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Transition in Vietnam **Impact of the Rural Reform Process** **on an Ethnic Minority**

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German Summary

Ende der 70er Jahre erreichte die wirtschaftliche Lage Vietnams ihren Tiefpunkt. Eine ausgeprägte Armut und kaum funktionierende politische Strukturen prägten diese Zeit. Verantwortlich dafür waren die fast 30 Jahre andauernden militärischen Auseinandersetzungen und ein sozialistisch geprägtes Wirtschaftssystem. Durch die im Jahre 1986 eingeleitete und ab 1988 forcierte Systemtransformation, Doi Moi, von der Zentralverwaltungswirtschaft hin zu einer Marktwirtschaft mit sozialistischer Prägung, konnten in den letzten zehn Jahren bedeutende wirtschaftliche Erfolge in allen Wirtschaftssektoren erzielt werden. Dieser wirtschaftliche Aufschwung manifestierte sich in hohen jährlichen Wachstumsraten des Bruttoinlandsproduktes (BIP) von bis zu 9%, einer Verringerung der Inflationsrate auf 4% (1999) und steigenden Export-raten.

Die wirtschaftlichen Veränderungen fanden zuerst und am tiefgreifendsten im Agrarsektor statt. Die Vergabe von Landnutzungsrechten und die Liberalisierung der Preise führten dazu, daß Vietnam unabhängig in seiner Nahrungsmittelversorgung wurde, Nahrungsüberschüsse produzierte und zum Nahrungsmittelexporteur wurde. Somit avancierte Vietnam vom Reimporteur zum weltweit drittgrößten Re-exporteur. Nichtsdestotrotz gehört das Land durch die oben beschriebene Ausgangslage noch immer zu den ärmsten Ländern der Welt mit einem Pro-Kopf-Einkommen von zirka 400 US\$ in 1999.

Für den größten Teil der Bevölkerung verbesserten sich die Lebensbedingungen durch den Transformationsprozeß. Eine Verbesserung läßt sich vor allem im städtischen Raum, weniger im ländlichen beobachten. Minderheiten, die vor allem den ländlichen Raum besiedeln, nehmen am wirtschaftlichen Aufschwung in noch geringerem Maße teil. Eine dieser Minderheiten ist die ethnische Gruppe der Black Thai, die im Norden Vietnams, einer der ärmsten Regionen des Landes, leben.

Die vorliegende Arbeit hat zum Ziel die technische Effizienz der wichtigsten Anbaukulturen der Bevölkerungsgruppe Black Thai zu bestimmen, um daraus Methoden einer nachhaltigen landwirtschaftlichen Produktion ableiten zu können. Dazu werden zunächst die wichtigen Phasen der institutionellen und ökonomischen Reformen in Vietnam analysiert, um ein besseres Verständnis der Rahmenbedingungen der Zielgruppe zu erlangen. Ferner werden die sozioökonomischen Faktoren, die das Haushaltseinkommen der Landwirte beeinflussen, untersucht, um die unterschiedlichen Einkommenskomponenten der Haushalte differenzieren zu können. Dazu wurden in der vorliegenden Arbeit in sechs Dörfern der Bevölkerungsgruppe Black Thai in der Provinz Son La, im Nordwesten Vietnams, qualitative und quantitative Dorfdaten anhand von Methoden des *Participatory Rural*

Appraisal erhoben. Weiterhin wurden standardisierte Haushaltsbefragungen durchgeführt. Hierzu wurden nach dem einfachen Zufallsprinzip 20% der landwirtschaftlichen Betriebe aus den sechs Dörfern ermittelt was die Gesamtstichprobe von 100 Betrieben ergab. Eine quantitativ-ökonomische Analyse der Daten wurde mittels der stochastischen „*Frontier*“-Analyse durchgeführt. Die stochastische Grenzproduktionsfunktion wurde mit Hilfe eines Modells für technische Ineffizienz geschätzt. Dazu wurde das Programm FRONTIER, Version 4.1, verwendet.

Eine wesentliche Erkenntnis aus der vorliegenden Arbeit zeigt, daß das Einkommen und der Lebensstandard der Black Thai sich durch den Transformationsprozess erhöht hat, aber dennoch das Jahreseinkommen im Vergleich mit dem Durchschnitt in Vietnam signifikant geringer ist. Auch das Durchschnittseinkommen in ländlichen Regionen kann von den Black Thai nur in sehr seltenen Fällen erreicht werden. Trotz des signifikanten Einkommensunterschiedes sind die Black Thai stark in ihrem Lebensraum verwurzelt und ihre Bereitschaft zur Migration in die Städte ist ausgesprochen gering.

Die Betriebssysteme der Black Thai sind subsistenzorientiert mit einem geringen Marktanteil. Der größte Teil des landwirtschaftlichen Einkommens wird durch die Produktion landwirtschaftlicher Nutzpflanzen erzielt, wobei Naßreis mit 24% und Mais mit 38% den größten Anteil haben. Die Tierproduktion ist durch die Haltung von Wasserbüffel und Rindern dominiert. Das Angebot an außerlandwirtschaftlichen Einkommensquellen ist gering, hat sich aber in den letzten zehn Jahren im Zuge der politischen Reformen im Land mit steigender Tendenz erhöht. Wichtigste außerlandwirtschaftliche Aktivitäten liegen im Bereich der Dienstleistung wie z.B. Xe-Om (Mopedtaxi) und Gaststätten sowie Anstellungen in der lokalen Verwaltung.

Die Selbstversorgung mit Reis ist eines der wichtigsten Ziele der Black Thai. Obwohl Reis nicht den größten Anteil am landwirtschaftlichen Einkommen hat und ökonomisch nicht immer die rentabelste Kultur ist, stellt er für die Bauern die wichtigste Kulturpflanze dar; Traditionen und kulturelles Erbe bestimmen die Wertschätzung der angebauten Kulturpflanzen.

Die Analyse der landwirtschaftlichen Einkommen im Rahmen dieser Arbeit macht Unterschiede deutlich sichtbar. Sie ergeben sich hauptsächlich aus Variationen im Einkommen aus Pflanzen- und Tierproduktion. Die erklärenden Parameter Alter, Schulbildung, Abhängigkeitsrate und die Entfernung zum nächsten Marktzentrum sind in der ökonomischen Analyse nicht signifikant.

Erkenntnisse aus dieser Arbeit unterstreichen die Bedeutung einer optimalen Allokation der knappen landwirtschaftlichen Ressourcen besonders der landwirtschaft-

lichen Nutzfläche. Eine 100% effiziente Ausnutzung der vorhandenen Ressourcen könnte zu einer merklichen Steigerung des Jahreseinkommen führen. Mit Hilfe der „Frontier“-Analyse wurde die stochastische Grenzproduktionsfunktion ermittelt. Die Analyse zeigt klar, daß die durchschnittliche Produktion von Naßreis und Mais bei den Black Thai noch steigerungsfähig ist (Effizienzrate bei Naßreis 56% und bei Mais 79%).

Signifikante Variablen beim Anbau von Naßreis sind Feldgröße, die eingesetzte Menge an Saatgut, die Intensität von anorganischer und organischer Düngung und die aufgewandten Arbeitsstunden. Sozioökonomische Variablen sind mit Ausnahme des Alters des Haushaltsvorstandes nicht signifikant. Bei der Maisproduktion ist die Menge des verwendeten Saatgutes und des eingesetzten anorganischen Düngers signifikant. Auch hier sind sozioökonomische Variablen nur von geringer Relevanz. Lediglich die Entfernung zum nächsten Markt hat eine signifikante Bedeutung.

Ließe sich der Anbau von Mais und Naßreis optimieren, könnte das Einkommen eines Black Thai Haushaltes von 870 US\$ um 149 US\$ gesteigert werden. Aber selbst dann würde das Einkommen der Black Thai weder das durchschnittliche Jahreseinkommen von zirka 1150 US\$ eines Haushaltes in Vietnam noch das der städtischen Bevölkerung (zirka 2500 US\$) oder das der Menschen im Südosten des Landes (zirka 2200 US\$) erreichen.

Außerdem ist mit einer hohen Wahrscheinlichkeit davon auszugehen, daß die Erhöhung der technischen Effizienz mit einer Gefährdung der natürlichen Ressourcen einhergeht. Steigende Erträge im Naßreisanbau waren bedingt durch die Einführung von Hohertragssorten Anfang der 90er Jahre und ermöglichten die Deckung des Eigenbedarf eines Haushaltes an Reis. Demzufolge wurde der Anbau von Bergreis vermindert und auf den dadurch frei gewordenen Flächen wurde Mais angebaut. Da beim Bergreis Hohertragssorten nicht in der Region eingeführt wurden, konnten die Landwirte den Rückgang der Erträge direkt feststellen und ihn auf sinkende Bodenfruchtbarkeit und Erosion zurückführen. Beim Maisanbau stiegen die Erträge durch den Einsatz neuer Sorten und überkompensierten so die Folgen der Erosion und der verringerten Bodenfruchtbarkeit an den Berghängen. Die Notwendigkeit, die Produktion in Richtung umweltschonender Verfahren umzustellen ist so für die Bauern nicht mehr gegeben, da sie keine direkten kurzfristigen ökonomischen Konsequenzen der jetzigen Produktionsweise spüren.

Um das Einkommen der Black Thai zumindest auf das nationale Durchschnittsniveau zu steigern reicht es nicht aus, die Grenzproduktionsfunktion der vorhandenen Technologien zu erreichen. Die Produktionsfunktion muß durch technischen Fortschritt

nach oben verschoben werden. Dies erfordert die Einführung neuer Technologien, wobei eine Kombination von produktionssteigerndem und umweltschonendem technischen Fortschritt notwendig ist. Die Einführung von Hohertragsorten in Verbindung mit Mikroterrassen oder Erosionsschutzhecken stellt eine Möglichkeit dar. Besonders zu berücksichtigen sind hierbei nicht nur die geologischen Rahmenbedingungen (Steilhänge, etc.) sondern auch die ökonomische Realisierbarkeit und kulturelle Barrieren, die die Einführung vorhandener Technologien erschweren können. Die vietnamesische Regierung, speziell die regionalen Behörden, sind hier gefordert, entsprechende Strategien zu entwickeln, die den Bauern die Notwendigkeit dieser neuen Technologien vermitteln und die Adoption fördern. Um das Haushaltseinkommen zu steigern, sollte ergänzend an die Schaffung eines außerlandwirtschaftlichen Arbeitsmarktes, sowohl in ländlichen als auch städtischen Gebieten, gedacht werden.

6. Conclusions, Policy Recommendations, Research Implications and Summary

This chapter presents the conclusions of the study, derives policy recommendations, proposes areas on which to focus future research and summarised the work. The conclusions are organised in such a way as to highlight each original research hypothesis.

6.1. *Impact of the Transition Process on Economic Development and the Livelihood of the Population*

Vietnam has embarked on a course of transition from a centrally planned, closed, bureaucratic and subsidised economy to a market-oriented one with a socialist face. The previous centralised system had its origins in the harsh French colonial policies and the subsequent difficult economic situation led to increasing nationalist and communist resistance against French authority and to the foundation of the Viet Minh in 1941. The beginning of transition was triggered by the severe social and economic crisis of the mid-1980s. In fact the transition began in 1979 but was not formally launched until the Sixth Congress of the Communist Party of Vietnam in December 1986.

Transition included extensive market liberalisation, intensive promotion of the private sector and the recognition of ownership in all economic sectors in Vietnam. The agricultural sector is especially important for the country because 25% (1999) of the GDP is produced in this sector. Reforms began here and it is also the sector where economic reforms have so far had most success. In terms of the situation of the rural population, the reforms with the greatest impact were (a) the change of the product contract system and the introduction of private property rights, (b) macroeconomic stabilisation policies, (c) liberalisation of markets (d) unification of the exchange rate and devaluation of the currency and (e) the lifting of trade restrictions.

The reform process has gradually improved the standard of living for most people in urban and rural areas and persisting poverty appears not to be the result of adjustment policies. The bulk of the poor have benefited economically from transition. However, Vietnam started from an extremely low base with extensive poverty and poorly-functioning institutional structures and is still in the World Bank's category for low-income countries with a per capita GDP of 350 US\$ (1998). The positive impact of the reform process is however visible in the fact that since 1986 the per capita income has increased significantly. Also, the improvements are often more pronounced in urban than in rural areas and the incidence of poverty varies considerably between regions.

The social impact of the reforms is quite difficult to measure. Taking the increasing Gini-coefficient (26% in 1989 and 36% in 1999) as an indicator, it can be seen that the gap between the rich and the poor has widened in the last ten years. Deterioration in quality in the health and education sectors can also be observed. Looking at the proportion of the population living below the poverty line, the majority also comes from rural areas.

Vietnam has shown the world that its willingness to initiate changes, but now the reform process needs to be completed. The argument that transition takes time because it is not easy to change customs and habits that have existed for so long is convincing, but the continuation of the reform process is necessary to further improve the living standard of the population.

The isolation of the country brought with it some benefits during the Asian crisis in 1997, while the neighbouring countries suffered more severely. In Vietnam, there was no stock market that might have suffered a plunge and there were no short-term foreign loans to recall. The Vietnamese dong, which is not a convertible currency, was gradually devalued at a pace determined by the National Bank of Vietnam. Vietnam is one of the few Southeast Asian economies that is expected to continue growing. These benefits, however, have been offset by a collapse in foreign investments, manufactured exports and tourism, all of which rely heavily on crisis-hit Asian partners.

Vietnam is facing now the twin challenges of a difficult external environment and a slowdown in domestic growth momentum. The sharp depreciation of East Asian competitors' currencies, coupled with a declining projected regional growth rate threaten to undermine Vietnam's performance in exports and direct foreign investment.

Presently, one of the most severe constraints for further economic development is the lack of adequate hard and soft infrastructure. Infrastructure is crucial for the transportation of capital and knowledge and thus for increased labour productivity. While agriculture has contributed significantly to poverty reduction in the past, a slowdown in its development appears to be noticeable now. The productivity increase due to the land reform and better access to modern inputs and credit has by and large come to a halt. At the present level of access to modern inputs and credit, it appears that access to knowledge is the most constraining factor. While modern inputs and credit are still scarce, simply improving the infrastructure and knowledge market could increase productivity. Vocational training in agriculture could be very effective here.

6.2. The Socio-Economic Situation of Black Thai Farmers

Black Thai farmers belong to an ethnic minority group living in the mountainous regions of Northern Vietnam and represents approximately 2.2% of Vietnam's population. Their main income derives from agricultural activities. The reforms in the agricultural sector have also led to increasing incomes for Black Thai farmers.

For the majority of the farm households examined in this study, the economic situation improved (according to 75% of the household heads). For instance, the revenues from crop production, particularly paddy rice, upland rice, maize and cassava, grew by 227% in nominal terms between 1993 and 1998 and by 122% in real terms. Reasons mentioned for this improvement were increased motivation to work due to the land reform (cited by 31% of the household heads), better access to input and output markets over the past ten years (31%), and the introduction and adoption of new HYVs by farmers (27%).

However, there is clear evidence of a wide gap between rural and urban areas concerning household income. In urban areas the real annual income per household was more than 35,000,000 VND (2,500 US\$) in 1998 whereas in rural areas it reached only around 13,000,000 VND (900 US\$). Furthermore, ethnic minorities are at the bottom end of the income scale in rural areas. Compared to the average income in rural areas, the Black Thai farmers on average reach only 10,000,000 VND (700 US\$), which is around 22% below the overall rural average.

Farmland in the vicinity of the Black Thai is quite scarce. Black Thai farm households of the Black Thai have on average 3,400 m² per capita for cultivation and there is not much agricultural land around to expand the farm area. In addition, agriculture in mountainous regions is often associated with not being sustainable because of deforestation and severe soil erosion on sloping fields. Therefore, extension of the cultivated area may not be a sustainable solution to increase the income of farm households. The workload in peak situations would often not allow an extension of cultivated area with the existing cropping pattern. Alternative crops with different labour peaks would be necessary in order to use family labour more effectively. Here, the agricultural extension service could contribute significantly by identifying culturally acceptable alternative crops with labour peaks between September and January.

In the long run, consolidation of farmland, migration and economic diversification will be necessary if a viable balance is to be maintained between people and natural resources in such fragile areas as the mountains of Vietnam. As land markets become more effective, some farms may be expanded and others may be given up. As a consequence, agricultural labour will be set free. Therefore, labour markets and

labour-intensive development paths are necessary to facilitate the absorption of rural labour at reasonable levels of productivity and earnings within both the rural and the urban economies.

6.3. *The Importance of Agricultural Income in Black Thai Households*

Agriculture is still the main source of income for farmers and contributes for around 90% to the total income of the Black Thai farmers. A relatively high contribution, 60%, comes from crop production, in which maize and paddy rice are the most important crops. The contribution of upland rice is found to be less important. Black Thai farmers perceive rice production as very important in their culture. However, the actual share of income from rice in total income is relatively low at 24%. For around 66% of the farmers, rice is the most important crop and only around 8% of the farmers mentioned maize as most important although it contributes for 38% to the total income.

Livestock contributes around 30% and off-farm activities around 10% to the household income. Off-farm activities are still quite a new source of income for the Black Thai farmers. Ten years ago, no off-farm employment was available that had potential for growth, but now it is on the increase. As an example of growing off-farm activities regional trade and handicrafts could be mentioned.

Farmers' basic socio-economic characteristics such as age, school education, and dependency ratio do not play an important role in the variations in household income. One reason for this may be that the level of formal education is generally relatively low in the region. The dependency ratio is relatively low due to the national family planning policy. However, there tends to be an inverse, although not significant, relationship between the dependency ratio and the household income.

More than 90% of the variations in agricultural income are explained by variations in crop yield and livestock production. Nevertheless, absolute agricultural income could be increased significantly if efficiency in resource allocation were enhanced. Currently, there is a high demand in the Red River Delta and in the Mekong Delta for agricultural products like maize and cassava, but also for fruits. Although market access has increased significantly in the past ten years, it is still at a very low level, because the necessary infrastructure is underdeveloped. Inadequate road and railway infrastructure constitute a problem for satisfying the demand for agricultural products. A better rural infrastructure system is required. However, it is not only the transportation system that must be improved but also access to markets (input, output, credit) and access to vocational training and health services are mentioned foremost.

6.4. Technical Efficiency of Black Thai Farmers' Agricultural Production

Agricultural income is an important income source for farm households. The main share of agricultural income comes from crop production, particularly from maize and paddy rice production. Paddy rice is mainly cultivated for home consumption and has a high cultural value. Maize is often sold at the farm gate or along the main roads to traders and represents the main source of cash revenues. Maize contributes for 38% to the household income.

The analysis of the technical efficiency of paddy rice and maize production in this study is carried out through a stochastic frontier production function technique. This approach is used because the traditional average production function has been shown not to be appropriate for the analysis of Black Thai production behaviour ($\lambda = 0.999$ for paddy rice and $\lambda = 0.783$ for maize). The analysis of the technical efficiency of Black Thai farmers showed clearly that neither the paddy rice producers nor the maize producers are fully efficient in the study region.

In paddy rice production, farmers used the local seed without any chemical fertiliser till the last decade. Since then, HYVs of paddy rice and chemical fertilisers have been introduced into the region. As a result, the yield of paddy rice has increased significantly from 2.9 ton per ha in 1993 to around 4 ton per ha in 1998. In 1998, 24% of households' income came from paddy rice production. On average, paddy rice farmers operate at 56% of technical efficiency and the yield of paddy rice could be increased by 44% through the improvement of the technical efficiency. This would imply an income increase of around 93 US\$ per household.

Production factors in paddy rice activity such as the area cultivated under paddy rice, the quantity of seed, fertiliser and manure applied and the amount of labour used are all significant. The importance of socio-economic factors is relatively slight. Only the age of the household head plays a significant role in the explanation of the technical efficiency level of the Black Thai farm household. The analysis suggests that there is an overuse of seed and fertiliser, which might be a result of lack of experience in using new inputs. Also, old farmers and farmers in more remote areas tend to be less efficient than the younger ones and those closer to the market centres.

Appropriate agricultural extension methods should be developed in order to reach older farmers and farmers living in the more remote areas. Moreover, farmers who have off-farm income tend to reach a higher degree of technical efficiency than those who depend only on income from their agricultural activities. Additional capital gives more flexibility in resource management, encouraging the adoption of technologies to increase productivity, and it provides liquidity in the event of credit constraints.

Interestingly, farmers who had current loans were not more efficient than those without. Nevertheless, better access to credit could help farmers to solve temporary financial bottlenecks.

As mentioned above, maize is the main income source for farmers. Due to the introduction of HYVs for maize, yields have increased significantly in recent years. Although only 25% of the land is cultivated with maize, it contributes for a disproportionately large share to agricultural income. On average, maize farmers operate at 79% of technical efficiency. Around 40% of the farmers in the sample have a technical efficiency level that is lower than the average technical efficiency of maize producers.

In maize production, the production factors seed and level of fertiliser used are significant. The amount of labour does not play a significant role in the technical efficiency of maize production. The importance of socio-economic factors is relatively slight; only the distance to the nearest market centre plays a significant role in terms of variations in maize output. The result for the parameter representing distance to the next market centre is unexpected, since it suggests that farmers who are closer to a market centre are less efficient than the others. Often farmers further away from market centres are also those who do not have paddy rice fields. Consequently, upland farmers may intensify maize production to a greater extent than farmers in the valleys.

Possibilities for raising the technical efficiency of paddy rice and maize are obvious. This would lead to an increase in household income. However, even if Black Thai farm households produce at full efficiency, they would still belong to the poorest income groups in the country. At around 12 million VND, their income would still be lower than the annual average rural real household income for the country as a whole and far below the annual real household income in urban areas, which is more than 35 million VND.

Agriculture is characterised by large seasonal variations in labour demand. While farmers sometimes face labour peaks that could be reduced by technical innovations, they are idle in other seasons. In the context of the Black Thai farmers operating in mountainous regions, their labour force is unproductive due to lack of irrigation facilities and other support services. Under such conditions, technological progress that is linked with appropriate investments in infrastructure could raise the productivity of both farm labour and land.

For farmers, financial costs and benefits are not the only relevant parameters for selecting technological innovations, as profit maximisation is usually not their ultimate goal. Other, less tangible economic benefits must also be considered, such as maintaining household food security. This is why they continue to cultivate rice and cassava although maize may be economically more attractive. This must also be borne in mind when introducing new agricultural techniques into the region.

6.5. *The Impact of Increasing Agricultural Productivity on Natural Resources*

Agricultural productivity in mountainous areas is relatively low compared to the delta areas of the Mekong and Red River. However, the livelihood of a farm household in the study region is based on its agricultural production. Therefore, productivity increasing technologies (PIT) and resource conserving technologies (RCT) have been introduced in the study region over the last few years. The adoption rate of PITs is quite high, whereas the adoption of RCTs is rather low. PITs comprise new seed strains, fertilisers, pesticides and so forth and farmers have adopted PITs predominantly for paddy rice production and rarely on upland fields. The exception on upland fields is the adoption of HYVs for maize (62% of the farmers). Farmers are interested in HYVs and willing to plant them on their fields but they are still hesitant with regard to the use of fertiliser. Extension services need to give more and better explanations of the effects of fertiliser and their application methods. The introduction of new varieties should go hand in hand with the introduction of fertiliser.

The introduction and rapid spread of high yielding paddy rice and maize varieties since the beginning of the 90s resulted in steady output growth for both crops. However, with regard to upland maize cultivation, there is increasing concern that the impact of cultivation on natural resources is negative and could, in the medium term, result in a decrease in output. In the study region, organic matter declined over time as land has been more intensively cultivated. In forest areas the average percentage of organic matter is the highest, at 3.7%. In fields that have been cultivated for more than 20 years the percentage has declined to 1.6%. The adoption of the HYVs (maize) has reduced the awareness of farmers regarding environmental problems like erosion and declining soil fertility. Yields have been steadily increasing and therefore the negative impact of soil erosion and declining soil fertility has not become sufficiently perceptible, as they have not yet had any negative economic impact on farmers. From the 100 farmers surveyed, only nine applied micro-terraces, but only on sugar cane fields. Farmers are well aware of erosion and declining soil fertility but they do not see the necessity of introducing RCTs on their fields. At present, PIT can compensate for the losses caused by erosion and declining soil fertility. Without a change in cultivation methods, however, 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. RCTs were neglected mainly due to the fact that adoption reduces the area available for crop production and needs substantial labour input all year round.

An increase in technical efficiency could conceivably go hand in hand with endangering natural resources. The evaluation of the correlation between the level of fertiliser or pesticides used in both paddy rice and maize production, however, is not significant, except in the case of paddy rice production and the level of fertiliser used. However, another approach (such as a net positive change in the resource stock model, which integrates flows of nutrients, erosion figures and other natural science factors) is necessary in order to investigate the direction of the correlation. For a more expressive environmental impact analysis more information is required, especially regarding soil contents and erosion processes. The present study did not investigate such environmental aspects. Future research on this issue could fill this gap.

A better understanding alone will not improve the adoption behaviour with regard to RCTs, 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. RCTs 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 that farmers could use as animal fodder or as a cash or food crop. Here there is still an immense need for future research. Micro-terraces 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.

The best approach would be to develop technologies that consider both PIT and RCTs in a participatory way drawing on the farmers' knowledge and experience. The Vietnamese government or institutions aiming at the development of rural areas need to elaborate policies that help to promote the adoption of technologies combining PITs and RCTs, so-called "overlap technologies" (Vosti and Reardon, 1977) and create incentives for farmers to apply them.

6.6. Summary of Major Implications

To sum up, the transition process by and large has had positive effects on the socio-economic situation of the Black Thai farmers in the mountainous regions of Northern Vietnam. Nevertheless, it has been found that the average income of Black Thai farmers is still below the rural average income, mainly because they live in marginal

regions. This is despite their access to innovations such as HYVs and other modern agricultural inputs. So far, agricultural income contributes most to the total income. Off-farm activities play a very minor role. Although rice may not contribute the largest share of agricultural income, this crop plays an important cultural role as the feeling of being food secure is closely linked to the perception of having access to it. Maize contributes the largest share of agricultural income. It is an important cash crop but, since maize is not used for human consumption, the cultural value attached to it is low.

The technical efficiency of paddy rice and maize production is alarmingly low. Nevertheless, even if the efficiency could be increased up to 100% level, the total income would remain low compared to the rest of the population. An outward shift of the production frontier is necessary. This implies that appropriate innovations beyond the present level are made available. The Vietnamese Government must elaborate policies that help to promote the adoption of these innovations. Otherwise, Black Thai farmers will be unable to exit poverty in the long term. Public and the civil society play an important role for the Black Thais and the development of their livelihood.