

Economic Appraisal of Sugarcane Production in Peasant Households in the Son La Province, Northern Vietnam¹

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1 Introduction

Vietnam is in a transition process. Due to the political changes in the mid-1980s, known as “Doi Moi”, a change took place from a purely planned economy to a market economy orientation (Bryant, 1998). In the process of “Doi Moi”, the legal framework for the private economy was created (Kurtz, 1997). These changes also influenced the agricultural production structure. Former agricultural cooperatives were split into private peasant farms. At the beginning, these farms were mainly subsistence-orientated. As markets for in- and outputs developed, agriculture became more market-orientated. Although more slowly this development took place in the northern provinces, too, where the industry and infrastructure are less developed than in other areas of Vietnam. The central and regional governments tried to accelerate this development through various measures mainly focused on the agricultural sector. One of them comprised the building of a sugarcane factory in the Son La province, Mai Son district.

1.1 Problem Statement

The reasons for setting up a sugarcane factory was that peasants, too, would profit from the sugarcane production. The following advantages for peasants were considered:

- increase of farm income,
- more cash income in times of liquidity scarcity,
- breaking of labor peaks due to the ratoon cropping technique² and the harvesting time in the winter season,
- purchase of plant material only every third or fourth year and
- protection against erosion due to the ratoon cropping and the creation of micro-terraces.

Land in Vietnam is still owned by the state (Pingali, 1997). Farmers get titles only for the use of the land (red books³). But not every farmer has access to these land-use rights. For farms without land-use rights, the government can decide what crops the farmers should cultivate. The sugarcane factory can act as a deputy of the government and can force the farmers to cultivate sugarcane. This, for example, was the case with several farms interviewed within the framework of this paper. If the farmers refuse to cultivate sugarcane, the government can exclude the farmers from the use of land. The sugarcane factory runs an extension service to promote sugarcane production and to give advice on its cultivation. Only few farmers had cultivated sugarcane before the sugarcane factory started its operation. The state-controlled

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² Ratoon cropping: The plant shoots out again after harvesting. Up to eight harvests are possible depending on the crop and the kind.

³ Red book: It is a document which transfers the land-use rights for agricultural production areas from the state to the farmers. These rights are valid for 20 years. The document has a red cover and is therefore called “red book” (Kurtz, 1997).

cultivation, the intensive promotion through the extension service and the fact that sugarcane is a new crop for most of the farmers may be reasons why production factors are not allocated at an optimum.

1.2 Objectives and Research Hypotheses

The objective of this research is to analyze the impact of sugarcane production on peasant farming systems in the district Mai Son and to identify reasons for the adoption or non-adoption of this specific production method. For this purpose, a full descriptive farming system analysis was conducted. The profitability of the sugarcane production has been assessed by a linear programming model.

Based on the problem statement presented above the hypotheses are formulated as follows:

1. The production of sugarcane is particularly suitable for resource-poor farms.
2. The production factors are better used in the sugarcane production than in competing production methods.
3. The high adoption rate of the sugarcane production is caused by the relevant household income improvement through this production method.
4. The production factors are optimally allocated in the farming systems.

2 Research Methods and Data

Empirical fieldwork was conducted in the Son La province of Vietnam. Three villages were selected for the survey in the communities of Hat Lot and Co Noi, Mai Son district. The three villages are populated by the Black-Thai minority.

2.1 Selection of the Villages and Households

A multitude of villages could not be considered for the sample because research permissions were denied. No permissions were given for villages of the Hmong minority and for villages close to the border of Laos. Other villages were excluded because of infrastructural shortcomings. The villages were selected by defined selection criteria, which reflected the infrastructure connection, the total village area, a wealth indicator and the attitude of the village chief towards the sugarcane factory. The chosen villages were Hua Tat (26 interviews), Mu Kit (30 interviews) and Na Path (26 interviews). The households were selected randomly out of a tax list. In each village, about 40% of the village population were interviewed (see Table 1). The interviews took place from August to September 1998 and a standardized questionnaire was used.

2.2 Classification of the Surveyed Households

The farming systems were classified into sugarcane cultivators and non-cultivators. Through this classification differences in the decision making of the farming systems could be identified. Normally a village or region is quite heterogeneous. Therefore the development for each farming system ought to be predicted. Consequently the sample needs to be classified according to the identified groups (Doppler, 1997). The size of the sugarcane area varies widely from 450m² to 20.000m². Thus, the sugarcane cultivators were sub-classified in farming systems with a big or small sugarcane area. This measurement should increase the homogeneity in each class and the heterogeneity between each class and therefore the estimation of the future development should be more realistic and more valid (Doppler, 1991). The sugarcane areas were sorted in ascending order to identify the upper and lower boundaries of the classes (Doppler, 1998). The heterogeneity between the classes was verified in a variance analysis.

The farming systems were classified into three groups:

- Class (1) farming systems without sugarcane production (n = 23)

- Class (2) farming systems with a sugarcane area of 2.000 m² and less (n = 25)
- Class (3) farming systems with a sugarcane area of over 2.000 m² (n = 34)

2.3 Econometric Methods

The farming systems data are described by the arithmetic mean or by the percentage. The significance of the differences were verified using an ANOVA.

The allocation of the production factors in the farming systems were analyzed by a linear programming model. This model renders a simultaneous view of all farm levels and the correlation between all production methods. The linear programming has proved a powerful planning instrument to determine the optimal organization of farms. A stability analysis was carried out to judge the validity of the optimal solution (Dabbert, 1995). The linear models are based on the average farms and additionally on selected cases of each class. Distortions, which can easily occur in the model of the mean farm, have been indicated by choosing real farms from each class. Hazell & Norton (1986) say: "Ideally, a model should be constructed for each individual farm." Clearly, this was not possible here. Therefore farms which represent their classes best were carefully selected. This was done with a distance measurement between important variables (family labor, arable area, properties). In this case the Euclidian⁴ distance measurement was used (Hartung & Epelt, 1995; Bley Müller *et al.*, 1996). The farm with the lowest sum of the Euclidian distance has been chosen in each class. Those farms were defined to represent their class best.

3 Farming System Analysis

In the following sections the farming systems will be described and analyzed by qualitative and quantitative data.

3.1 Labor Force and Child Labor

The big sugarcane farms (big-sc-farms) are identical to large families with a considerable working force. It is the opposite in the non-sc-farms (see Table 2). Labor peaks are normally covered by family members, by friends or by extending the daily working time. Only a few farms of each class hire daily labor.

Table 1 Family and labor structure of the surveyed households

	Non-sc-farms n = 23	Small-sc-farms n = 25	Big-sc-farms N = 34	Total n = 82
Ø number of persons / family	5.6	6.8	7.2	6.6
Ø number of family worker	2.2	2.6	2.7	2.5
Percentage of the farms using child labor	57	72	94	77

Source: Dufhues (1999)

The use of child labor is widely spread in all farming systems. Altogether, three quarters of the children work on the farms on a regular basis. Normally, the children work half of the day, and in the other half they go to school. The children are supposed to feed animals, particularly buffaloes and cattle, which are taken by them into the mountains for grazing. In the regional cultural context, the tending of the animals is not considered as child labor. But about one quarter of the children has to work on the field as well. Especially the big-sc-farms use chil-

⁴ The distance between two objects is calculated usually by the Euclidian measurement (Bortz, 1989). It measures the shortest length between two points in multi dimensional space.

dren as labor force (see Table 2). These farms own more animals than farms in other classes (see also Table 7) and have a bigger agricultural area (see Table 3). Therefore these farms have a higher demand for labor which is partly covered by the children. The difference in the use of child labor between the non-sc-farms and the small-sc-farms could be explained by the higher labor intensity in the plant production (see Tables 3, 4 and 5). About 40% of the interviewed farmers plan to invest additional capital into animals, particularly into buffaloes and cattle. This would mean that an improvement of the capital increase would also support child labor. The implementation of labor intensive production methods like sugarcane production would probably expand child labor as well.

3.2 Land Use

The differences in the land endowment between the three classes are significant with a standard error of 5% (see Table 3). Obviously, the small-sc-farms have the smallest arable area. All farmers cultivate land with a wide range of slope, but not all farmers cultivate flat or irrigatable land. The irrigatable land is exclusively used for paddy rice. Sugarcane farmers cultivate on average more paddy rice than farmers without sugarcane production. One explanation could be that sugarcane is only cultivated on the flat land or on land with a little slope, because the land must be trafficable by lorry in order to transport the cane to the factory. Paddy rice is cultivated on the flat land, too, due to the building of irrigating terraces. The flat lands are better connected to roads than steep plots. Therefore it is more likely that a farm which cultivates paddy rice has suitable land for sugarcane as well and vice versa.

Table 2 Arable area per household in hectare

	Non-sc-farms n = 23	Small-sc-farms n = 25	Big-sc-farms n = 34	Total n = 82
Average paddy rice area	0.02	0.09	0.16	0.1
Average agricultural area	1.7	1.5	2.6	2.0
Agricultural area / labor	0.8	0.6	1.0	0.8

Source: Dufhues (1999)

3.3 Agricultural Production

Agricultural income is dominated mainly by plant production. In comparison to plant production, animal production is of little importance. It supplies only 10% of the farm income. The most important crop among all farms is maize, followed by paddy and upland rice, sugarcane and cassava. The cultivation of paddy rice as a staple food is deeply connected to the regional culture. A paddy rice area is counted as a status symbol. The paddy rice areas are the subsistence insurance for the villages (Bryant, 1998). Soybeans are not important for the average farm, but on single farms the cultivation area of soybeans extends up to 25% of the arable land. The sugarcane production competes directly with maize as far as the area of cultivation is concerned. These two methods will be considered more closely in the following sections.

3.3.1 Sugarcane Production

Sugarcane is mostly cultivated in a three to four year ratoon. The harvest takes place during the dry season, between December and March. The yields are high in the first years and decrease in later years (Rehm & Espig, 1996). Most of the farms are in the first or second year of cultivation.

The intensive maize production on upland fields and the reduction of fallow periods has led to serious erosion problems (Luibrand, 1999). The cultivation of sugarcane can prevent erosion damage due to the ratoon cropping technique and cultivation of sugarcane in micro-terraces. But this effect does not appear on the plots where it is mostly needed, namely the very steep

slopes. Sugarcane is grown only on land which is accessible by lorry (see also section 3.2), and this land is generally flat or land with only a little slope.

All surveyed farms except one sold the cane to the factory. This specific household produced sugar itself. Farms which process sugar on a small-scale basis have to pay a tax of VND 30,000 per production day in order to reduce private competition to the factory. This tax reduces also the private demand of sugarcane raw material.

The factory offers a production credit up to seven million VND per hectare to the sugarcane producers. Three million VND are paid out in cash and the other four million in kind (plant material, fertilizer, pesticides). The interest rate amounts to one percent per month, if the credit is paid back within one year and 1.2% if the credit runs for a longer period. A production credit is less expensive than a bank credit, because the bank charges an interest rate of 1.6% per month. If the farmers take the production credit, they are forced to sell the sugarcane exclusively to the factory. Over 70% of the farmers took the credit and were therefore contractually obliged to sell the sugarcane to the factory.

The price for the cane depends on the variety and the quality. Each variety has two quality levels which are determined in the sugarcane factory. The average price per kilogram cane is VND 220. Private traders pay about 20-25% more than the factory for good cane quality. The sugarcane is transported from the field to the factory free of charge⁵.

The yields and the prices in both classes are almost identical. The big-sc-farms began the cultivation on average two years earlier than the others (see above). Accordingly, the yields in these classes should be significantly higher. But the small-sc-farms compensate this through the higher use of inputs such as capital and work (see Table 4). In general, the production on small plots is more intensive. However the increase of the yields is eaten up by the higher input costs. At the end, the marginal return of the big-sc-farms is significantly higher with a standard error of 5% than those of the small-sc-farms.

The yields on farms without credit are on average 12 tons higher per hectare than on farms with credit, and the gross margin is VND 1.3 million higher. This could be explained by the fact that many of these farms started earlier with the sugarcane production, and due to the ratoon cycle they gain higher yields. Many of the early adopters of the sugarcane production took no credit. These farms were less depending on the credit of the sugarcane factory than the following farms. The pioneers of new production methods are normally the more wealthy farms with a good resource endowment. They have a certain margin to play with and are therefore willing to take more risks than farms which live closer to the subsistence level (Hoffmann, 1997).

In total, seven farms have a negative gross margin. All are found in the class of small-sc-farms. These farms have a small area of arable land and a relatively low family income. According to the farmers there were no negative environmental factors which influenced the sugarcane production. The sugarcane cultivation was obviously implemented without solid review of the special farming conditions in those cases. This may be connected with the problem that the economically weak, in particular, sometimes engaged in unprofitable investments (Hoffmann, 1997). These farms also implemented the sugarcane production later than the others. Consistent with the research experience, late adopters review innovation less carefully (Hoffmann, 1997).

⁵ All prices are farm gate prices.

Table 3 Marginal costing of sugarcane production in million VND

	Small-sc-farms n = 25	Big-sc-farms n = 34	Total n = 59
Yield t / ha	31.2	33.0	32.0
Price VND / kg	219	220	220
Gross yield	6.9	7.1	7.0
Plant material: divided into three years	1.0	1.0	1.0
Fertilizer	2.6	1.3	1.8
Pesticides	0.3	0.2	0.2
Cost for ploughing	0.0	0.1	0.1
Total costs	3.8	2.6	3.1
Interest rate	0.5	0.3	0.4
Special cost total	4.3	2.9	3.5
Gross margin / ha	2.6	4.2	3.5
Labor days / ha	691	344	391
Labor productivity in VND / day	3,800	12,200	9,000
Capital productivity in VND	1.6	2.5	2.0

Source: Dufhues (1999)

3.3.2 Maize Production

Maize yields are sold to over 90%. Farmers use the remaining part to feed animals or in rare cases as food. Farmers assess maize as a staple food of very low quality. It is ranked lower than cassava. Only households with a very low family income use maize as food.

Maize yields of the surveyed farms are very high in comparison to the average yields of farms in the Mai Son district (see Table 5). The average yields in this district are 5.3 t/ha (Agriculture book district Mai Son, 1998). The extremely high hectare yields suggest that farmers biased the survey on purpose. During the interviews, the farmers probably mentioned only plots where agricultural cultivation is permitted and left out plots where cultivation is illegal. Therefore the calculated hectare yields were overestimated in relation to the cultivated land. The results show hectare yields above the average. This bias is probably only connected to the plots with a slope, because the sugarcane and paddy rice plots are all located in the valleys, and these areas are normally registered in the red book.

Upland rice is also cultivated on plots with a slope. According to the assumption above, the yields of upland rice per hectare should be above the average yields of the district as well. But in fact they are not. Except for the high maize yields, there is no other evidence that the farmers biased the survey on purpose. All analyses in this paper are based on the assumption that the information given by the interviewed persons was correct. Consequently, the high maize yields are assumed to be true as well. But the possible bias mentioned above will be considered in the deviation analysis of the LP-model in the following section.

Differences in the gross margin of sugarcane and maize could be explained by the following:

- Sugarcane is a new production area for most of the farmers. The extension service of the factory gives advice about the cultivation, but cannot totally compensate the experience gained over decades like in the cultivation of maize.
- Inaccurate adoption of the sugarcane production decreases the average gross margin.

- The factory prices per kg of sugarcane are quite low. Private traders are paying a clearly higher price, but most of the farmers are caught in the contract of the production credit to sell the cane to the factory.
- The use of on- and off-farm inputs in the maize production is very low in comparison to the sugarcane production. Consequently the costs of inputs are likewise very low.

Table 4 Marginal costing of maize production in million VND

	Non-sc-farms n = 23	Small-sc-farms n = 25	Big-sc-farms n = 34	Total n = 82
Yield t / ha	8.0	10.6	10.8	10.0
Price VND / kg	1,280	1,140	1,180	1,190
Gross yield	8.8	11.5	11.7	10.8
Plant material: divided into three years	0.6	0.6	0.6	0.6
Fertilizer	0.4	0.4	0.6	0.5
Pesticides	0.0	0.0	0.0	0.0
Total costs	1.0	1.0	1.1	1.1
Interest rate	0.3	0.2	0.3	0.3
Special costs total	1.3	1.2	1.4	1.3
Gross margin / ha	7.5	10.2	10.6	9.5
Labor days / ha	240	303	307	287
Labor productivity in VND / day	31,300	33,700	34,500	33,100
Capital productivity in VND	6.6	9.6	8.3	8.3

Source: Dufhues (1999)

3.4 Farm and Family Income and Capital Supply

The commercialization of the farm products is equal in all classes with around 80%. According to Doppler (1991), the farming systems are subsistence- and market-orientated with intensive market connections. The off-farm income is negligible.

Crop yields of the Black Thai farmers in the Son La province in general and farm incomes have considerably improved in the last years through switching from subsistence products to high value cash crops (maize, fruits, sugarcane, etc.) and through adopting new technologies (chemical fertilizers, pesticides, high yielding varieties, etc). This development was initiated by improved access to markets (Neef, Sangkapitux & Kirchmann, 2000).

The big-sc-farms produce a clearly higher income than the farms of the other classes. This difference, with a standard error of one percent, is highly significant. It could be explained by the high extension of the sugarcane production in this class. This assumption is only partly true, because:

1. Only 18% of the profit of the plant production are provided by the sugarcane production. Therefore maximal 3 million VND of the difference could be explained by the production of sugarcane (the opportunity costs are not considered).
2. In general, the big-sc-farms own more resources. Farms with a better resource endowment are able to produce a higher income.
3. According to the assumption above the returns per hectare of arable land should be higher on farms including sugarcane production. But they are almost identical in all classes (see Table 6).

Table 5 Farm and family income in million VND

	Non-sc- farms n = 23	Small-sc- farms n = 25	Big-sc- farms n = 34	Total n = 82
Farm returns:				
Plant production	12.4	13.9	22.9	17.2
Animal production	2.3	1.5	2.6	2.2
Tenure and other returns*	0.1	0.1	0.1	0.1
Sum	14.8	15.5	25.6	19.5
Farm expenditure:**				
Plant production	1.3	1.4	2.7	1.9
Animal production	1.1	1.0	1.5	1.2
Tax, wages, tenure	1.1	1.3	1.8	1.4
Maintenance	0.2	0.1	0.2	0.2
Interest rate for credits	0.8	1.8	1.2	1.3
Sum	4.4	5.6	7.5	6.0
Farm income	10.4	10.0	18.2	13.5
Farm income / labor	4.7	3.9	6.7	5.4
Productivity of the arable land / ha	6.1	6.7	7.0	6.8
Off-farm income	1.2	0.2	1.1	0.9
Family income	11.6	10.2	19.3	14.4
Family income / person	2.1	1.5	2.7	2.2
Expenditure for living / year	8.4	9.1	11.0	9.7
Owner's capital creation	3.2	1.1	8.3	4.7
Farms with a negative owner's capital creation	30%	48%	15%	29%

Source: Dufhues (1999)

Notes: Total sums may not exactly add up due to rounding inaccuracies.

* other income: e.g. selling of vegetables on the market or compensation payments of the 327-program

** depreciations are left out because of insignificance

The big-sc-farms show the highest owner's capital creation. The difference to the other two classes is significant with a standard error of five percent. Farms with a negative owner's capital creation are in the lowest quartile of the income distribution of the surveyed farms. The high number of farms without sugarcane production which consume their deposits/capital may be explained by the very low yields of upland rice in the last year or by the scarcity of resources in this class. In the class of small-sc-farms there is an even higher amount of farms with a negative owner's capital creation. This could also be related to the scarcity of resources in this class. Another explanation could be that many inaccurate adoptions of the sugarcane production exist in this class which lower the family income. The consumption habit reacts with a time lag to changes in income (Henze, 1994) and could therefore lead to a negative owner's capital creation.

The opening of the markets in general increased the supply of consumer goods in regional and local markets. This could have raised the demand. Without change in the income this effect could result in a negative owner's capital creation as well.

Due to the highest family income, the big-sc-farms own the biggest property. The high debts of sugarcane farmers are mostly a result of the production credits of the factory (see Table 7).

More than 30% on average of the property of small-sc-farms are covered by debts, and 16% of the households in this class have higher debts than the value of their assets. One result of those high debts is that these farms cultivate more upland rice than others because upland rice as a staple food cannot be pawned. This leads to more debts and further dependence because of the low returns and unstable yields of the upland rice. Those households are subject to a “vicious circle”.

Table 6 Property in million VND

	Non-sc-farms n = 23	Small-sc- farms n = 25	Big-sc-farms n = 34	Total n = 82
Assets				
Buildings	10.2	8.3	12.8	10.6
Durable consumer goods	4.6	2.4	5.5	4.3
Animals	4.8	4.7	9.2	6.6
Arable land	4.3	4.0	6.4	5.0
Deposits and leased capital	0.6	0.6	1.4	0.9
Assets in total	24.5	19.9	35.3	27.4
Debts	3.8	6.2	6.5	5.6
Property in total	20.7	13.7	28.8	21.7

Source: Dufhues (1999)

Note: Total sums may not exactly add up due to rounding inaccuracies.

3.5 Extension

The farmers have access to maize, sugarcane and fruit tree extension. The agricultural extension is given by the sugarcane factory or by community officials. There is no difference in the intensity of the extension between big and small-sc-farms. But the difference between the various villages is quite high. This probably depends on the attitude of the village chief towards the extension service, the accessibility of the village and the possession of land-use rights. If farmers do not have red books, the extension service of the factory can just order to grow sugarcane. In that instance, the service does not need to persuade the farmers to grow sugarcane and therefore does not need to pass by that often. This was the case in one village of the survey, namely in Na Path.

The farmers do not criticize the extension service and most of them say that the extension service is helpful. But this does not necessarily mean that the extension service has a high acceptance by the farmer, because to criticize a person who is on official duty offends the Vietnamese tradition. This assumption is also strengthened by the fact that 40% of the farmers do not want additional extension at all.

Many farmers started to grow sugarcane because of the pushy promotion of the extension service. But the extension service rather advertises the sugarcane production than counsels the farmers. The farmers are not in the center of the extension. Hoffmann *et al.*, (1997, p.62) writes: “The extension workers are committed to the welfare of their clients.” In this case the extension workers are committed first and foremost to the welfare of the factory and not to their clients. This probably leads to a high amount of inaccurate adoptions which is confirmed by the sections above.

3.6 Important Determinants of the Adoption of Sugarcane Cultivation

Over 30% of the sugarcane producers say that they grow sugarcane because it saves labor and breaks labor peaks (planting only every third year and harvesting time in the winter). How-

ever this point is more important for the big-sc-farms (see Table 8). The working peaks of these farms are more extreme because they have more arable land to cultivate. In total, sugarcane is more labor intensive than other production methods, except for paddy rice.

The share of farms which are urged or forced to grow sugarcane is extremely high with over 40%, especially in the class of small-sc-farms. In general, these farms start later with the sugarcane production than others. In the first year, the factory did not hit the full production capacity because they did not get enough raw material. The first adopters were persuaded and the following were rather pushed to cultivate sugarcane to hit the capacity of the factory. The socialist past could explain the high portion of farmers which are urged to grow. All farmers were united in cooperatives and all decisions were made in a centralistic and directive way. Even now the farmers show a strong influence in their decision-making process by authorities, e.g. the extension service. The statement of some farmers points into the same direction, namely that sugarcane is easy to commercialize. The factory organizes everything (inputs, transport, sale). This could be a consequence of working within a cooperative for decades, although most cooperatives were dissolved about ten years ago. Still, this could be an influence of the Vietnamese culture. Meyer-Tran *et al.*, (1999) write: “In circumstances of uncertain future expectations, many people are not very eager to make decisions at all.” Maybe many farmers prefer to adopt decisions which are made by others.

Probably many farmers are strongly influenced by their neighbors. Because the neighbors grow sugarcane, particularly the rich and influential ones, the single peasant does not want to stay behind the development. Chauveau (1997, p.132) made similar experiences in Africa: “There the status of cocoa cultivator had become a kind of minimal social norm, so that people who grew no cocoa were misfits, outcast or foreigners.”

Table 7 Reasons to start sugarcane production, in percent

	Non-sc-farms n = 23	Small-sc-farms n = 25	Big-sc-farms n = 34
Easy to grow / little work	16	41	31
Higher income expected	28	24	26
Urged to grow by the factory, government, extension workers	32	18	24
Forced to grow	24	18	20
Breaking labor peaks / labor diversification	4	12	9
Others*	8	6	7

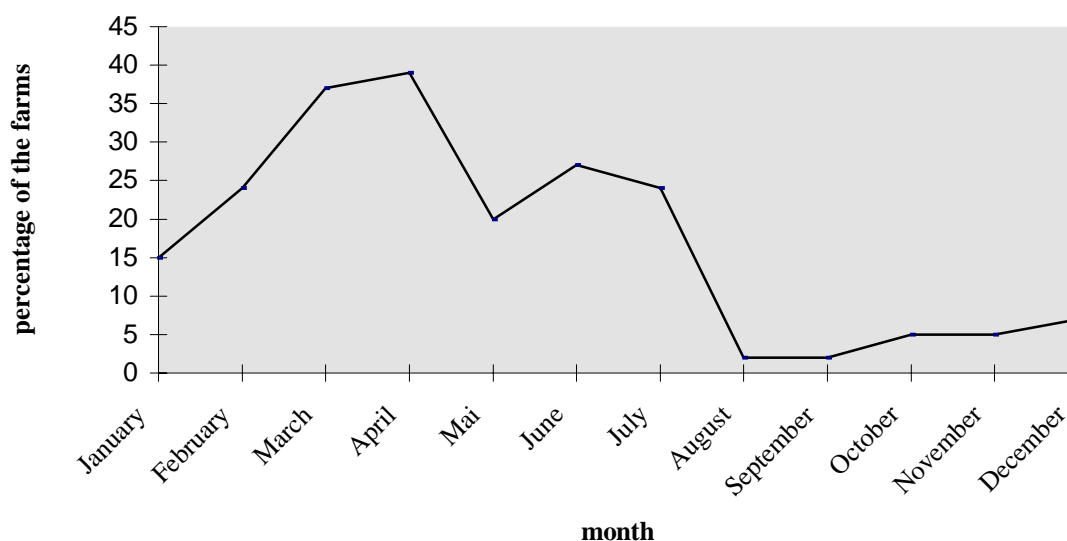
Source: Dufhues (1999)

Notes:

* others: credit, risk diversification, easy to sell

Sugarcane is a very capital-intensive production method. Seventy percent of the sugarcane farmers took this credit, and 60% of the farmers mentioned that they have liquidity problems during the year. There is evidence that the opportunity to get a cheap credit during a time of high need for cash (see Figure 2) could be a decisive criteria to start with the sugarcane production, even if this reason is not explicitly mentioned by the farmers. An explanation why this important point was not mentioned could be that several farmers were discontent with the production credit. The disbursal of some credits was delayed and some farmers did not get the full credit. An advantage of the sugarcane production is to gain money in times of scarce liquidity. But this advantage was partly leveled because the production credit from the factory had to be repaid first, and there were some complaints about delayed disbursal of the money.

Figure 1 Percentage of the farms with liquidity problems within the production year of 1997/98



Source: Dufhues (1999)

4. Simultaneous Comparison of Alternative Production Methods

To weigh the advantages of each production method it is necessary to assess all production methods at the same time within the range of the resource endowment. This is done with a linear programming model. The model used is a strongly reduced representation of the farming reality. The average farms of each class and, additionally, a selected case of each class are optimized. The model restrictions, assumptions and activities are described in Tables 8 and 9.

Table 8 Model restrictions

(1) capital endowment	The amount of free usable capital was determined by the mean owner's capital creation of each class. It was assumed that the costs of living are fix.
(2) land endowment	The land endowment was determined by the average amount of arable land in each class.
(3) labor force endowment	The labor force was calculated by the family labor minus the amount of used activities which were not shown in this model (e.g. collecting fire wood, fruit trees, garden work, etc.). These activities were not considered in the model because of their insignificance.

Table 9 Model activities

(1) paddy rice	Paddy rice can be grown only on irrigatable areas (see section 3.2) and on these plots exclusively paddy rice is grown. Therefore paddy rice was taken into the model with the average area of each class.
(2) upland rice	This model activity has no restrictions. A minimum area of upland rice was not taken into account to cover the subsistence, as about 50% of the farms do not grow upland rice at all.
(3) maize	Maize can be cultivated on all plots. Thus, a restriction of this activity was not introduced in the model.
(4) cassava	More than 95% of the surveyed farms grow cassava. It is cultivated for food, risk spreading and subsistence security. Subsistence security is one of the major aims in peasant households and should therefore be considered in the model (Doppler, 1998). Consequently, cassava was brought into the model as an activity with a minimum cultivation area which represents the average size of cassava plots in each class.
(5) sugarcane	It was assumed that all plots are suitable for sugarcane production because of lack of data and to ease the model.
(6) soybeans	Soybeans can only be cultivated on certain plots. It was supposed that these plots cannot be leased. The area of soybeans was fixed into the model similar to the paddy rice area.
(7) leased area	It is very likely that a farm can only lease a certain amount of land. This quantity was determined in the model by the maximum leased area in the survey (2 ha).
(8) area let on lease	No restrictions were considered because the demand for land is extreme high in this region.
(9) daily labor	No restrictions were considered for employing daily labor because the workers are recruited out of different regions.
(10) off-farm activities	Because of the low opportunities to get off-farm jobs, they were not considered in the model. But it was assumed that it is possible to work on other farms in times of agricultural working peaks (March – May; August - November).
(11) credit	It was supposed that farmers could only take one credit from the bank. Informal sources of credit were not considered. The amount of borrowed money was limited by the average credit amount in each class.
(12) production credit of the sugarcane factory	Only sugarcane farmers can use this credit. The amount of credit was related to the cultivation area and does not pass over seven million VND per hectare.

4.1 Analysis of the LP-model

According to the calculations of the LP-Model, none of the analyzed models cultivated sugarcane. The validity area of the model has a wide range. That means that in spite of insecure data the optimal solution was probably found. Over 70% of the surveyed households cultivate sugarcane, consequently there must be other reasons to start with the sugarcane production which are not included into the model, e.g. urge, advice, imitation, etc. (see section 3.6).

The analysis of the models of real farms showed similar results. But the validity area of the big-sc-farm was relatively small. This implicates that if the scope of the model changed a little, the activity “sugarcane” could become profitable.

4.2 Changing the Scope of the Models

The deviation analysis considers single changes in the scope of the model under the *ceteris paribus* assumption. The following changes in the scope of the model were examined:

Table 10 Adoption of sugarcane production by changed scope of the LP-model

Changes of scope	∅ farm of non-sc- farms n = 23	∅ farm of small-sc- farms n = 25	∅ farm of big-sc- farms n = 34	farm no. 33 non-sc- farms n = 1	farm no. 9 small-sc- farms n = 1	farm no. 20 big-sc- farms n = 1
Raising prices per kg sugarcane						yes
Raising sugarcane yields					Yes	yes
Reducing maize yields						yes
Reducing maize yields & raising sugarcane yields			yes		Yes	yes
Raising capital supply						
Reducing capital supply			yes			yes
Raising credit limit						
Expelling farmers from credit, except the factory credit						
Reducing capital supply & no access to other credits, except the factory credit			yes			yes
Raising supply of arable land						yes
Raising the leasing opportunities						yes
Raising family labor supply						

Source: Dufhues (1999)

The reduction of maize yields could be interpreted by the assumption that the farmers biased the survey on purpose (see section 3.3.1). In the deviation analysis, the maize yields were equaled with the average yields of the district Mai Son. The deviation analysis shows that even with a strong reduction of the maize yields, for most of the farms maize is still the more profitable alternative. Consequently even if the bias were true, it would have no influence on the overall research results. Besides, the capital and working coefficient of maize were not adapted to the bias assumption. With an adaptation to the bias, they would be significantly lower and the profitability of the maize production would rise again.

A boost of the sugarcane and, at the same time, a reduction of the maize yields are necessary to make the sugarcane cultivation profitable to a bigger number of farms. In general, these farms are in the class of the big-sc-farms and have most of the resources available. Despite these conditions, about two thirds of the farms do not yet grow sugarcane.

A reduction of the capital supply makes sugarcane profitable for the big-sc-farms because it is now an advantage to grow sugarcane and to take the cheap credit of the factory. The deviation analysis can be seen as a confirmation of the assumption that the production credit of the sugarcane factory is an important decision criterion for the adoption of the sugarcane production.

The conclusion of the deviation analysis shows that even if the frame conditions of the farming systems change positively toward the sugarcane production, the cultivation of sugarcane will only be profitable for about one third of the farms; and these farms are rather the bigger ones with a good resource endowment. In this context it should be mentioned that the prices per kg sugarcane dropped at about 50% in the year following the survey (Luibrand, 1999).

5 Acceptance or Rejection of the Hypothesis

The hypotheses could not be tested statistically because the sample is not representative. Due to a deep qualitative analysis, assumptions could be made in order to accept or to reject the individual hypotheses.

Hypothesis (1): *The production of sugarcane is particularly suitable for resource-poor farms.*

The big-sc-farms are the resource-rich farms (see sections before). The deviation analysis of the linear programming model shows that the sugarcane cultivation gets rather profitable in the big-sc-farms and that the profitability of the sugarcane cultivation is connected to a good resource endowment. Altogether 14% of the sugarcane cultivators achieve higher gross margins from the sugarcane production than from the maize production. All of these are big-sc-farms. In contrast, farms with a negative gross margin of sugarcane have only few resources available and could be found in the class of the small sugarcane farms.

Due to the results above the hypothesis could possibly be rejected. Sugarcane production is a production area which is suitable rather for rich than resource-poor farms.

Hypothesis (2): *The production factors are better used in the sugarcane production than in competing production methods.*

The descriptive analysis of the production factors shows that the factor productivity is clearly higher in the maize production than in the sugarcane production. This is confirmed by the LP-model, where in none of the models sugarcane was grown. Thus, the hypothesis can most likely be rejected. That means that the production factors are better used in other crops.

Hypothesis (3): *The high adoption rate of the sugarcane production is caused by the relevant household income improvement through this production method.*

Only a small part of the household income could be explained by the sugarcane production (see section 3.4). Just 20% of the sugarcane producers say that they grow sugarcane to increase the farm income. There is evidence that in many cases the income dropped through the implementation of the sugarcane production. Sugarcane production was excluded in the optimal solution of all LP-models. If the sugarcane production was replaced by the maize production, the household income would rise. As shown in section 3.6, there are several other reasons for the adoption of the sugarcane production. Therefore, the hypothesis could probably be rejected.

Hypothesis (4): *The production factors are allocated at an optimum in the farming systems.* According to the LP-model, none of the analyzed farms hit the optimal allocation of production factors. The hypothesis is rejected.

6 Final Conclusions and Further Research Needs

The aim of this chapter is to present the final conclusions and to address further research needs as well as possible developments.

6.1 Final Conclusions

The production intensity of sugarcane is already quite high. A further increase of the production intensity through an increasing use of external inputs would offer only a small potential for raising the sugarcane yields.

The provincial government should promote the creation of a free market for the land-use rights to increase the mobility of the land. The land-use rights will likely move to the more productive farms. These farms are, in general, the resource-rich farms. Therefore, this measure could have a positive effect on the extension of the sugarcane production. Another measure to promote sugarcane production could be the improvement of the infrastructure in the villages, mainly roads, to develop more areas for the cultivation.

The promotion of sugarcane cultivation should focus on a long-term sustainable production. That means that the production must be profitable for the single farmer. Otherwise the macro-economic costs (wrong factor allocation, controlling cost, subsidies, etc.) are much higher than the social benefits. In the long run, an optimal allocation of production factors on the farm level leads also to a higher productivity on the district level. In this context the extension service in general should concentrate more on the real needs of the farmers and on their welfare. In particular, the sugarcane extension service should focus only on farms with favorable conditions for sugarcane production to avoid inaccurate adoptions.

6.2 Possible Developments and Further Research Needs

It can be assumed that the know-how of the sugarcane production will rise over the years. Therefore, it can be expected that the sugarcane yields will increase and sugarcane will be a profitable production method for more farms than it is now. Still, maize will be the more profitable alternative for most of the farms.

20% of the non-sugarcane farms plan to start with sugarcane cultivation, and about 30% of the sugarcane cultivators plan to extend the production. Facing this development, 20% of the sugarcane cultivators want to reduce or stop the production. After the first ratoon circle one can suppose that this amount of farms will rise noticeably. At this point, all cost and yields can be overviewed and many farms will notice that maize production is more profitable for them.

As the ratoon circle goes on, more and more farmers will pay back their loans to the factory. Then they are not any more bound by the credit contract and can sell the cane to private purchasers at a better price. This can lead to a lack of raw material in the factory. But this will lead more likely to quality problems because the high quality cane will be purchased by private traders, and the factory will get only the low quality cane (low sugar content, high content of fiber).

The sugarcane production is a good opportunity for some farmers to increase their farm income. Still, for most of the farmers this is not the case. This survey shows that the main positive impacts of the sugarcane production (improvement of farm income, gaining cash income in times of scarce liquidity, protection against erosion) did not reach many farms, and on some farms the income situation became even worse. Some households are deeply involved in

debts and are trapped in a vicious circle. The production of sugarcane seems to worsen this situation. Nevertheless, the sugarcane production had some positive impacts on the leveling of labor peaks.

This survey showed that the decision, research and extension structures in Vietnam are still strictly top down. The farmers are at the end of the development process and do not participate in the decision-making process at all. Out of this, some general questions appear:

- Why are the farmers hardly involved in the development processes? Why does the government not trust the farmers in general, and why does the government not trust/use the knowledge of the farmers? And finally, how could the farmers get involved in these processes?
- Why can the farmers be so easily influenced by the authorities, even after ten years of breakdown of the cooperatives? Could this be explained sufficiently by the Vietnamese culture alone or are there other reasons?
- Many of the farmers cultivated a new crop on the advice of the extension service and it failed. Do they trust the extension service any more?

In this region there is clearly a need for an extension service which is much more committed to the welfare of the farmers than it is now. Even if the extension service is committed to the welfare of the clients, it should not try to solve the problems for their clients, but rather support them by finding their own solution. Furthermore, an extension service would be needed which informs the farmers about their rights and educates them to act and to decide on their own.

The numerous credits which were taken by the farmers from the sugarcane factory can, on the one hand, be related to the promotion of extension service. On the other hand, it can indicate a high demand for short-term production credits. Probably formal institutions in this region do not supply those services, or there are big constraints for the farmers to get access to them. In this context, future research should focus on adapted credit products, too.

The increase of cash crop cultivation leads to an improved farm income and a higher living standard in many households, but also to a decrease of staple food production. This again can induce higher food prices. Low food prices play a key role for food security of the poorest who spend the main part of their income on food (Heidhues, 2000). In this context, research should be undertaken, how the poorest of the poor are affected by the new production techniques.

Through the reforestation program the fruit production could become an important income in the future. Therefore, farmers are very interested in fruit trees. Additional research is required concerning the fruit tree cultivation, the marketing and the processing of fruits. The strong increase of fruit tree production could be a further development from annual to perennial farming systems (Doppler, 1991).

References

- Agriculture book, 1998. District Mai Son, Son La Province
- Bleymüller, J. & Gehlert, G. & Gülicher, H., 1996. Statistik für Wirtschaftswissenschaftler. Verlag Franz Vahlen GmbH, München, S. 43 & S. 124
- Bryant, J., 1998. Population and Development Review 24 (2): Communism, Poverty, and Demographic Change in North Vietnam, S. 254-256
- Bortz, J., 1989. Statistik für Sozialwissenschaften. Springer-Verlag, Berlin, S. 688-690

- Chauveau, J.P., 1997. Cocoa as Innovation: Strategies, Institutions and Local Context in the Diffusion of Cocoa Cultivation in West Africa in Comparative Perspective, *Ländliche Soziologie der Entwicklungsländer, Ausgewählte Texte*, Universität Hohenheim, Institut 490 D, S. 122-134
- Dabbert, S., 1995. Einzelbetriebliche Planungsmethoden I. Wintersemester 1996/97 Institut für Landwirtschaftliche Betriebslehre (410 A). Universität Hohenheim
- Doppler, W., 1998. PC-Seminar. Institut für Agrar- und Sozialökonomie in den Tropen und Subtropen (490 C). Universität Hohenheim
- Doppler, W., 1997. Methoden der landwirtschaftlichen Betriebslehre (Farming Systems Approach). Vorlesungsskript Sommersemester 1997, Institut für Agrar- und Sozialökonomie in den Tropen und Subtropen (490 C), Hohenheim, S. 75-90
- Doppler, W., 1991. Landwirtschaftliche Betriebssysteme in den Tropen und Subtropen. Ulmer, Stuttgart, S. 17-24, S. 84-85, S. 92-95, S. 132-137 & S. 190-191
- Dufhues, T., 1999. Ökonomische Bewertung des Zuckerrohranbaus in kleinbäuerlichen Betriebssystemen in der Son La Provinz (Nordvietnam). Stuttgart, Universität Hohenheim, Institut für Agrar- und Sozialökonomie in den Tropen und Subtropen, Lehrstuhl für Landwirtschaftliche Betriebslehre in den Tropen und Subtropen
- Hartung, J. & Elpelt, B., 1995. *Multivariate Statistik: Lehr- und Handbuch der angewandten Statistik*. R. Oldenbourg Verlag, München, S. 70-73
- Hazell, P.B.R. & Norton, R.D., 1986. *Mathematical Programming For Economic Analysis in Agriculture*. Macmillan Publishing Company, New York, S. 143-45
- Heidhues, F., 2000. The Future of World, National and Household Food Security. Research in Development Economics and Policy, Discussion Paper No. 7/2000. Stuttgart, University of Hohenheim, Institute of Agriculture Economics and Social Science in the Tropics and Subtropics
- Henze, A., 1994. *Marktforschung: Grundlagen für Marketing und Marktpolitik*. Ulmer, Stuttgart, S. 85-90 und 195-200
- Hoffmann, V., Hess, C.G., & Kidd, A., 1997. *Kommunikation und Beratung in Entwicklungsländern*. S.3 & S. 62
- Kurths, K., 1997. Private Kleinbetriebe in Vietnam, Rahmenbedingungen und Hemmnisse ihrer Entwicklung. Verlag für Entwicklungspolitik Saarbrücken, S. 1
- Luibrand, A., 1999. Impact of the Transformation Process on the Living Standard of Smallholders and the Environment in Mountainous Regions of Northern Vietnam. In: *Sustainable Landuse Management – The challenge of Ecosystem Protection* -, p. 179-187. Verein zur Förderung der Ökosystemforschung zu Kiel e.V., Kiel
- Luibrand, A., 1999. Expert interview. Hohenheim
- Meyer-Tran, E., Mutz, G., Wolf, K., 1999. *Modernisation and Individualisation in Southeast Asia: The Transformation Process in Vietnam*. Munich, Institut for Social Science
- Neef, A., Sangkapitux, C. & Kirchmann, K., 2000. Does land tenure enhance sustainable land management? Evidence from mountainous regions of Thailand and Vietnam. Research in Development Economics and Policy, Discussion Paper No. 2/2000. Stuttgart, University of Hohenheim, Institute of Agriculture Economics and Social Science in the Tropics and Subtropics
- Pingali, P.L., 1997. Prospects for sustaining Vietnam's reacquired rice exporter status. *Elsevier Science Ltd., U.K.: Food Policy*, Vol. 22 No. 4, S.348 und S. 357
- Rehm, S. & Espig, G., 1996. *Die Kulturpflanzen der Tropen und Subtropen*. Ulmer, S. 27 & S.72

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