Deutscher Tropentag 2000 in Hohenheim
Session: Technologies, Institutions and Policies for Natural Resource Conservation

Productivity increasing versus resource conserving technologies: A case study on the farming systems of the Black Thai in the uplands of north-west Vietnam

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Abstract

In the mountainous regions of northern Vietnam soil erosion and natural resource degradation are of major concern. Productivity improving innovations can be counterproductive to longer term resource conservation measures, as increasing yields conceal the long term soil fertility decline caused by erosion. Problem consciousness is a necessary condition for farmers but even that will not improve the adoption behaviour towards resource conserving technologies, unless erosion control measures and methods for improving the soil fertility at hand are economically more attractive to farmers. Here more research is needed for further research to adapt the existing technologies to farmers' constraints.

Keywords: new technologies, sustainable land use, Vietnam

Introduction

After the implementation of the program of economic renewal in Vietnam ("Doi Moi"), the country experienced significant growth in all economic sectors with impressive growth rates ranging between 7 and 9 percent through most of the 1990s. However, the regional distribution has been uneven, with growth concentrated in the irrigated rice areas and urban centres.

In Vietnam, where around 80% of the population depends on income from the agricultural sector, three-quarters of the land area is mountainous and agricultural land is scarce with 0.1 ha per capita (GENERAL STATISTICAL OFFICE 1998). High population growth rates,

resettlement programs and extensive reforestation programs have increased the pressure on agricultural land. Marginal areas, mainly on steep slopes, are cultivated and often maladjusted farming methods are applied. Agricultural productivity therefore is low. Additionally, soil erosion and natural resource degradation are of major concern.

To cope with this problems national and international development organisations are working in mountainous regions to introduce productivity increasing and resource conservation technologies (RCT). Productivity increasing technologies (PIT) imply mainly new varieties, the use of fertiliser and the planting of winter and autumn crops. For the conservation of natural resources, RCT like hedgerows, microterraces and inter-cropping maize with beans have been introduced to the farmers. The introduction of PIT proved to be quite successful but the acceptance of RCT is still very low (FRIEDRICHSEN 1999).

1. Research problem

Under certain conditions, PIT can suspend the introduction of longer term resource conservation measures. RCT will not be applied if PIT caused short term increases in yields overshadow the long term soil fertility decline caused by erosion. This paper analyses the different reactions of farmers towards PIT and RCT and the interaction between these two approaches in the mountainous regions of north-west Vietnam.

2. Research area and methodology

This study was conducted in six Black Thai villages of the Yen Chau district of Son La province in the north-west of Vietnam. 80% of the province's area is mountainous. The province is populated by various ethnic groups; the Black Thai is the largest one with 58% (STATISTICAL PUBLISHING HOUSE, 1996). For the Black Thai, irrigated rice growing in valleys is the basic agricultural activity. In addition subsidiary crops on upland fields are cultivated. The most important crops on the uplands are upland rice, maize and cassava. PIT as well as RCT are introduced in the research region by the Social Forestry Development Project (SFDP),

a Vietnamese-German technical co-operation project and different non governmental organisations (NGO), like Action Aid or Care International.

This work is based on a farm household survey with standardised questionnaires in 1998, covering 100 smallholders. Each farm household was interviewed three times to get reliable data of the family, tenure and availability of resources, farm activities and the cash in- and cash out-flux of the farm between December 1997 and November 1998.

In group discussions, a historical transect of the village was developed and the approximate structure of upland cultivation over the last 50 years was recorded. Supplementary, the participatory research tool *ranking* was applied to picture the changes in yields and areas of important crops over the same period. Major emphasis was laid on understanding the reasoning and reaction of farmers in the past and today towards the way of cultivating their upland fields.

3. Results and discussion

3.1. Productivity increasing technologies

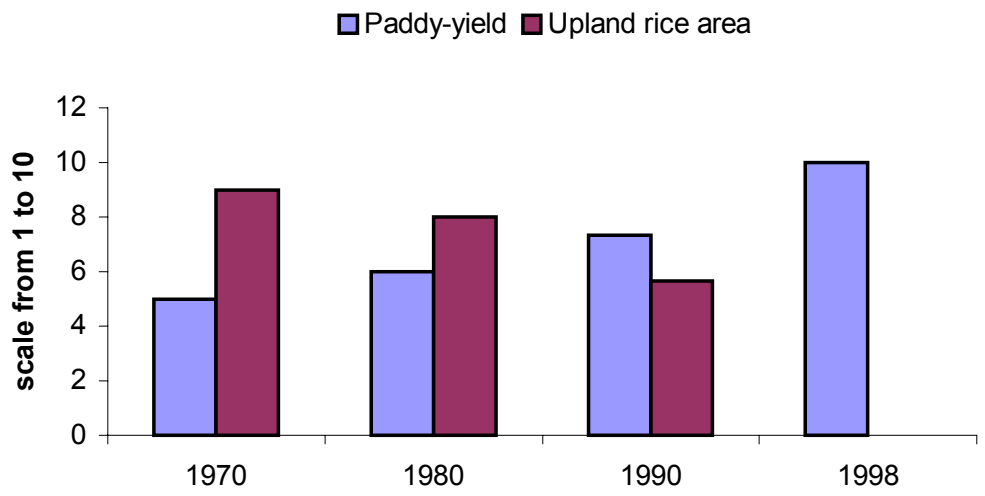
The main impact of crop intensification can be found in paddy rice production. Farmers are less reluctant to apply PIT on paddy fields than they are in upland cultivation (Table 1) with the exception of high yielding varieties (HYV). HYV in the uplands are mainly used in maize production but rarely for the other crops.

Table 1: Share of farmers which use high yielding varieties, fertilisers and pesticides on their paddy and upland fields (in %)

	Paddy fields	Upland field
High yielding varieties	86	85
Fertiliser	69	28
Manure	67	8
Pesticide	59	16

Source: own survey, 1998

Through the promotion of (HYV), fertiliser and agrochemical in paddy rice cultivation, productivity has increased from 1650 kg/ha in 1990 to 2340 kg/ha in 1998 (STATISTICAL PUBLISHING HOUSE 1995/1998). The increasing yields on paddy fields also had a strong influence on the upland cultivation system. Through increasing yields in paddy rice production the area of upland rice declined. In villages with large paddy areas the cultivation of upland rice was even completely abandoned (Figure1).



Note: Ranking on an ordinal scale from 1 to 10, best = 10

Figure 1: Development of paddy rice yield and upland rice area since 1970 in Son La Province

Self sufficiency in rice is still a major and dominant objective of the farm households and has high priority. Due to increased paddy rice yields more farm households can now meet the rice requirements alone from their paddy fields. Upland rice cultivation is therefore declining and amounts today to only 12 % of the upland cultivation area. This land is now increasingly used for other crops, mainly for maize (Figure 2).

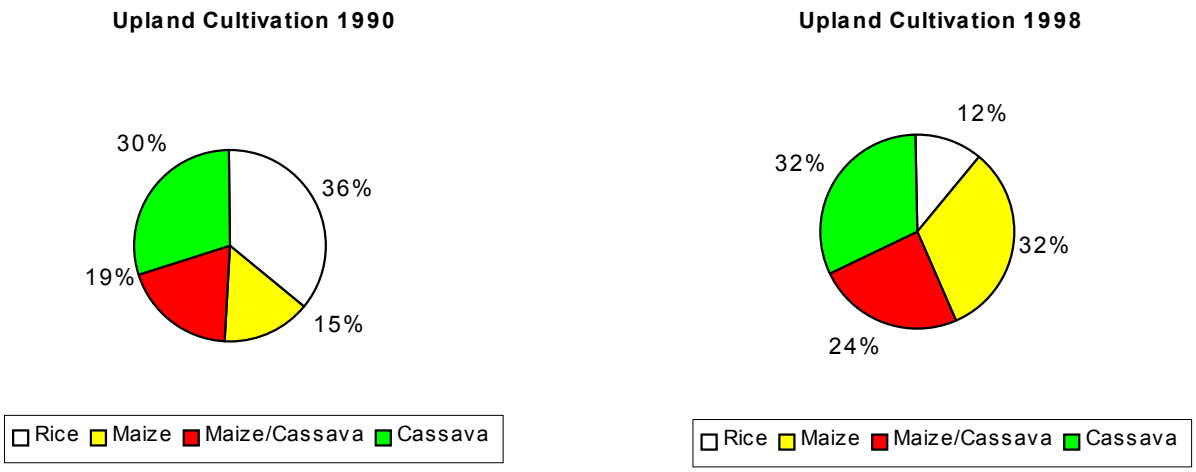
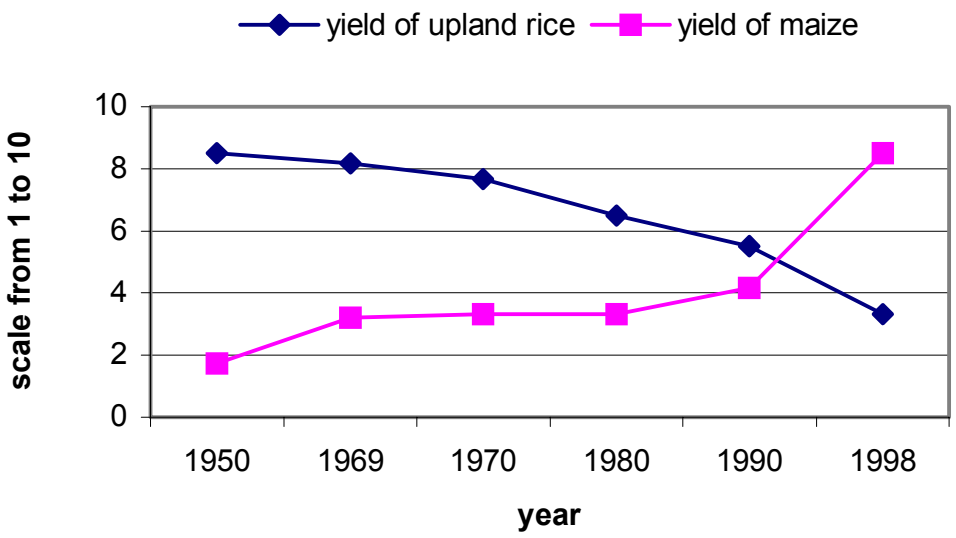


Figure 2: Development of upland cultivation in six Thai villages between 1990 and 1998, cultivation in % of total upland area

The maize area increased significantly and takes up now 32% of the upland area. In general one can observe that upland rice was substituted through maize cultivation.

Not only the area in upland rice cultivation decreased, also yields per hectare declined (Figure 3). In contrast maize yields increased remarkably over the last ten years. In upland rice production, improved varieties were not strongly promoted and not applied by the farmers. Of the surveyed farmers, none was using new varieties for upland rice.

All farmers who are still growing upland rice are using traditional varieties. Through the use of the same varieties over a long period farmers did notice continuous decline of yields and associated this to decreasing soil fertility and erosion. WEZEL ET AL. (submitted) found lower maize and cassava yields as well as lower soil fertility at the lower positions of the slopes caused by erosion and by enhanced mineralisation due to more frequent historic cropping. They underline the observation of the farmers that erosion even without visible signs of soil erosion exists, soil degradation proceeds resulting in reduced yields.



Note: Ranking on an ordinal scale from 1 to 10, best = 10

Figure 3: Development of yields in maize and upland rice production in six Black Thai villages between 1950 and 1998

Since a few years, improved varieties for maize are promoted by projects and the extension service and are widely applied by farmers. 79% of the farmers who plant maize are using new varieties. Due to the application of HYV, maize yields on upland fields increased significantly. In maize production, the consequences of decreasing soil fertility is concealed by the increasing yields.

On upland fields farmers are using HYV but they are still reluctant to use other PIT, like fertilisers or pesticides (Table 1). The resulting decline in soil fertility will probably accelerate in the future as farmers continue to cultivate their upland fields without using fertilisers or RCT. Consequences will only be perceived when serious depletion of soils has already taken place.

3.2. Resource conserving technologies

RCT in form of hedgerows, covercrops and microterraces are promoted in the research area. Hedgerows are planted with Leucaena sp., Tephrosia sp., Cajanus sp. and Indigofera sp., legume tree species, in rows with three to eight meters distance. Soil building above hedgerows,

can be observed and indicates the effectiveness of hedgerows in reducing soil loss due to erosion. Microterraces are small terraces with a width of 50-100 cm established along contour lines with a slight inclination towards the slope. Different grasses and legumes as well as covercrops, are used as a vegetative cover to protect soil from the impact of monsoon rains during the early stage of the crop and after the harvest. The purpose of these RCT is to reduce erosion and to improve soil fertility. Nevertheless, the rate of adoption of these RCT is very low. From the 100 surveyed farmers, nine applied microterraces, but only in sugarcane fields. Hedgerows and covercrops were not applied at all by these farmers.

Sugarcane is a relatively new crop in the area. The cultivation of sugar cane was introduced with the support of a sugar cane factory supplying a technology package. The factory promoted micro-terraces to alleviate fertiliser loss (DUFHUES 2000). For traditional crops like maize, upland rice and cassava, micro-terraces were not applied.

RCT was neglected mainly due to the fact that the adoption reduces the area available for crop production and needs substantial labour input. A study done in villages of the Social Forestry Development Project Song Da, operating in Yen Chau District, found increasing workload through the adoption of ecologically favourable technologies for 46% of the male and 60% of the female respondent (LUIBRAND 2000).

In the case of hedgerows capital for purchasing seeds for the hedges is necessary but capital or access to credit is very limited in farm households (THEESFELD 2000, SCHENK ET AL. 1999). From the farmers only 52% had taken a credit, and only 24% where using it for farm activities. Additionally, there is no necessity for farmers to adopt RCT, because maize yields, due to the continuos switch to HYV, continue to rise. Thus, production is considered by farmers as sustainable. Obviously, farmers base their economic decisions on short term benefits without taking the external costs of soil erosion for present and future generation into account.

4. Conclusions

The livelihood of a farm household is based on its agricultural production, and long lasting economic benefits can only be achieved through sustainable intensification of agricultural activities. Farmers are interested in HYV and willing to plant them on their fields but they are still hesitant in the use of fertiliser. Extension services need to give more and better explanations on the effects of fertiliser and their application methods. The introduction of new varieties should go hand in hand with the introduction of fertiliser.

Farmers are well aware of erosion and declining soil fertility but they do not see the necessity for the introduction of RCT on their fields. At present, PIT can compensate the losses caused by erosion and declining soil fertility. Without a change in cultivation methods serious depletion of soils will take place. In the long run, yields will decline and this development will have a negative impact on the livelihood of farm households.

Better understanding alone will not improve the adoption behaviour of RCT, unless erosion control measures at hand are economically more attractive to farmers. Long-term sustainability without short-term economic incentives will not be in farmers interest. RCT are still very labour intensive and land consuming without any short term economic benefits for the farmer. For hedgerows and inter-cropping, crops or plants must be found which farmers could use as animal fodder or as cash- or food crop. Here, there is still an immense need for future research. Microterraces will always be a very time and labour consuming method without any noticeable short term benefit for the farmers. Here it is important to find incentives to make their adoption more attractive to farmers.

At best, technologies which consider both PIT and RCT, should be developed in a participatory way including farmers knowledge and experiences. The Vietnamese government needs to elaborate policies, which help to promote the adoption of technologies which combine PIT

and RCT, so called “overlap technologies” (VOSTI AND REARDON 1977) and create incentives for farmers to apply them.

5. Acknowledgements

Many thanks to G. Buchenrieder and A. Wezel who went through the manuscript with valuable remarks The research was made possible through the financial support provided by the Ministry of Science, Research and Art of Baden-Württemberg, Germany and the Eiselen Foundation, Ulm, Germany.

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