreover, SALT has been presented as a sustainable blueprint for agriculture rather than a source of technologies that can be adjusted to local conditions and needs. The rigid promotion of SALT is likely to have little impact on the Mangyan for several reasons. First, if one or more of its elements are incorrectly implemented, ecological stability will be undermined and soil erosion will be increased rather than prevented. Second, as Schlege (1981) demonstrated in the Southern Philippines, plough agriculture demands more labour than swidden cultivation and SALT is particularly labour intensive. Third, the Mangyan are unlikely to abandon a system of agriculture that is an integral part of their culture, and finally there is the problem of acquiring draught animals.

The cultural dimension is an important element in the swiddeners' resistance to plough agriculture. The promotion of the plough is experienced as an attempt to undermine cultural identity. The Mangyan prefer to adjust their swidden systems to accommodate increasing pressures in such a way that the cultural dimension of their agricultural activities is maintained and strengthened.

Contemporary Mangyan farming

In recent years the Mangyan have developed a differentiated system of temporary and permanent fields, each with specific crops and specific usage. While the traditional integrated farming system included all the essential crops the Mangyan needed for subsistence, various farming subsystems are now required to raise the necessary crops. Farmers initially avoided kogun-infested land mainly because the rhizomes of this grass survive burning. But as forest fallow land became increasingly

scarce, new fields had to be opened on kogun land. This type of land was abundant and, to prepare it, Mangyan farmers use fire, the plough and sometimes the hoe. Both plough and hoe have only recently been adopted by the Mangyan and plough agriculture has not replace swidden farming, but complements it by allowing the exploitation of otherwise unexploited areas. The various farming sub-systems found in the Mangyan crop production system today include:

- *Ploughed fields* usually planted with a mixture of annual crops and some perennials. These fields are typically located on deforested, kogun-infested land. They are permanent with a relatively short fallow period.
- *Swidden fields* planted with mixed annual crops and bananas. Perennials, if considered valuable, are left unburned. Compared with the traditional system, the swiddens have a strongly reduced fallow, are used for shorter periods and the emphasis is on grain crops.
- *Fields with minimal clearing and tillage* used for the extensive production of root crops such as cassava and yams.
- *Fields with no tillage and limited clearing* used for fruit trees and bananas.
- *Forest* reserve and fallowed land with secondary forest vegetation.

Swidden fields are usually combined with fields that require minimal clearance and tillage, perennial crops are raised and there is also some extensive root crop production. Some farmers are wholly dependent on their swidden farms, the most, however, include many (sometimes all) sub-systems in their individual farming system.

The knowledge of older farmers such as Hamalat is essential in rediscovering the principals of traditional swidden cultivation.

Table 1. An estimation of the ecological stability of the subsystems used in Mangyan agriculture

subsystem	presence of permanent plant cover	intensity of tillage	ecological stability
ploughed farms	few (fruit) trees/ bananas	intensive	very low
short-cycled swiddens	some (fruit) trees/ (wild) bananas	extensive	low (during first year)
extensive farms	weeds/scattered trees	extensive	medium
perennial crop farms	many (fruit)trees/ bananas	extensive	high
forest reserve	natural	none	very high

Farming unsustainable

This differentiation has not neutralised the negative effects of the increasing pressures on the farming system. The newly developed farming system compares unfavorable with the traditional swidden system. Almost all Mangyan in Tinis-an stated that yields have fallen considerably in recent decades. The yield/labour ratio has also dropped. Weed control is considered to have become more troublesome and many traditional crops have disappeared from the area. Soil erosion is no longer uncommon and landslides occur during typhoons. Mangyan farmers could no longer maintain their practice of fitting crop production harmoniously into natural processes on ploughed fields. However, the other types of fields still reflect the Mangyan's profound understanding of the best way to fit crop production into the dynamics of natural processes.

Ecological stability of the system

The productivity and stability of agricultural production in hilly, tropical lowland conditions is enhanced by the continuous presence of plant cover. A permanent or perennial plant cover stimulates the build-up of organic matter in the soil and the presence of permanent root systems prevent erosion. Intensive tillage promotes the decomposition of organic matter in the soil and leaves it vulnerable to erosion. The risk of soil degradation is especially high on ploughed farms, often only a few (fruit) trees have been planted. Moreover, these farms are usually opened on kogun land, where there are very few trees. Swiddens are only unstable when they have just been opened. The presence of large and/or valuable trees, which are often left unburned, stabilises the swiddens and the rapid recovery of vegetation further increases stability.

Mangyan innovation

The Mangyan of Tinis-an are acutely aware of the fragility of their agro-ecosystem and the need to increase food production. Further shortening of the fallow period in the ploughed and short-cycle swidden systems is impossible without chemical fertiliser. However, as Mangyan farming is still essentially a subsistence agriculture, the use of chemical fertiliser is risky and not very profitable. Purchasing external inputs is therefore far from feasible. In fact, an increase in the level of food security can only come from further developing the remaining three sub-systems: extensive farms, perennial crop farms and forest reserves. The Mangyan are, therefore, shifting crop production towards these more stable subsystems. The most recent development is a renewed interest in root crops such as yam and red tannia. Both yam and red tannia were important crops in the traditional swidden cycle, but their importance diminished as farming became more differentiated. Both yam and red tannia provide food during periods when other food is scare and are generally produced in the ecologically more stable extensive farm sub-system. In this way, the Mangyan raise their food security level and at the same time improve ecological stability.

Conclusion

It is not uncommon for outsiders to consider swidden agriculture as a static type of agriculture, dominated by tradition and in danger of disappearing. Recent developments in the Mangyan swidden system, however, shows that swiddeners are trying to sustain and improve their swidden agriculture. The trend towards ploughed fields and shortened fallow periods which lead to ecological degradation has been halted with an intensification of the ecologically more stable agroforestry sub-systems. To achieve this transformation swiddeners have fallen back on traditional practices. Based on the potential of traditional swidden agriculture to use land in a sustainable way and recent experiences with fallow intensification, it is expected that these indigenous innovations will create opportunities for sustaining a growing population.

The recent adaptation of the Mangyan swidden system shows the importance of

Yam (*Dioscorea* spp.)is particularly useful for developing the extensive production of food if grown like the forest yams of this area. It can give good yields and only requires the farmer to dig a planting hole and carry out some initial weeding. With its preference for stalking, yam is an excellent woodland (inter)crop and flourishes amongst fruit tree stands, reforested areas and secondary forest as well as on marginal and fallow land. Trees can be left undisturbed to develop into a yam/ bush agroforestry system. Although yam is usually raised as an annual crop, it is a perennial and can be left in the field during years of plentiful food supply to provide a reserve for years when food supplies are scarce.

Red tannia (*Xanthosoma violaceum*) is not a climbing crop, but is larger, sturdier and more perennial-like than the normal white tannia. Both types of tannia can be planted on swiddens and ploughed farms, but red tannia also produces well on extensive farms. It requires little attention apart from the digging of a planting hole and some ring weeding. Erni (1989) observed that red tannia, once established, yields continually for many years and needs only little additional care. Although not as flexible as yam, red tannia can also serve as a food reserve.

Mangyan traditions as a source of knowledge for innovation. Both yam and red tannia were traditionally important crops which have now been rehabilitated in order to overcome contemporary problems. Thus, even though the Mangyan no longer practice the original traditional swidden cycle, knowledge of this cycle is still very relevant as they develop new agricultural strategies. These adjustments, unlike introduced agricultural technologies such as plough farming and SALT, also strengthen the cultural identity of the swiddeners. Hopefully, the flexibility and the potentials of swidden agriculture will be recognised by the agriculturalists and policy makers responsible for the uplands and forests inhabited by swiddeners.

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Achieving sustainability

Teaching farmers that green manure and cover crops have valuable uses besides maintaining soil fertility can help sustain the widespread use and adoption of green manuring practices

Roland Bunch

Today, well over 125,000 farmers are using green manure and cover crops in Santa Catarina, Brazil. Green manure and cover crops are equally popular in neighbouring Parana and Rio Grande do Sul. In Central America and Mexico, an estimated 200,000 farmers are using 20 traditional systems involving some 14 different species of green manure and cover crops and organisations from Central Mexico to Nicaragua are promoting their use in at least 25 additional systems. Across the ocean in West Africa more than 50,000 farmers have adopted *Mucuna* spp. or *Dolichos lablab* as green manures in the last eight years

The present widespread use and rapid adoption of green manure and cover crops has taken many people by surprise. To some extent this is because little attention has been given to the extent to which green manures and cover crops have always been used in traditional systems. Gene Wilken, for example, in his otherwise excellent book, **Good farmers: traditional agricultural resource management in Mexico and Central America**, stated that "cover cropping is not widespread in traditional Middle America," (Wilken 1987). Many scientists believed the technology inappropriate for village farmers. As late as 1989, Anthony Young in the classic **Agroforestry for soil conservation** dismissed green manuring as "a form of non-productive improved fallow which has rarely found favour with farmers". (Young 1989)

Sustainability

For more than a decade it has been accepted that green manures and cover crops would only be accepted by small farmers if they could be grown on land that had no opportunity cost, could be intercropped with other produce, grown under tree crops or on fallow land and be cultivated in periods of expected drought or extreme cold. They would also be favoured if they involved no extra labour or out-of-pocket cash expense (Bunch 1995).

Whilst these assumptions have proved correct, recent experience has shown that the sustainability of green manure and cover crops is more likely to be guaranteed when they provide farmers with some other benefit besides fertile soil. This condition is consistent with the observation that village farmers generally prefer multiple use technologies.

Experiences worldwide

Experience from many parts of the world confirms the value farmers' attribute to green manures and cover crops that have multiple uses. In most known, traditional systems legumes are appreciated not only because they maintain soil fertility, but because the seeds or pods can also be eaten. Examples include the *Vigna* spp. which is intercropped in Southern Honduras, El Salvador and South-east Mexico and the high-altitude scarlet runner bean (*Phaseolus coccineus*), which is widely used from upstate New York (Seneca bean) to Mexico (ayocote) and from Guatemala (piloy) to Honduras (chinapopo) and Northern Chile. The velvet bean (*Mucuna* spp) is easily the most popular of